amateur radio

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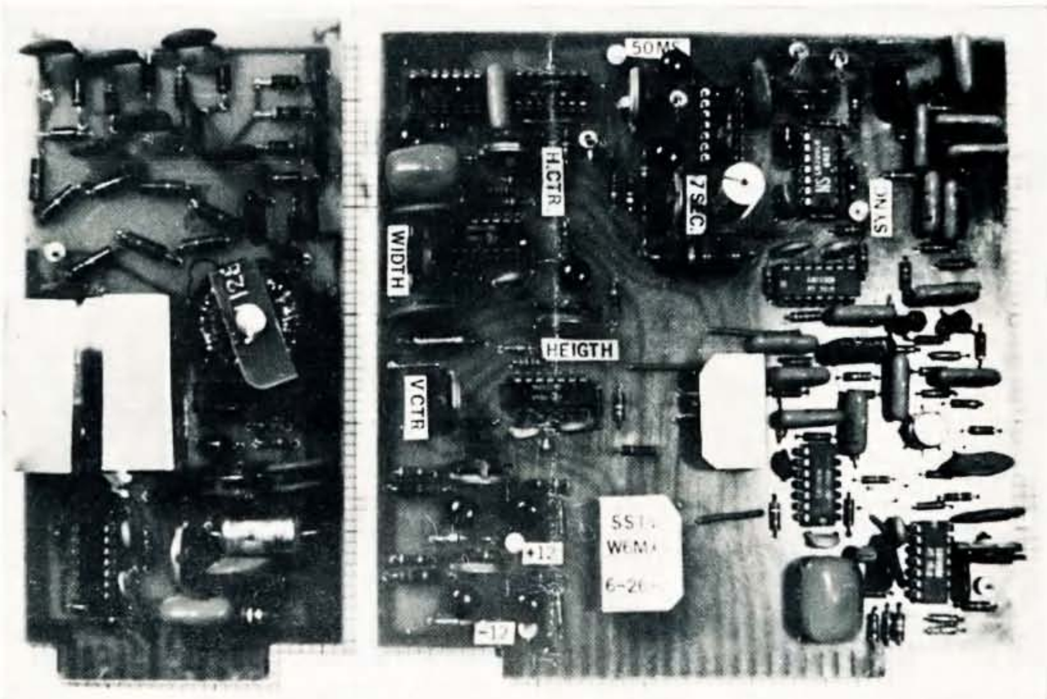

amateur radio

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★

ACKNOWLEDGMENTS: If you write to Federal Executive or to the Manager no acknowledgment is sent out unless you specially request one. Better still, for important items, send them certified mail.

★

Members of the W.I.A. should refer all enquiries regarding delivery of "A.R." direct to their Divisional Secretary and not to "A.R." direct. Two months' notice is required before a change of mailing address can be effected. Readers should note that any change in the address of their transmitting station must, by P.M.G. regulation, be notified to the P.M.G. in the State of residence; in addition, "A.R." should also be notified. A convenient form is provided in the "Call Book".

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COVER STORY

Pictured on our front cover is a PC board of a typical Slow-Scan TV Monitor complete less CRT and EHT supply. Note ICs are used throughout. See S.S.T.V. article on page 3.

FEDERAL COMMENT:

NEW LOOK IN ADMINISTRATION: E.D.P.

This New Year marks yet another step forward in Institute affairs. During last year, as decided at the 1971 Convention in Brisbane, the entire membership details were programmed into computer files to serve three primary and numerous secondary functions.

The three primary objectives are:—

- Preparation of subscription notices;
- Constantly updated mailing lists for "A.R.";
- Australian Call Book printing data.

The first of these has been achieved as all members should already have received their notices for subscriptions due for the year 1972. The second is imminently in operation and the third is partly a function of the material now held being merely the "pressing of a button" to obtain within minutes a print out of the necessary details after feeding in the missing data.

It is equally important, as a corollary, to observe that the data now on file can only be amended or added to BY EACH DIVISION in respect of the members of that Division. Carefully conceived security checks have been devised to ensure that this continues. It is also necessary to assure members that whatever levies are deducted for Federal activities can only be done by the agreement of Divisions and then only at a Federal Convention under normal conditions.

I am glad at this stage to acknowledge the enormous debt of gratitude owed by the Institute to Dr. Deane Blackman, VK3TX, for conceiving and organising the entire project. Without his help, which has also given us considerable savings compared with commercial operations, the old muddles would have continued in certain areas of application.

To programme the details of the membership has required a number of compromises to comply with the objectives on the one hand and the inherent limitations on the other. For some Divisions the detail appears too great, to others too restricted. In certain areas the programme does not admit of infinite variation.

With these points in mind the existing financial arrangements had to be fitted into the system. VK2, VK4 and VK5 Divisions operate a subscription year running from March in one year to February of the next year. VK7 Division is in process now of changing over to the calendar year. VK3 and VK6 are already on a calendar year basis (January to December). Subscription rates in VK2 and VK6 were recently increased and certain revisions were carried out in another Division.

In the Federal field, the I.A.R.U. dues were on a calendar year basis but the per capita fee was still on the March-February year. "Amateur Radio" itself, by agreement at the last Convention, is scheduled for early transfer to Federal Executive from the VK3 Division. At the last Convention the annual Federal per capita fee from 1/1/72 was increased from 55c per member to $3.35 for each Full and Associate grade of member to pay for the administration costs of the Federal office.

Resulting from all these variants, it was necessary to programme the computer with amounts equivalent to ten-twelfths of the annual subscription rates for each of the Divisions on a March-February year, full subscription rates on the others; a full year of the per capita fees less two-twelfths of the amount already paid and ten-twelfths of the costs of "A.R."

This was by prior agreement with the Divisions and results in all the Institute subscriptions, fees, dues and levies for the 1972 year concluding on 31st December, 1972. Most of the Divisions, as a matter of practical application, have ended their financial year on this date and it is, therefore, convenient that all the financial arrangements now fit the calendar year.

As a result of these considerations the members of some Divisions will have noticed that their subscription rates appeared peculiar (being 10/12ths of the annual rate) and others will have observed unusual rates of Federal deductions (again 10/12ths in most instances). Due to various teething troubles and because we could not afford to run two systems in parallel, two errors crept into the programme which resulted in an erroneous grand total on each notice and description errors in the sub-divisions of fees. Both had to be corrected by hand unfortunately.

In the past, subscriptions have been paid to Divisional offices. From these amounts have derived the Federal contributions paid over to Federal Executive in lump sums by each Division. In the new system all subscriptions are required to be sent direct to Federal Executive where they will be accounted for with Divisions at frequent intervals and through the computer to tally-in with the previously programmed data. Although the accounting load on the Federal office will be considerably enhanced, it is hoped that a modern accounting system will readily cope with the demands made on it. Delays along the line will occur when members make or send payments to their Divisions. Receipts will not be issued unless specially requested by the sender so it will be desirable whenever possible to pay by crossed cheque made out to "W.I.A." or "Wireless Institute".

What else does all this mean? The centralisation of subscriptions and the processing through E.D.P. of address changes and other alterations will relieve Divisions of a tremendous volume of work normally done by hard working volunteers. Several Divisions have commented that the preparation of the E.D.P. material has unveiled hitherto unsuspected areas of confusion and error.

Even now, errors may occur either by reason of inevitable and unavoidable communications delays or through normal human inaccuracies. Although the computer is deemed to be exact in its work, data has to be transcribed for the input and the nature of the data must comply with fixed specifications in the programme. Mistakes do occur in both these areas, but the percentage error is low. All these mistakes have to be found and have to be corrected. Sometimes yet another error arises whilst correcting a mistake. One example met with was changing a member's initials which had originally been incorrectly inserted. The correction brought out the correct initials, but in the process the member's name and title were erased. These had to be resurrected but in this process the member's serial number was incorrect with the result that the whole of the member's details had to be re-submitted and we began again at square one. Fortunately, such examples are very, very few in number but are time-consuming to rectify.

The whole of this operation is a collective effort in co-operation by a great many people so, if you do find an error in your subscription notice, please tell, or write to, the Federal Manager about it. Every possible precaution has been taken to ensure correctness and completeness, but in any new undertaking various difficulties always seem to arise despite the best endeavours to avoid them.

Two concluding thoughts. One is to wish you and yours all you wish yourself in the year ahead, and the second is to ask your continued support for the Institute and the Amateur Cause in every possible way.

—MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

SLOW-SCAN TELEVISION—THE AUSTRALIAN WAY

J. A. WILSON, VK3LM/T, and A. H. McKIBBIN,† VK3YEO*

Have you ever wanted to respond to the call "CQ Slow-Scan, CQ Slow-Scan, W6 – – – calling"? Or have you ever heard a variety of audio tones being transmitted on h.f. and wonder what is going on? It could be a CQ call being transmitted in video form but, alas, you can't answer it. Do you want to know more? Then please read on.

SLOW-SCAN TELEVISION (s.s.t.v.) presents an intrigue that is rapidly growing in popularity within the Amateur fraternity. While maintaining all of the DX potential available to conventional s.s.b. transmission, it adds the facility of instantly transmitting picture information in the equivalent audio bandwidth used for voice transmission. Additionally, the pictures may be tape-recorded on a conventional audio tape-recorder and played back any time.

The delightful feeling on first becoming acquainted with the h.f. communications seems to repeat itself with the potential of slow-scan where both activity and DX contacts are a reality.

One of the first items needed to begin in this field is a slow-scan monitor, about which more information will be presented later.

S.s.t.v. earns its name from a scanning rate that is much slower than conventional t.v. In order to use a conventional t.v. camera for s.s.t.v., the horizontal and vertical sweep circuits would have to be modified for the slower sweep frequencies. Another method by which s.s.t.v. pictures can be produced is by means of a flying-spot scanner. Here you cannot transmit live action, but must rely on a slide, negative or photograph which is scanned by a dot of light being produced by a fast-moving electron beam of a c.r.t. focused on to the slide, negative or picture. The light, either passing through the slide or alternatively being reflected from the photograph, modulates a photo-multiplier tube. This video information is combined with vertical and horizontal sync. signals which modulate a conventional Amateur transmitter via the microphone input.

S.S.T.V. SYSTEM USED TODAY

An s.s.t.v. signal is a 1.5 kHz. tone which is shifted down to 1.2 kHz. for sync. information, and modulated upwards to 2.3 kHz. for picture information (video information). The 1.5 kHz. represents the black level and 2.3 kHz. is the white, with tones in between giving shades of grey. The 1.5-2.5 kHz. shift is similar to facsimile and possibly receiving converters could be used on either mode.

A 5-m.s. burst of 1.2 kHz. tone gives the horizontal sync. pulse, while a 30-m.s. pulse of 1.2 kHz. is used for the vertical sync. (see Fig. 2). A horizontal sweep rate of 15 Hz. and a vertical sweep rate of either 7.2 seconds or 8 seconds results in a horizontal resolution of 120 lines. It should be noted by the way that none of these standards is critical.

Although the idea of s.s.t.v. was widely circulated in the late 1950s, the first serious Amateur experiments took place in 1967 when a group of Stateside Amateurs was given permission by the F.C.C. to explore the feasibility of s.s.t.v. on 10 metres. The experiments were a success, and in August 1968, the F.C.C. announced frequency allocations for U.S. Amateurs.

In Australia, we are permitted to transmit s.s.t.v. on any authorised Amateur band provided the bandwidth does not exceed that of an a.m. station, e.g. 6 kHz.

Photo of Jim K1MEA/4 taken from monitor of VK3YEO. Signal strength less than S1. Noise and fading seen on the picture, also lack of horiz. sync. Recorded on Bigsten Cassette Recorder C120 at 1⅞/sec. Receiver FT200, tri-band beam TH3Jr., 40 ft. at VK3BFT (C.T.C. club station), operator was John VK3LM.

Many users of the v.h.f. nets in Melbourne may have heard the woeful tones of s.s.t.v. being transmitted over either 52.525 MHz. f.m. net or Channel B 2 metre f.m. net from time to time and have wondered just what is going on.

Since an f.m. type signal is used for sending the information, the receiving monitors can have a good deal of limiting built in, thus making the system relatively immune to interference from voice signals in adjacent channels.

One of the major benefits of any f.m. system is the "**capture**" effect, which permits the dominant signal to come through easily but reduces or eliminates the effect of the others.

During early experiments, a.m. was used and it was found that by this method, the pictures were greatly degraded after passing over long distances by noise, fading and adjacent-channel interference.

STANDARDISATION

The standardisation question has two sides to it. On the one hand, the man who is thinking of building equipment desires a measure of assurance that his equipment will not be obsolete as soon as it is built. On the other hand, in the long-range picture, it would be a shame to settle for less than the best possible system—the

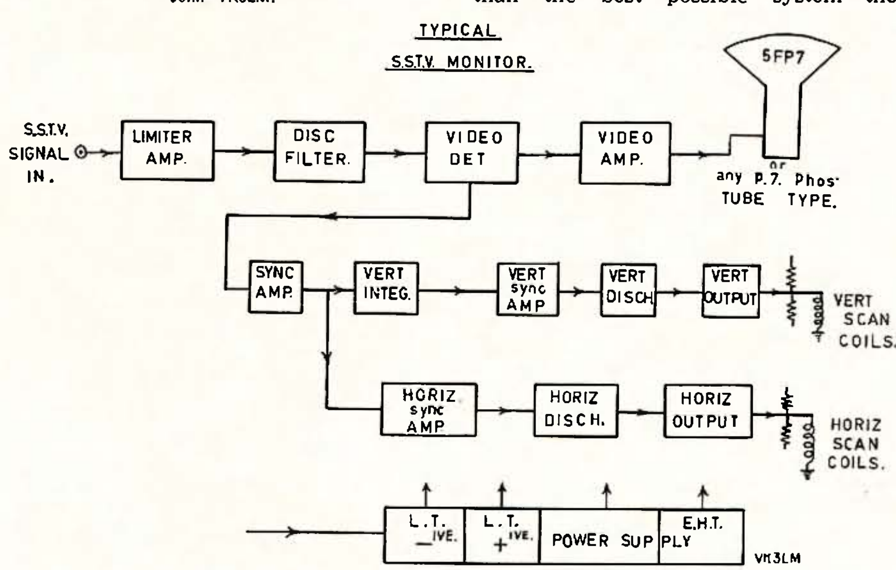


FIG. 1.

* 14 Merrilong Street, Ringwood East, Vic., 3135.
† 27 Beverley Street, East Doncaster, Vic., 3109.

"best" in this case being the optimum compromise between many factors. The system at the moment follows the following guide-lines:—

1. It utilises existing transmitting and receiving apparatus in the Amateur station and this equipment requires no modification at all (e.g. a.m., s.s.b. or f.m. modes).

2. The system can use simple equipment involving moderate cost and readily available components.

3. The system performance is good using simple equipment and by using more sophisticated equipment, it is possible to obtain extremely good results under very poor conditions.

4. The system must be compatible with both 50 and 60 Hz. power frequencies to permit world-wide operation as American circuits are designed to lock to the 60 Hz. mains supply.

Perhaps we in Australia could improve on s.s.t.v. standards as the Federal Executive has stated that they are willing to accept recommendations to suit Australian and overseas standards. For example, here in Australia 50 Hz. mains supplies are evident. We could utilise this for the Australian system and increase the horizontal resolution to say 150 lines per frame or even more. Therefore our monitors would be capable of both 50 and 60 Hz. systems. What are your views on this?

At the present time, it is known that about 500 Amateurs throughout U.S.A., England, Sweden, New Zealand and Australia are active on s.s.t.v.

In Australia, Eric VK6ES is probably the pioneer of s.s.t.v. and has been active for several years. The following is a list of known Amateurs who, at the time of printing, are either active or are in the process of building s.s.t.v. gear:

W.A.—Eric VK6ES
S.A.— Max VK5MF
Vic.— John VK3LM/T, Ringwood E.
George VK3NU, Burwood
Stan VK3TE, Elwood
Wally VK3ABM, Toorak
Kevin VK3ARD, Mt. Waverley
Neville VK3YDR, Rosanna
Mac VK3YEO, Doncaster East
Other States—activity not known.

TRANSMISSIONS

Transmissions take place mainly on 14.230 MHz. in the 20 metre band, ±8 kHz. should the channel be already in use.

In VK3, the co-authors (Mac VK-3YEO and John VK3LM/T) have been handling pictures on 52.525 MHz. 6 metre f.m. and occasionally on Channel B 2 metre f.m. At a later stage, we would like to estabilsh a v.h.f. slow-scanners frequency where experiments and video traffic could be transmitted without interference to other station modes.

With s.s.t.v., we transmit individual pictures rather than movies as in conventional t.v. A long persistance c.r. tube with a P7 phosphor is used so that the image will remain long enough on the screen during the scanning period of the information. Pictures can then be photographed with either conventional or "polaroid" cameras. QSL cards could be made showing the actual picture received from the transmitting station. Alternatively, audio tape QSLs could be exchanged.

Pictures can be received and recorded on standard ¼" audio tape on a reasonably good quality tape recorder at a speed of 3¾" per second. Alternatively, a good quality "Philips-type cassette" recorder at 1⅞" per second can be used. The basic requirement of the recorder is to have a low wow and flutter rate, otherwise the pictures will have wavy edges due to recorder speed variation similar to horizontal "pulling" seen on some commercial fast-scan t.v. receivers. Good success has been had recording pictures on a cassette recorder.

Fig. 4—Picture taken from a commercial monitor of U.S. origin and readers should observe the pin-cushion effect that occurs on most 25-inch tubes today.

PROPOSED S.S.T.V. SPECIFICATIONS

Australia—Not to exceed the bandwidth of d.s.b. = 6 kHz.

1. **S.s.b. normal bandwidth** = 3 kHz.
2. **S.s.t.v.** = 2.3 kHz.
3. **Tone** = 1500 Hz.
   (a) Shifted between 1200 Hz. for sync. information.
   (b) Modulated upwards 2300 Hz. for picture information.
   e.g. **1500 Hz. = black level**
   2300 Hz. = white level
   Tones in between = shades of grey.
   5-m.s. burst of 1200 Hz. = horizontal sync.
   30-m.s. burst of 1200 Hz. = vertical sync.
4. **Horizontal sweep rate** = 60 Hz. supply = 15 Hz.
   Horizontal sweep rate = 50 Hz. supply = 16.66 Hz.
5. **Vertical sweep rate** = 60 Hz. supply = 8 secs.
   Vertical sweep rate = 50 Hz. supply = 7.2 secs.
6. **Resultant resolution** of 120 lines per frame.
7. **Picture size**: Approx. 4¼" sq. Format 1:1.
8. **Direction of scan** (50 and 60 Hz. supply):
   Horizontal—left to right.
   Vertical—top to bottom.

Above as per International and Australian.

INTERNATIONAL S.S.T.V. (NET) FREQUENCIES

(VK Amateurs should note that the 80 and 40 metre frequencies are outside the Australian frequency allocations and thus cannot be used for transmitting purposes.)

80 metres = 3845 kHz.
40 metres = 7200 kHz.
20 metres = 14230 kHz.

Other frequencies are in use from time to time on 21 and 28 MHz.

SUGGESTED AUSTRALIAN (NET) FREQUENCIES

80 metres = 3.650 MHz.
40 metres = 7.125 MHz.
20 metres = 14.230 MHz.
6 metres = 52.6 MHz.
2 metres = 144.675 MHz.

—Draft prepared by J. Wilson, VK3LM/T.

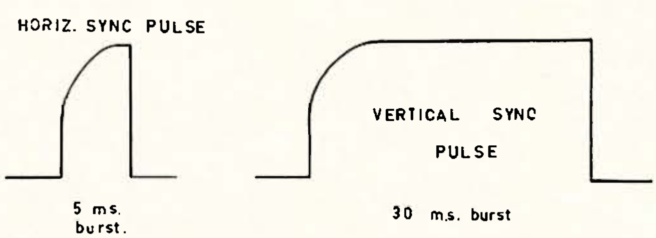


FIG. 2.

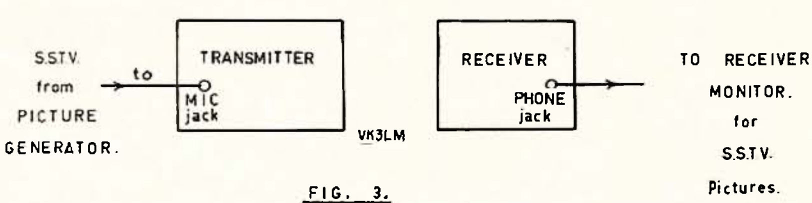


FIG. 3.

RECEIVING THE PICTURE

Receiver tuning is carried out in the normal way as for receiving an s.s.b. signal, but slightly more care in tuning is desirable (see Fig. 3). When off-tuned on s.s.b. the pitch of the voice will be either higher or lower than natural voice resonances because of the tuning error that exists; in s.s.t.v. the above fault would cause incorrect contrast, resulting in the picture being either greyer or blacker than normal.

EQUIPMENT

The monitor (see Fig. 1) is basically the first functional requirement of s.s.t.v. as anyone can become involved in receiving the pictures to keep abreast of current activity. In fact, you can have an entire video programme recorded on tape, plus the monitor and you can then take part in two-way involvement with slow-scan.

The first major requirement for monitor construction is to obtain a 5, 6 or 7 inch c.r. tube with a P7 long persistance phosphor. Although many of these tubes have been available via disposal sources, supplies are quickly drying up. Some units, such as Indicator type 101 or Indicator 101/109 16089 ex Albertros contained a CV1650 tube and a very sensitive deflection yoke with line drive assembly. This meant that a lot of the mechanical construction was already done. The CV1650 is a 6" English tube giving reasonably good picture detail.

Those who may be lucky enough to have a 5FP7 tube in the junk box will have the king of the disposal tubes as these give sharp brilliant pictures with about 6 kv. applied to its anode. In fact, any P7 type phosphor tubes can be used and should you have a suitable tube, it can be re-gunned and re-phosphored for P7 at reasonable prices from picture tube re-gunning establishments in the various States.

One of the larger picture tube manufacturers here in Australia (name supplied—Ed.) will make a new tube, any size to your own specification, for approximately $5 more than the normal trade price for a one-off production.

Due to the 120-line resolution, picture size is rather small, being about 4¼" square format received on a 6" diameter tube. Larger pictures can be received but they become like a very coarse newspaper photo.

Shown elsewhere is an un-retouched photo taken from a commercial monitor 4¼" square format. Note the scan pin-cushion effect that occurs similar to the problem seen on most 25" tubes today (see Fig. 4).

The electronics for the rest of the monitor is rather conventional and can be built with almost any type of electronic components to suit the valve man, transistor man or IC king. Shown is a block diagram of a typical solid state monitor (Fig. 1).

First the deflection system will probably be magnetic and the best coils found were those from the old 70° Bush Simpson or early Classic 70° yokes. Focus can also be obtained by use of the magnetic assemblies obtained from old t.v.'s using the above yokes.

A simple monitor consists of several limiter amplifiers, a discriminator, sync. and video detectors, video amplifier and display c.r. tube. The sync. separator is followed by a one-shot multivibrator (mono-stable) discharge circuits and deflection circuits. A power supply provides different potentials of plus and minus 10 volts or so with the common being at earth potential and e.h.t. supply to suit the type of c.r. tube used.

At this stage, no attempt has been made to publish a constructional article on a s.s.t.v. monitor as it has been found that most Amateurs prefer to use bits and pieces found on hand and to select sections of circuits from various articles to suit their own needs.

A very sophisticated circuit was received from Mike Tallant, W6MXV, who can supply PC boards, ICs, etc., on a commercial basis to Amateurs throughout the world. A photograph on the front cover shows how the entire monitor is constructed on two printed circuit boards, one being approximately 6" square containing all the limiter, sync., video amp. circuits, etc., and the second board approximately 6" x 3" containing the high and low voltage regulated supplies. Interested people requiring more information on these boards could write direct to Mike Tallant, W6MXV (ex W9HWX) at 2843 Mayglen Way, San Jose, California, 95133, U.S.A.

Call of ZL1AOY received by John VK3LM (white letters on black background) on FT200. Strength S8, noise-free picture. Sync. pulling seen on picture. Taken from monitor of Mac VK3YEO.

An article that has appeared enabling Amateurs to become active with smaller equipment outlays is "Slow Scan TV Adaptor for Oscilloscopes" by Bill Briles, W7FEN, published in "QST," June 1970, pages 46-50.

At the conclusion of this article is a list of references where interested people in all aspects and development of slow-scan can obtain information and build up a file of all known published records to date.

Some commercial gear is available State-side for about $US1,200. This includes both monitor and camera and is marketed under the name of "Robot". The only other commercial unit made is built by a one-man firm operated by W2EKY and the monitor is known as the "Eky". The do-it-yourself kit sells for about $US300 with PC boards available for $US10.

PICTURE TRANSMISSION

The first requirement of picture transmission is to satisfactorily scan the slide, photograph or negative in a light-tight box. Two methods of achieving this are shown in Fig. 6. Suggestion 1 shows the reflective method of scan, where the photograph is scanned directly by the c.r.t. and the reflection picked up by the photo-multiplier tubes (usually 931As, etc.).

In suggestion 2, direct scanning methods are tackled. Here the image must be either a transparency or a negative, as the light must pass through the image to reach the photo-multiplier. A very simple way to get going by this method is to use a 35 mm. slide projector where all optics and slide mechanisms are provided. All that is required is to remove the projector lamp from the lamp house and insert a photo-multiplier tube. The c.r.t., usually a 3FP7 tube, can be mounted a suitable distance in front of the objective lens. The above is then assembled in a light-tight box and connected to the rest of the electronics.

A typical block diagram of a slow-scan television picture generator is shown in Fig. 7. Here the c.r.t. scanning is achieved by the usual vertical and horizontal deflection circuits (note

FLYING SPOT SCANNERS.

PICTURE SCANNING METHODS.

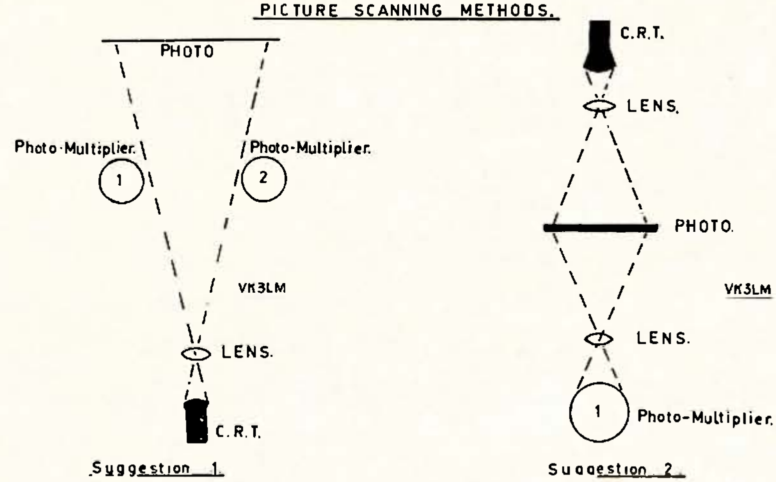


FIG. 6.

the 3FP7 is an electrostatic tube). Output from the photo-multiplier is fed to the modulator then on to the sub-carrier oscillator where output is then taken to the transmitter phone jack as audio out.

Connection to the transmitter is simply by insertion directly into the microphone jack (see Fig. 3) where correct levels are set by the microphone gain control on the transmitter to obtain normal transmitter operation. Of course, should closed circuit pictures be required then the output of the scanner would be fed directly into the monitor input jack.

As can be seen, equipment is not outside the reach of the enthusiastic Amateur. Construction and layouts are not critical. With care and proper construction techniques, excellent results should be obtained.

Included in this article are photographs taken from pictures received from Ian ZL1AOY on 14230 kHz. on ¼" audio tape on a Bigsten Cassette recorder and fed into a monitor constructed by Mac VK3YEO. The photographs were taken with a Leica camera fitted with a bellows and mounted 5" from a 5FP7 tube. Readers should note that these photographs are early results and picture quality should improve as the equipment is further perfected. In U.S.A., some Amateurs are starting to develop s.s.t.v. in **colour**, so the enthusiast should prepare for the future.

PARTS AVAILABILITY

Most of the components used are readily available from most radio parts suppliers throughout the Commonweath. The most difficult parts to obtain are the P7 phosphor tubes. During the latter years, many P7 tubes were available via several disposal sources. Ham Radio Supplies had 40 indicator units complete with h.v. power supplies and a 6" tube. During the last couple of months, these units have been bought by prospective s.s.t.v. operators. However, Ken Milbourn of Ham Radio Supplies, 104 Highett Street, Richmond, Vic., has in stock fifty 3FP7 new tubes suitable for either small monitors or flying spot scanners. The price is $2 direct or plus packing and posting should this be required.

Ken also has in stock at the time of writing, several 3FP7 tubes mounted in shields with filter fitted to the screen face. These are available for $5 complete direct, or plus packing and postage should this method of delivery be preferred.

As mentioned earlier in this article, if you have suitable 5" or 6" tubes, these can be re-gunned and re-phosphored at any t.v. re-gunning manufacturer. However, new tubes (8", 11" or 12") can be supplied made to your specifications with P7 phosphor in a one-off unit (name and address supplied—Ed.). The price of the tube will be trade price plus $5 for the special order. Delivery is approximately two weeks from receipt of order.

Deflection yokes and other components will depend on the type of c.r.t. used. If electrostatic tubes are used, then no deflection components are required. As stated previously, suitable early type t.v. deflection coils can be obtained from obsolete television receivers.

For the flying spot scanners, photomultipliers such as type 931A have been plentiful through normal disposal sources.

This about winds up our first article on Slow-Scan Television—the Australian Way. Included in the insert are detailed proposed specifications of s.s.t.v. in Australia with a list of proposed net frequencies of operation for Australia. You will note that some of the American frequencies are not suitable for transmitting in Australia as these are outside our operating frequencies.

We would like to know how you feel about s.s.t.v.; are you interested in forming an s.s.t.v. club? Do the proposed frequencies suggested pose any problems within your particular State? All communications on the subject should be sent to either of the authors whose addresses are given elsewhere in the article.

Further results and developments will be published in "Amateur Radio" in the near future.

Listed below is a reference of all known articles published on s.s.t.v. for those people wishing to obtain more information on the subject or propose to compile a comprehensive folder on s.s.t.v.

Picture: CQ call by Jim K1MEA/4 (white on black), photographed from monitor of VK3YEO. Signal strength less than S1. Noise level and interference heavy. Note adjacent channel interference seen on the picture, also signal QSB at the bottom of the picture.

LIST OF KNOWN PUBLISHED INFORMATION ON S.S.T.V.

"A Solid State S.S.T.V. Monitor," W9LUO, "QST," March 1971.
"A Compact Slow-Scan Monitor," WA2BCW, "QST," March 1964.
"A Slow-Scan Television Signal Generator," K7YZZ, "73 Mag.," July 1969.
"A Slow-Scan Television Picture Generator," K7YZZ, "73 Mag.," Oct. 1967.
"Conversion Fast-Scan to Slow-Scan Television," W3YZC, "Ham Radio," July 1971.
"Narrow Band Image Transmission" (two parts), W4ZII, "QST," Aug., Sept. 1958.
"Magnetic Deflection for S.S.T.V.," WB2ZIV, "73 Mag.," Feb. 1971.
"An S.S.T.V. Patch Box," W4UMF, "73 Mag.," Feb. 1971.
"A Slow-Scan Vidicon Camera (three parts), WA2BCW, "QST," June, July, Aug. 1965.
"An S.C.F.M. System of S.S.T.V.," WA2BCW two parts), "QST," Jan., Feb. 1961.
"Slow-Scan with Regular Vidicons," WA2EMC, "QST," Feb. 1966.
"S.S.T.V. Budget Television for Hams," W2NSD, "Electronics Ill.," July 1971.
"Slow-Scan T.V. Viewing Adaptor for Oscilloscopes," W7FEW, "QST," June 1970.
"Slow-Scan Image Transmission—A Progress Report," WA2BCW, "QST," April 1960.
"Twenty Metre Slow-Scan Tests," "QST," June 1969.

(Continued on Page 15)

SLOW-SCAN TELEVISION (S.S.T.V.) CLUB

We would like to hear from all Amateurs and S.w.l's interested in SLOW-SCAN, and who would be interested in forming a **Slow-Scan Group in VK.** It is hoped that active participation in s.s.t.v. on both h.f. and v.h.f. in VK will result.

All interested Amateurs may contact either VK3LM/T, John A. Wilson, 14 Merrilong St., Ringwood East, Vic., 3135 (phone 870-5132) or VK3YEO, A. H. (Mac) McKibbon, 27 Beverley St., East Doncaster, Vic., 3109 (phone 842-1411).

BLOCK DIAGRAM of an S.S.T.V. PICTURE GENERATOR.

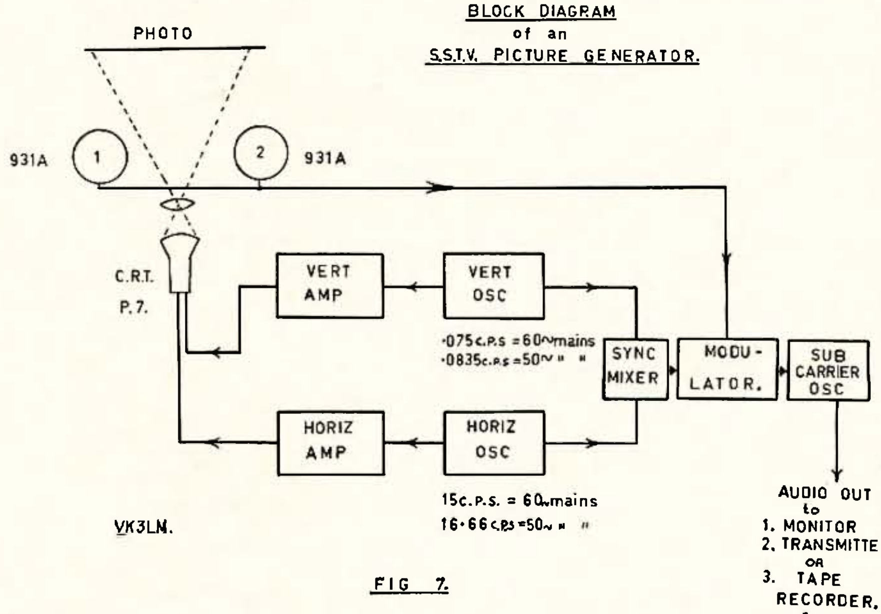


FIG 7.

A V.H.F. 25-WATT POWER AMPLIFIER

G. L. C. JENKINS, VK3ZBJ, and H. L. HEPBURN,† VK3AFQ*

In the March, April and June 1971 issues of "A.R." the authors described a 146 MHz. f.m. transceiver. The June issue made mention of the use of the B3/12 and B12/12 C.T.C. power devices marketed in Australia by Varian. Further up in the power level, Varian market the C.T.C. B25/12 and the C.T.C. B40/12 which, at 146 MHz., can be expected to give 25/30 and 45/50 watts of r.f. output when powered from a 13.6v. rail.

This article is intended briefly to describe an "add on" 146 MHz. p.a. which uses the B25/12 device.

The circuit diagram is given in Fig. 1 and a close basic resemblance can be seen to the 2/3 watt driver and 10/15 watt p.a. originally described. Whilst, electrically, the resemblance is real, there is an equally real divergence when the components used are considered. In the 25 watt unit the d.c. and r.f. currents flowing are high and the components used have to handle these increased currents.

In the units so far built and tested the two input fixed capacitors (6.8 pF. and 22 pF.) are Philips ceramic beads as is the 22 pF. fixed capacitor in the collector circuit of the B25/12. The two 33 pF. fixed capacitors between output and ground are unencapsulated silver micas. The 9 pF. trimmer in the input circuit is a Shinmei unit, while the 3/30 pF. trimmer in the collector circuit is an El-Menco type T50210 20 pF. mica compression trimmer. The performance of this trimmer in high current duty at 146 MHz. is significantly in excess of that obtained with the more usual type of ceramic compression trimmer. The El-Menco component is marketed by A.E.E. Capacitors, of Bell Street, Preston, Vic.

The base choke is a Philips 2¼ turn RFC type 4312-020-36700 modified by replacing the original wire by two parallel wires through the ferrite core. The ferrite used is "lossy" at the frequencies involved and use of alternative ferrites (such as F29 coil former slugs) can lead, at the best, to low efficiency in the p.a. and, at the worst, to breakdown of the transistor. It is essential that the choke used has a low Q and a low impedance at the operating frequency. Use of high Q or high Z chokes may generate voltages at the base which could exceed the ratings of the transistors.

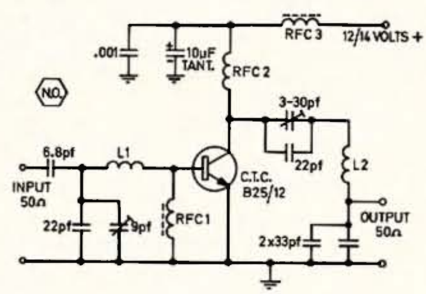
RFC3 is used only as an h.t. line decoupling device and here an F29 slug on a single wire answers the purpose well.

RFC2 is air wound to the dimensions given.

The whole unit is mounted on a piece of (suitably etched) circuit board 4" x 2⅛" used with the copper side uppermost. The components are soldered direct across the appropriate "lands" on the p.c.b. and no wires go through the board. This method of mounting is used so that the board can be laid direct on to a metal heat sink with the main fixing bolt of the transistor making good thermal contact to the heat sink. If one assumes an r.f. output of 25 watts and a d.c. efficiency of, say, 60%, then it can be readily appreciated that some 15 watts of the d.c. input energy must be dissipated as heat. Those attracted by the mathematics involved may care to do some sums, but in practice a piece of ⅛" thick aluminium, painted matt black, at least the same dimensions as the p.c.b. itself, is required.

The general method of tuning up is the same as that described in the April 1971 issue of "A.R." for the 3 and 10 watt power stages. As a guide to performance, the unit now described when running from a 12.6 volt supply draws 3.3 amps. d.c. Under these conditions the measured r.f. output is 25 watts and the d.c. to r.f. conversion 60%.

* 17 Noel Street, East Brighton, Vic., 3187.
† 4 Elizabeth Street, East Brighton, Vic., 3187.



25WATT 144MHz POWER AMPLIFIER—FIG.1

L1—3 turns 18 gauge tinned copper, 3/16-in. i.d. 3/8-in. long.
L2—2 turns 18 gauge tinned copper, 5/16-in. i.d., 1/2-in. long.
RFC1—Philips 4312-020-36700 ferrite RFC—modified, see text.
RFC2—4 turns 16 gauge tinned copper, 1/4-in. i.d., 1/2-in. long.
RFC3—Neosid F29 slug on single wire.

N.S.W. DIVISION, W.I.A.

Central Coast Field Day

GOSFORD

MONDAY, 21st FEB., 1972

Scrambles, Fox Hunts and Mobile events, Ladies Events and Displays, Lunch—morning and afternoon tea, Tours to points of local interest, ample parking and cover.

See Programme in February "A.R."
Details and inquiries to Central Coast Branch of the W.I.A., P.O. Box 238, Gosford, N.S.W., 2250

SIMPLE TRANSISTOR TESTER FOR THE BEGINNER

HARDY SCHONING, VK2BBA*

INTRODUCTION

If you use semiconductors rather than valves in constructing equipment, you are bound to collect, over a period of time, a considerable number of odd transistors and diodes. These finally end up in a box and when you want one either you cannot ascertain the number or you cannot trace it in your data book.

Most of these odd bits would be quite unsuitable for building a 2 metre rig, but would have many applications in the low frequency ranges if only you knew what they were.

A small instrument is described which will enable you to determine the polarity (NPN or PNP), d.c. gain h_{FE} and the leakage current I_{CEO} as well as the polarity of diodes.

All the values given are for silicon transistors—

$$(V_{BE} = 0.6\text{V.})$$

However, the tester can be used for both silicon and germanium devices without change.

PRINCIPLE OF TRANSISTOR D.C. GAIN MEASUREMENT

As the beginner will already know, the current gain of a transistor in common emitter circuit is—

$$h_{FE} = I_C \div I_B$$

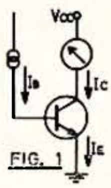


FIG. 1

If the base current is set at a simple value (1 mA. or 100 μA.) and you measure the collector current I_C, the equation may be solved easily as follows—

I_B set to 1 mA.

I_C reads on meter 39 mA.

$$h_{FE} = 39 \text{ mA.} \div 1 \text{ mA.}$$
$$= 39$$

In other words, you can take the reading on the collector mA. meter as d.c. gain h_{FE}—you can take the mA. meter scale as it is for a h_{FE} scale. We can introduce the further following simplification—

We know $I_E = I_C + I_B$
and $h_{FE} = I_C \div I_B$
so $I_B = I_C \div h_{FE}$
then $I_E = I_C + (I_C \div h_{FE})$
or $I_E = I_C\ [1 + (1 \div h_{FE})]$

The gain h_{FE} of most transistors is greater than 20, so the fraction $1 \div h_{FE}$ is 0.05, and getting smaller with increasing gain.

We, therefore, say the expression $1 \div h_{FE}$ is, for our purpose, small enough to be disregarded. We simplify our tester by saying

$$I_E = I_C$$

I_E is easier to measure.

DESIGN OF THE TRANSISTOR TESTER

If you understand the principle of the gain measurement, there should be no problem in designing a simple circuit. Here is one example which you could choose yourself—

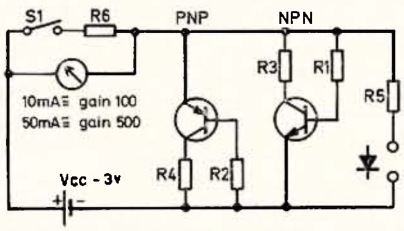
V_{CC} = 3 V.
I_B = 100 μA.
Instrument = 10 mA. = h_{FE} 100 f. scale
2. Range = 50 mA. = h_{FE} 500 f. scale
so 1 mA. would be h_{FE} of 10
2 mA. „ „ „ „ 20 etc.

Assume: Base-Emitter voltage
$$V_{BE} = 0.6 \text{ V.}$$
(for silicon transistor, slightly less for germanium).

Find with simple calculation:

$$R1 = R2 = (V_{CC} - V_{BE}) \div I_B$$
$$= (3\text{V.} - 0.6\text{V.}) \div 100\ \mu\text{A.}$$
$$R1 = R2 = 24\text{K}\ \Omega.$$

I used 22K Ω 2% because it is a standard value. You can make the resistor out of one 22K Ω and 2.2K Ω if you like to be more precise.



TRANSISTOR TESTER WITH TWO SOCKETS
FIG. 2

In Fig. 2, R3 = R4 are in the circuit for current limiting purposes in case of a wrong connection. I_C maximum of 60 mA. is allowed for. This current is permissible for smaller transistors for short periods, thus—

$$R3 = R4 = V_{CC} \div I_C \text{ max.}$$
$$= 3 \text{ V.} \div 60 \text{ mA.}$$
$$R3 = R4 = 50\ \Omega.$$

Insert, therefore, the nearest values you have available, 56 Ω or 47 Ω $\pm$10%, ¼ watt or more. Be careful not to wire R3 or R4 as a common resistor in series with the battery, as this would influence the base current I_B.

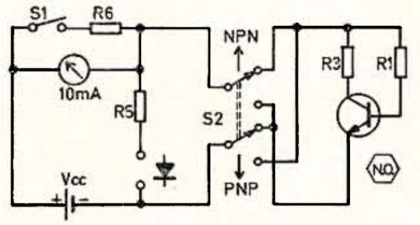
For diodes two more connections are brought out. R5 limits the forward current.

$$R5 = (V_{CC} - V_F) \div I_C \text{ max.}$$
$$= (3 \text{ V.} - 0.6 \text{ V.}) \div 10 \text{ mA.}$$
$$R5 = 240\ \Omega.$$

For R5 I chose 330 Ω $\pm$10% because I had one handy.

To extend the gain reading to 500 you shunt the meter with R6. This resistor value must depend upon the resistance of your milliammeter. Calibrate it for a full scale of 50 mA. with your multimeter.

In this range R3 and R4 will reduce the collector-emitter voltage by high gain transistors, but the tester still will give a reasonable indication of the gain.



TRANSISTOR TESTER WITH ONE SOCKET AND NPN-PNP SWITCH FIG. 3

A small (1½" x 1½") miniature edgewise panel meter was purchased cheaply with a 0-10 linear scale. This was calibrated against a multimeter for two ranges, 10 mA. full scale for a gain of 100, 50 mA. full scale for a gain of 500. You could take out two connector terminals so as to use your multimeter as a milliammeter. In any event, multiply your mA. reading by 10 to obtain the d.c. gain of the transistor.

Two TO18 sockets were handy so these were used instead of PNP-NPN switch. Terminals for the diode test were two 6BA screw heads. S1 is a slide switch, on-off. All of this was built with two UM-3A dry batteries in a cheap little plastic box.

Care taken in assembly will ensure a good appearance and the plastic will take many hard knocks. If you have only one socket, use a switch to change the polarity as shown in Fig. 3. If you have no sockets, a 3-wire outlet with clips will be satisfactory. An on-off switch for the battery is not required, it will last many months.

USING THE TESTER WITH UNKNOWN TRANSISTORS

To determine the connections of the unknown transistor, look up the type of case in the handbook or similar publication, but, if you cannot find it, take a guess bearing in mind that the metal can may often be the collector connection.

I_{CEO} Test: Bend the base wire up; plug the collector and emitter into the NPN-PNP socket. There should be no current reading on either polarity; if there is, the transistor is leaky. If there is a full scale deflection on one polarity and not the other, you do not have the right connection on the transistor, i.e. you have either the collector-base or emitter-base junction, so keep trying to find the two poles which give no reading. These are emitter and collector. The third wire is the base.

NPN or PNP? Connect the collector lead—or the one you think it is—to the collector terminal and connect the base to the emitter terminal. If there is no current indication, you have the

(Continued on Page 15)

* 6/98 Copland Street, Liverpool, N.S.W., 2170.

THE PHASE-LOCK LOOP

PART ONE

R. F. DANNECKER, VK4ZFD*

This is the first of two articles written with a view to acquainting Amateurs with the principles of the phase-lock loop. Applications of the phase-lock loop are outlined and the use of a phase-lock loop as an optimum f.m. discriminator is discussed.

The basic phase-lock loop is shown in block diagram form in Fig. 1. It comprises three basic components:—

(1) A phase detector (Fig. 2),
(2) A low pass filter (Fig. 3),
(3) A voltage controlled oscillator (v.c.o.) (Fig. 4).

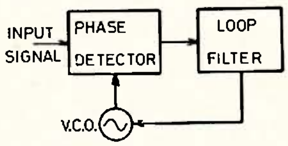


FIG. 1. BASIC PHASE LOCK LOOP

The phase of a periodic input signal and that of the v.c.o. is compared by the phase detector; output of the phase detector is a measure of the phase difference between its two inputs. This difference voltage is then filtered by the loop filter and applied to the v.c.o. Control voltage on the v.c.o. changes the frequency in a direction that reduces the phase difference between the input signal and the v.c.o.

When the loop is "locked" the control voltage is such that the frequency of the v.c.o. is exactly equal to the average frequency of the input signal.

Suppose now that the input signal carries information in its phase or frequency; this signal is inevitably corrupted by additive noise. Suppose also that the v.c.o. is the "local oscillator" in some form of receiver. The task of such a phase-lock "receiver" is to reproduce the original signal while removing as much of the noise as possible. If the "local oscillator" could be locked to the input signal and made insensitive to the random noise on this signal, then the input signal could be reconstructed.

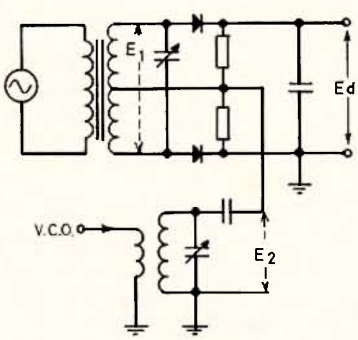


FIG. 2. TYPICAL PHASE DETECTOR

If the signal input is Er sin $(2\pi f t)$ and the v.c.o. is E2 cos $(2\pi f t + \theta)$ then the output of the detector is Ed $\approx$ 2E2 sin θ or for small θ, Ed $\propto$ E2 θ for E2 $>$ E1, i.e. the output voltage is proportional to the phase difference between the signal input and the v.c.o.

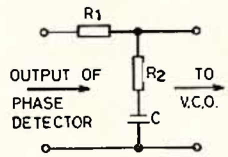


FIG. 3. TYPICAL LOW PASS FILTER

The transfer function of this filter is

$$H(S) = \frac{S\,C\,R2 + 1}{S\,C\,(R1 + R2)} + 1$$

where S is the complex variable.

The input to the loop is a noisy signal, whereas the output of the v.c.o. is a cleaned-up version of the input. To suppress noise, the error output signal from the phase detector is averaged over some length of time by the loop filter, and the averaged error is then used to control the frequency of the oscillator. It is reasonable, therefore, to consider the loop as a kind of filter that passes signals and rejects noise.

Two important characteristics of the filter are that the bandwidth can be very small and the filter automatically tracks the signal frequency. Narrow bandwidth is capable of rejecting large amounts of noise; it is not at all unusual for a phase-lock loop to recover a signal deeply embedded in noise.

One application of the phase-lock loop is as the local oscillator in a synchronous or homodyne receiver. In essence this receiver consists of nothing but a local oscillator, a mixer, and an audio amplifier. To operate, the oscillator has to be adjusted to exactly the same frequency as the carrier of the incoming signal which is then converted to an intermediate frequency of zero Hz. Output of the mixer contains demodulated information that is carried as sidebands by the signal. Correct tuning of the local oscillator is essential to synchronous reception; any frequency error whatsoever will hopelessly garble the information. Furthermore, phase of the local oscillator must agree, very closely, with the received carrier phase. In other words, the local oscillator must be phase-locked to the incoming signal.

Another common application arises in television receivers. The flywheel synchronisers in present-day t.v. receivers are really phase-locked loops.

Space use of phase-lock began with the first American (Russian?) artificial satellites. These carried 10 mW. c.w. transmitters; received signals were correspondingly weak. Furthermore, Doppler shift made the exact frequency uncertain. At the 108 MHz. frequency used, the Doppler shift could range over a ±3 KHz. interval. Hence an ordinary fixed-tuned receiver would require at least a 6 KHz. bandwidth

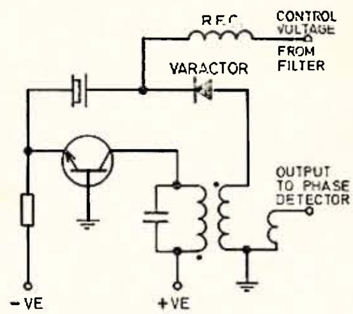


FIG. 4. TYPICAL VOLTAGE CONTROLLED OSCILLATOR

for a signal that could be contained in something like a 6 Hz. bandwidth. This entails a noise penalty (noise is directly proportional to bandwidth) of 1,000 times, i.e. 30 dB. Such penalties are intolerable and that is why narrow-band phase-locked tracking receivers are used.

Noise can be rejected by a narrow-band filter, but if the filter is fixed, the signal will almost never be within the passband. For a narrow filter to be usable it must be capable of tracking the signal. A phase-locked loop is capable of providing both the narrow bandwidth and tracking that are needed. Current applications of phase-lock include:—

(Continued on Page 15)

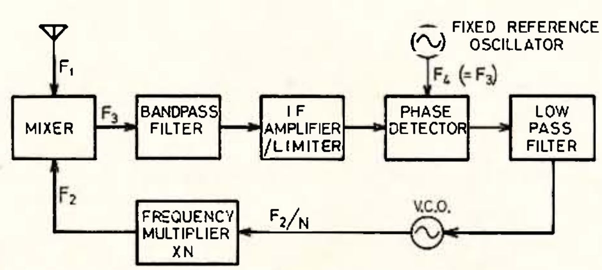


FIG. 5 BASIC PHASE-LOCK RECEIVER

* 52 Pohlman Street, Southport, Qld., 4215.

AUSTRALIAN DX CENTURY CLUB AWARD

OBJECTS

1.1 This Award was created in order to stimulate interest in working DX in Australia and to give successful applicants some tangible recognition of their achievements.

1.2 This Award, to be known as the "DX Century Club" Award, will be issued to any Australian Amateur who satisfies the following conditions.

1.3 A certificate of the Award will be issued to the applicants who show proof of having contacted one hundred countries, and will be endorsed as necessary, for contacts made using only one type of emission.

REQUIREMENTS

2.1 Verifications are required from one hundred different countries as shown in the Official Countries List.

2.2 The Official Countries List will be published annually in "Amateur Radio" and will be amended from time to time as required. Should a country be deleted from the Countries List at any time, members and intending members will be credited with such country if the date of contact was before such deletion.

2.3 The commencing date for the Award is 1st January, 1946. All contacts made on or after this date may be included.

OPERATION

3.1 Contacts must be made in the H.F. Band (Band 7) which extends from 3 to 30 MHz., but such contacts must only be made in the authorised Amateur Bands in Band 7.

3.2 All contacts must be two-way contacts on the same band. Cross band contacts will not be allowed.

3.3 Contacts may be made using any authorised type of emission for the band concerned.

3.4 Credit may only be claimed for contacts with stations using regularly-assigned Government call signs for the country concerned.

3.5 Contacts made with ship or aircraft stations will not be allowed, but land-mobile stations may be claimed provided their specific location at the time of contact is clearly shown on the verification.

3.6 All stations must be contacted from the same call area by the applicant (except as below), although if the applicant's call sign is subsequently changed, contacts will be allowed under the new call sign providing the applicant is still in the same call area.

If the applicant moves to another call area, contacts must be made from within a radius of 150 miles of the previous location to qualify for award purposes. If the distance of the new location from the old exceeds a radius of 150 miles, a separate application for a new award must be made claiming only contacts made from the new location.

3.7 All contacts must be made when operating in accordance with the Regulations laid down in the "Handbook for the Guidance of Operators of Amateur Wireless Stations" or its successor.

VERIFICATIONS

4.1 It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that two-way contacts have taken place.

4.2 Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the details for each claimed station in accordance with the details required in Rule 4.3.

APPLICATIONS

5.1 Applications for membership shall be addressed to the **Federal Awards Manager, W.I.A., P.O. Box 67, East Melbourne, Vic., 3002**, accompanied by the verifications and check list with sufficient postage enclosed for their return to the applicant, registration being included if desired.

5.2 A nominal charge of 25c, which shall also be forwarded with the application, will be made for the issue of the certificate to successful applicants who are non-members of the Wireless Institute of Australia.

5.3 Successful applicants will be listed periodically in "Amateur Radio". Members of the D.X.C.C. wishing to have their verified country totals, over and above the one hundred necessary for membership, listed will notify these totals to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager and two officers of the Federal Executive of the W.I.A. in the interpretation and application of these Rules shall be final and binding.

5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them when necessary.

AUSTRALIAN V.H.F. CENTURY CLUB AWARD

OBJECTS

1.1 This Award has been created in order to stimulate interest in the V.H.F. bands in Australia, and to give successful applicants some tangible recognition of their achievements.

1.2 This Award, to be known as the "V.H.F. Century Club" Award, will be issued to any Australian Amateur who satisfies the following conditions.

1.3 Certificates of the Award will be issued to the applicants who show proof of having made one hundred contacts on the V.H.F. bands, and will be endorsed as necessary, for contacts made using only one type of emission.

REQUIREMENTS

2.1 Contacts must be made in the V.H.F. Band (Band 8) which extends from 30 to 300 MHz., but such contacts must only be made in the authorised Amateur Bands in Band 8.

2.2 In the case of the authorised bands between 30 and 100 MHz., verifications are required from one hundred different stations, at least seventy of which must be Australian. The Amateur Bands 50 to 54 MHz. and 56 to 60 MHz. will be counted as one band for the purposes of the Award.

2.3 In the case of the authorised Amateur Band between 100 to 200 MHz., verifications from one hundred different stations are required.

2.4 It is possible under these rules for one applicant to receive two certificates, one for each of the authorised Amateur Bands nominated in Rules 2.2 and 2.3.

2.5 The commencing date for the Award is 1st June, 1948. All contacts made on or after this date may be included.

OPERATION

3.1 All contacts must be two-way contacts on the same band, and cross band contacts will not be allowed.

3.2 Contacts may be made using any authorised type of emission for the band concerned.

3.3 Fixed stations may contact portable/mobile stations and vice versa, but portable/mobile station applicants must make their contacts from within the same call area.

3.4 Applicants, when operating either portable/mobile or fixed, may contact the same station licensee, but may not include both contacts for the same type of endorsement.

3.5 Applicants may only count one contact for a station worked as a limited licensee with a Z or Y call sign who is subsequently contacted as a full A.O.C.P. holder.

3.6 All stations must be contacted from the same call area by the applicant (except as below), although if the applicant's call sign is subsequently changed, contacts will be allowed under the new call sign providing the applicant is still in the same call area.

If the applicant moves to another call area, contacts must be made from within a radius of 150 miles of the previous location to qualify for award purposes. If the distance of the new location from the old exceeds a radius of 150 miles, a separate application for a new award must be made claiming only contacts made from the new location.

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4.2 Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the following details:—

4.4.1 Applicant's name and call sign, and whether a member of the W.I.A. or not.

4.4.2 Band for which application is made, and whether special endorsement is involved.

4.4.3 Where applicable, the date of change of call sign and previous call sign.

4.4.4 Details of each contact as required by Rule 4.3.

4.4.5 The applicant's location at the time of each contact if portable/mobile operation is involved.

4.4.6 Any relevant details of any contact about which some doubt might exist.

APPLICATIONS

5.1 Applications for membership shall be addressed to the **Federal Awards Manager, W.I.A., P.O. Box 67, East Melbourne, Vic., 3002**, accompanied by the verifications and check list with sufficient postage enclosed for their return to the applicant, registration being included if desired.

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AUSTRALIAN D.X.C.C. COUNTRIES LIST

	Phone	C.W.
A2—Botswana		
AC3—Sikkim		
AC4—Tibet		
AC5—Bhutan		
AP—East Pakistan		
AP—West Pakistan		
BV—Taiwan		
BY—China		
C2—Nauru		
C3—Andorra		
CE—Chile		
CE9AA-AM, FB8Y, KC4, LA, LU-Z, OR4, UA1, VK0, VP8, ZL5, ZS1, 8J—Antarctica		
CE0A—Easter Is.		
CE0X—San Felix		
CE0Z—Juan Fernandez		
CM, CO—Cuba		
CN—Morocco		
CP—Bolivia		
CR3—Portuguese Guinea		
CR4—Cape Verde Is.		
CR5—Principe, Sao Thome		
CR6—Angola		
CR7—Mozambique		
CR8—Portuguese Timor		
CR9—Macao		
CT1—Portugal		
CT2—Azores		
CT3—Madeira		
CX—Uruguay		
DA, DJ, DK, DL, DM—Germany		
DU—Philippine Is.		
EA—Spain		
EA6—Balearic Is.		
EA8—Canary Is.		
EA9—Rio de Oro		
EA9—Ceuta and Melilla		
EI—Ireland		
EL—Liberia		
EP—Iran		
ET—Ethiopia		
F—France		
FB8W—Crozet Is.		
FB8X—Kerguelen Is.		
FB8Z—Amsterdam and St. Paul Is.		
FC—Corsica		
FG7—Guadeloupe		
FH8—Comoro Is.		
FK8—New Caledonia		
FL8—French Somaliland		
FM7—Martinique		
FO8—Clipperton Is.		
FO8—French Oceania		
FP8—St. Pierre and Miquelon		
FR7—Glorioso Is.		
FR7—Juan de Nova		
FR7—Reunion Is.		
FR7—Tromelin		

	Phone	C.W.
FS7—Saint Martin		
FW8—Wallis and Futuna Is.		
FY7—French Guiana and Inini		
G—England		
GC—Guernsey and Dependencies		
GC—Jersey Is.		
GD—Isle of Man		
GI—Northern Ireland		
GM—Scotland		
GW—Wales		
HA—Hungary		
HB9—Switzerland		
HB0—Liechtenstein		
HC—Ecuador		
HC8—Galapagos		
HH—Haiti		
HI—Dominican Republic		
HK—Columbia		
HK0—Bajo Nuevo		
HK0—Malpelo Is.		
HK0—San Andres and Providencia		
HL, HM—Korea		
HP—Panama		
HR—Honduras		
HS—Thailand		
HV—Vatican		
HZ, 7Z—Saudi Arabia		
I, IT—Italy		
IS1—Sardinia		
JA, JH, JR, KA—Japan		
JD1—Minami Torishima		
JD1—Ogasawara and Kazan Is.		
JT—Mongolia		
JW—Svalbard		
JX—Jan Mayen		
JY—Jordan		
K, KN, W, WA, WB, WN—United States of America		
KB6—Baker, Howland and American Phoenix Is.		
KC4—Navassa Is.		
KC6—Eastern Caroline Is.		
KC6—Western Caroline Is.		
KG4—Guantanamo Bay		
KG6—Guam		
KG6—Mariana Is.		
KH6, WH6—Hawaiian Is.		
KH6—Kure Is.		
KJ6—Johnston Is.		
KL7, WL7—Alaska		
KM6—Midway Is.		
KP4, WP4—Puerto Rico		
KP6—Palmyra Group, Jarvis Is.		
KR6, 8—Ryuku Is.		
KS4—Swan Is.		
KS4B, HK0—Serrana Bank and Roncador Cay		
KS6—American Samoa		
KV4, WV4—Virgin Is.		

	Phone	C.W.
KW6—Wake Is.		
KX6—Marshall Is.		
KZ5—Canal Zone		
LA—Norway		
LU—Argentina		
LX—Luxembourg		
LZ—Bulgaria		
MP4B—Bahrein		
MP4D, T—Trucial Oman		
MP4M—Sultinate of Muscat and Oman		
MP4Q—Qatar		
OA—Peru		
OD—Lebanon		
OE—Austria		
OH—Finland		
OH0—Aland Is.		
OJ0—Market Reef		
OK—Czechoslovakia		
ON—Belgium		
OX—Greenland		
OY—Faroe Is.		
OZ—Denmark		
PA—Netherlands		
PJ—Netherlands Antilles		
PJ—Sint Maarten		
PY—Brazil		
PY0—Fernando de Noronha		
PY0—St. Peter and St. Paul's Rocks		
PY0—Trinidade and Martim Vaz Is.		
PZ—Surinam		
SK, SL, SM—Sweden		
SP—Poland		
ST—Sudan		
SU—Egypt		
SV—Crete		
SV—Dodecanese		
SV—Greece		
TA—Turkey		
TF—Iceland		
TG—Guatemala		
TI—Costa Rica		
TI9—Cocos Is.		
TJ—Cameroun		
TL—Central African Republic		
TN—Congo Republic		
TR—Gabon		
TT—Chad		
TU—Ivory Coast		
TY—Dahomey		
TZ—Mali		
UA1-6, UK1, 3, 4, 5, 6A, E, H, I, J, L, P, U, W, X, Y, UW1-6—European Russian S.F.S.R.		
UA9, 0, UK9, UW9, 0—Asiatic R.S.F.S.R.		
UA1—Franz Josef Land		
UA2, UK2F—Kaliningradsk		
UB5, UK5—Ukraine		
UC2, UK2A, C, I, L, O, S, W—White Russian S.S.R.		
UD6, UK6C, D, K—Azerbaijan		
UF6, UK6F, O, V—Georgia		
UG6, UK6G—Armenia		
UH8, UK8H—Turkoman		
UI8, UK8A, C, D, F, G, I, L, O, T, U, Z—Uzbek		
UJ8, UK8J, R—Tadzhik		
UL7, UK7—Kazakh		
UM8, UK8M, N—Kirghiz		
UO5, UK5O—Moldavia		
UP2, UK2B, P—Lithuania		
UQ2, UK2G, Q—Latvia		
UR2, UK2R, T—Estonia		
VE, VO—Canada		
VK—Australia		
VK2—Lord Howe Is.		
VK4—Willis Is.		
VK9AA-MZ—New Guinea		
VK9AA-MZ—Papua		
VK9NA-NZ—Norfolk Is.		
VK9XA-XZ—Christmas Is.		
VK9YA-YZ—Cocos Is.		
VK0—Heard Is.		
VK0—Macquarie Is.		
VP1—British Honduras		
VP2A—Antigua, Barbuda		
VP2D—Dominica		
VP2E, K—Anguilla		
VP2G—Grenada and Dependencies		
VP2K—St. Kitts, Nevis		
VP2L—St. Lucia		
VP2M—Montserrat		
VP2S—St. Vincent and Dependencies		
VP2V—British Virgin Is.		
VP5—Turks and Caicos Is.		
VP7—Bahama Is.		
VP8—Falkland Is.		
VP8, LU-Z—South Georgia Is.		
VP8, LU-Z—South Orkney Is.		
VP8, LU-Z—South Sandwich Is.		
VP8, LU-Z, CE9AN-AZ—South Shetland Is.		
VP9—Bermuda Is.		
VQ1—Zanzibar		
VQ9—Aldabra Is.		
VQ9—Chagos Is.		
VQ9—Desroches		
VQ9—Farquahar		
VQ9—Seychelles		
VR1—British Phoenix Is.		
VR1—Gilbert, Ellice and Ocean Is.		
VR2—Fiji Is.		
VR3—Fanning and Christmas Is.		
VR4—Solomon Is.		
VR5—Tonga		
VR6—Pitcairn Is.		
VS5—Brunei		
VS6—Hong Kong		
VS9K—Kamaran Is.		
VU—Andaman and Nicobar Is.		
VU—India		
VU—Laccadive Is.		
XE, XF—Mexico		
XF4—Revilla Gigedo		
XT—Voltaic Republic		
XU—Cambodia		
XW—Laos		
XZ—Burma		

	Phone	C.W.
YA—Afghanistan		
YB, YC, YD—Indonesia		
YI—Iraq		
YJ—New Hebrides		
YK—Syria		
YN—Nicaragua		
YO—Rumania		
YS—El Salvador		
YU—Yugoslavia		
YV—Venezuela		
YV0—Aves Is.		
ZA—Albania		
ZB2—Gibraltar		
ZD3—The Gambia		
ZD5—Swaziland		
ZD7—St. Helena		
ZD8—Ascension Is.		
ZD9—Tristan da Cunha & Gough Is.		
ZE—Rhodesia		
ZF1—Cayman Is.		
ZK1—Cook Is.		
ZK1—Manahiki Is.		
ZK2—Niue		
ZL—New Zealand		
ZL/A—Auckland and Campbell Is.		
ZL/C—Chatham Is.		
ZL/K—Kermadec Is.		
ZM7—Tokelaus		
ZP—Paraguay		
ZS—South Africa		
ZS2—Prince Edward and Marion Is.		
ZS3—South-West Africa		
1M—Minerva Reefs		
IS—Spratly Is.		
3A—Monaco		
3B6, 7—Agalega and St. Brandon		
3B8—Mauritius		
3B9—Rodriguez		
3C—Equatorial Guinea		
3C0—Annobon		
3V—Tunisia		
3W, XV—Vietnam		
3X, 7G—Republic of Guinea		
3Y—Bouvet Is.		
4S7—Ceylon		
4U—I.T.U. Hq. Geneva		
4W—Yemen		
4X, 4Z—Israel		
5A—Libya		
5B4, ZC4—Cyprus		
5H—Tanzania		
5N—Nigeria		
5R—Malagasy Republic		
5T—Mauritania		
5U—Niger Republic		
5V—Togo		
5W—Samoa		
5X—Uganda		
5Z—Kenya		
6O—Somali Republic		
6W—Senegal		
6Y—Jamaica		
7O—South Yemen		

	Phone	C.W.
7P—Lesotho		
7Q—Malawi		
7X—Algeria		
8P—Barbados		
8Q6, VS9M—Maldive Is.		
8R—Guyana		
8Z4—Saudi Arabia/Iraq Neutral Zone		
9A1, M1—San Marino		
9G—Ghana		
9H—Malta		
9J—Zambia		
9K—Kuwait		
9L—Sierra Leone		
9M2, 4—West Malaysia		
9M6, 8—East Malaysia		
9N—Nepal		
9Q—Republic of the Congo		
9U—Burundi		
9V—Singapore		
9X—Rwanda		
9Y—Trinidad		
——Abu Ail, Jabal at Tair		
——Blenheim Reef		
——Geyser Reef		
——Maria Theresa Reef		
——Melish Reef		

DELETED COUNTRIES LIST

	Phone	C.W.
C9—Manchuria (prior 16/9/63)		
CN2—Tangier (prior 1/7/60)		
CR3—Damao, Diu (prior 1/1/62)		
CR8—Goa (prior 1/1/62)		
EA9—Ifni (prior 13/5/69)		
ET2—Eritrea (prior 15/11/62)		
FF8—French West Africa (pr. 7/8/60)		
FI8—French Indo China (pr. 21/12/50)		
FN—French India (prior 1/11/54)		
FQ8—French Equ. Africa (pr. 17/8/60)		
I1—Trieste (prior 1/4/57)		
I5—Italian Somaliland (prior 1/7/60)		
JZ0—Nether. New Guinea (pr. 1/5/63)		
PK1, 2, 3—Java (prior 1/5/63)		
PK4—Sumatra (prior 1/5/63)		
PK5—Netherlands Borneo (pr. 1/5/63)		
PK6—Celebes & Moluc. Is. (pr. 1/5/63)		
UN1—Karelo-Finnish Rep. (pr. 1/7/60)		
VO—Newfoundland (prior 1/4/49)		
VQ6—Brit. Somaliland (prior 1/7/60)		
VS4—Sarawak (prior 16/9/63)		
VS9H—Kuria Muria (pr. 29/11/67)		
ZC5—Brit. North Borneo (pr. 16/9/63)		
ZC6—Palestine (prior 2/7/68)		
ZD4—Gold Coast (pr. 6/3/57)		
9K3, 8Z5—Kuwait/Saudi Arabia Neut. Zone (pr. 15/12/69)		
9M2—Malaya (prior 16/9/63)		
9S4—Saar (prior 1/4/57)		
9U5—Ruanda-Urundi (between 1/7/60 and 1/7/62 only)		

THE PHASE-LOCK LOOP

(Continued from Page 10)

(1) Perfect a.f.c. (automatic frequency control) of receivers;
(2) P.c.m. telemetry bit synchronisation;
(3) Frequency multipliers and dividers;
(4) Coherent transponders;
(5) Noisy oscillators can be enclosed in a loop and locked to a clean signal; if the loop has wide bandwidth, the oscillator tracks out its own noise and the output is greatly cleaned up.
(6) A phase-locked loop can be used as a frequency demodulator; in which service it gives superior performance to conventional discriminators.

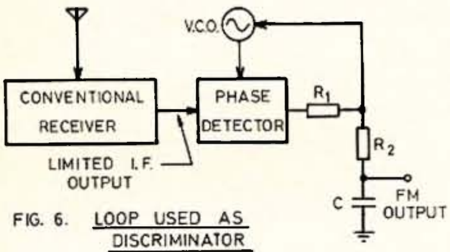

FIG. 6. LOOP USED AS DISCRIMINATOR

A simplified diagram of a superheterodyne phase-lock receiver is shown in Fig. 5. The principal difference between this and a conventional receiver is that the local oscillator tracks the input signal, allowing a much narrower i.f. bandwidth. The smallness of the bandwidth is limited only by error and stability considerations.

Consider now the output of the phase detector; this is proportional to the phase difference between the i.f. signal and that of the local reference oscillator. As the input signal varies in frequency when modulated, so the output of the phase detector will vary in sympathy with the modulation in order that the v.c.o. track with the incoming signal to keep the frequency and phase of the i.f. signal correct. Thus this voltage from the phase detector is a demodulated version of the f.m. signal. Direct use of the phase-detector output is unsatisfactory since it would be very noisy and unfiltered. Normally the demodulated signal is taken from the loop low-pass filter.

A simpler method for using a phase-lock loop as an f.m. demodulator is shown in Fig. 6; performance is of course not as good as a fully fledged phase-lock receiver, but practical advantages are obvious.

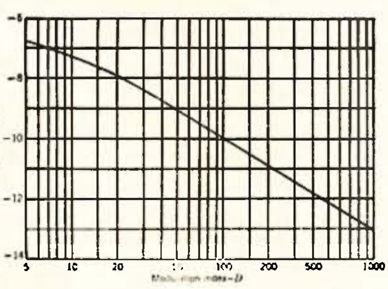

Fig. 7.—Threshold for Random Modulation (Ref. 1).

The threshold of a conventional discriminator is considered to be +10 dB. SNR (signal-to-noise ratio) at the input to the limiter, whereas the threshold SNR for the phase-lock loop demodulator is indicated in Fig. 7.

CONCLUSIONS

The following conclusions may be drawn regarding discriminators:—

(1) At high input SNR's there is no appreciable difference between phase-locked and conventional types.
(2) A phase-locked loop will have a lower threshold than the +10 dB. of a conventional disriminator.
(3) The improvement that can be gained depends on the modulation of the input signal.
(4) For best results, the loop should be specifically designed for the modulation actually present.
(5) Premodulating filtering can provide better performance.

In the second article on this subject, a practical f.m. demodulator using an IC will be discussed. This is of the "add on" variety as in Fig. 6.

REFERENCES

1. Gardner, F. M.: "Phaselock Techniques," Wiley, 1966.
2. Lindsey, W. C.: "Optimum Frequency Demodulation," J.P.L. Space Programmes Summary No. 37-26, vol. iv., pp. 227-237, April 1964.
3. Lathi, B. P.: "Communication Systems," Wiley, N.Y., 1968.
4. McMullen, C. W.: "Communication Theory Principles," Macmillan, N.Y., 1968.
5. Harman, W. W.: "Principles of the Statistical Theory of Communication," McGraw Hill, N.Y., 1963.

SLOW-SCAN T.V.

(Continued from Page 7)

"S.S.T.V.—A Taped Lecture in France, 1969," SM0BVO, "73 Mag.," Dec. 1969.
"The Vidicon Minicamera," W8TYY, "73 Mag.," Apr. 1968.
"Slow-Scan Colour Transmission," W4UMF, "73 Mag.," Jan. 1970.
"A Procedure for Reception of Slow-Scan Colour Pictures using Additive Synthesis," "73 Mag.," Nov. 1969.

LIST OF ABBREVIATIONS USED

S.S.T.V.—Slow-Scan Television.
Disc.—Discriminator.
Det.—Detector.
Amp.—Amplifier.
Integ.—Integrator.
Sync.—Synchronising.
Vert.—Vertical.
Horiz.—Horizontal.
Disch.—Discharge (saw tooth).
Scan.—Scanning.
L.T.—Low tension.
H.T.—High tension.
E.H.T.—Extra high tension.
m.s.—Milli-second.
Osc.—Oscillator.
Photo.—Photograph or picture.
Photo-multiplier.—Photo-sensitive tube (light sensitive).
Lens.—Optical system.
C.r.t.—Cathode ray tube.
P7—Speed of phosphor coating on c.r.t.

ACKNOWLEDGMENTS

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Jack Smith, of Ringwood—Photography of s.s.t.v. pictures.

Mike Tallant, W6MXV—IC circuits of s.s.t.v. monitor and board photograph.

Articles from "QST," 73 Magazine" and "Ham Radio".

TRANSISTOR TESTER

(Continued from Page 9)

right socket or polarity. If there is any current reading, change to the other polarity. If there is no current reading in either polarity, the transistor is a reject. Base open!

h_{FE} d.c. Gain Measurement: Now attach all three connections of your transistor and read the gain on the meter—up to 100 on the 10 mA. scale, up to 500 on the 50 mA. scale. If a very small gain is shown, you have probably erroneously transposed the collector and emitter leads, so merely interchange the two staying in the same polarity as determined previously.

Testing Known Transistor: As what you have done may appear confusing, make some tests with a known transistor to give you a better understanding, but there is really no need to do this if you know the connections of your transistor. In this case, you plug the transistor into each socket and get a gain reading in the right polarity, but nothing in the other. By disconnecting the base there should be no current. If there is a current reading, the device is a reject—leaking!

Testing a Diode: To test a diode, connect it to the diode terminals; in the forward direction it will conduct but by changing the diode connections there should be no reading.

If the device conducts in both directions, even a very small current, or there is no current at all, it is not a diode.

CONCLUSION

Naturally, there are many more parameters to be measured on a semiconductor, particularly for the more serious designer. However, for most of the simple circuits and for the beginner who wants to wet his feet in solid state, this tester is not only very helpful as a start but it takes very little effort and time to build.

With a higher voltage (V_{cc} = 9v.) you will improve the I_{CEO} test, but not all points under the previous heading apply, due to the early breakdown of the base emitter junction. Additional switches could, of course, extend the ranges, etc.

This simple addition of the tester has been found very handy and satisfactory and a good return for the small effort and investment.

ACKNOWLEDGMENT

Sincere thanks to Peter Dodd, VK3CIF, for editing this article.

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W.I.A. Novice Licensing Investigation Committee

Supplementary Report, Oct. '71

COMMITTEE MEMBERS

R. C. Black, VK2YA (Chairman); P. J. Healy, VK2APQ; K. Howard, VK2AKX; D. Jeanes, VK2BSJ; K. Watson, VK2BLW.

INTRODUCTION

Since the original Novice Licensing Report was submitted to the Federal Convention last Easter a considerable amount of further material has been received from groups and individuals interested in the proposals. "Amateur Radio" has published points of view relative to (i) the desirability and otherwise of introducing a lower-level form of Amateur transmitting licence, and (ii) criticism of matters included in the original Report. In adddition, letters, petitions and verbal opinions have been received in considerably greater quantity than those available prior to the compilation of the original Report. It is stressed that the submissions favouring a lower-level form of licence again greatly exceeded those opposing such a move. Furthermore, it is noted that the strongest support comes from (a) radio clubs which are conducting training courses for the A.O.C.P., and (b) persons situated in remote country areas away from clubs and other licensed Amateurs.

COMMITTEE RECOMMENDATIONS REGARDING MATTERS FOR NEGOTIATION WITH THE P.M.G. DEPT.

(a) That the P.M.G. authorities should be asked to approve a trial period of FIVE years during which a lower-level licensing scheme should be operated and, at the expiration of that period, an assessment should be made of its value to the Amateur Service and to the public interest..

Comment: This suggestion was offered by Mr. O'Burtill, VK3WW, and Mr. Shawsmith, VK4SS, in letters to the Editor of "A.R." The pro-Novice section of the Amateur movement and other interested persons should be pleased to have an opportunity of proving their point; the lower-level licensees should be keen to demonstrate that such a scheme will function effectively; the radio clubs providing training courses would be able to assess the value of this grade of licence as a supplement to the theoretical and practical training provided by their courses; the persons who are unfavourably disposed towards Novice licensing will have to look forward to only a limited period of lower-level licensing IF the project proves to be unsuccessful.

At present the protagonists and opponents of the Novice concept have only overseas experience and unproven opinions on which to base their ideas. A trial period will provide a firm basis for the Amateur Service and the Licensing Authority to see "at first hand" the value—or otherwise—of the project. At the end of the trial period a conference of representatives of the P.M.G. Dept. and the Amateur Service could consider the desirability of (i) continuing the lower-level licensing under existing conditions, (ii) introducing modifications to the scheme as found desirable during the trial period, (iii) discontinuing the lower-level grade of licence.

(b) That of the various suggested schemes for an amended licensing structure, preference should be given to that which involves THREE grades of Amateur transmitting licences.

Comments: Suggestions involving four and five grades have been received by the committee and each contains special features of merit to the Amateur Service. However, this committee feels that simplicity of administration, organisation and examining should be paramount and that an additional licence should be recommended in terms of conditions specified in Appendices A, B and C to this Supplementary Report.

(c) That the suggested name of the proposed lower-level certificate should be "The Amateur Operator's Restricted Certificate of Proficiency" and should, therefore, be indicated by the abbreviation "A.O.R.C.P."

Comment: There has been considerable opposition to the use of the term "Novice". Some regard it as an undesirable Americanism; others state that we Australians should be able to contrive our own designation; others regard the word "Novice" as connoting a standard of knowledge which is too low to maintain the prestige of the Amateur Service. The Eastern Zone of Victoria has recommended the "Restricted" designation and this committee strongly supports this usage.

(d) That suggestions involving the use of radio telephony for "Restricted" licensees should be discarded and that the original proposals of "CW ONLY" should be maintained.

Comment: In most overseas countries where lower-level licensing operates "CW ONLY" is the accepted situation. In U.S.A. the original voice facility for Novice operators on one band was withdrawn and "CW ONLY" is the current situation.

(e) That there should be NO LIMITATION on tenure for "Restricted" licensees.

Comment: This will be subject to review at the end of the trial period and perhaps it may be felt at that stage that a limited tenure might be preferable. It is considered that the restrictions imposed on transmitting privileges will in themselves provide sufficient incentive for holders of such licences to study further and to gain operating and practical experience leading ultimately to higher Amateur qualifications. Some correspondents to "Amateur Radio" have expressed the fear that in a "limited tenure" scheme there MAY be a tendency for "time-expired" licensees to retain their equipment and engage in unlicensed transmitting. While this committee does not admit that this is an insuperable problem, it is considered that there are other valid reasons for NOT imposing a time limit.

There may be some "Restricted" operators whose educational limitations may make them incapable of progression to A.O.C.P. level, but who could make a useful contribution to the Amateur Service nevertheless; others may have work and family commitments which debar them from completing A.O.C.P. requirements in a limited period; others may find complete satisfaction in the hobby by c.w. operating and by improving their operating speeds well beyond the examination specifications; others again may use the "Restricted" facility for offering advice and instruction to newcomers to the bands. However, this committee is of the opinion that a great majority of "Restricted" operators will eventually move to A.O.L.C.P. and/or A.O.C.P. status.

(f) That a distinctive range of call signs be suggested for identification of "Restricted" Amateur stations, such as "VK3RAA to VK3RZZ".

Comment: It is evident that such special identification should be possible and this committee recommends the suggestion of the Eastern Zone in Victoria regarding the call sign proposal.

(g) That "Restricted" licensees should be permitted to operate as Fixed, Portable and Mobile station operators.

Comment: Some correspondents queried the safety aspect of Mobile operation. However, it was not envisaged that a vehicle should be driven at the same time as the driver operated a Morse key. It is suggested that the "Restricted" operator would operate the Mobile station as a PASSENGER. This phase of Amateur Radio offers valuable technical problems and situations within the scope of the proposed "Restricted" licence.

(h) That the original suggestion regarding the submission of character references by applicants for lower-level licences should be deleted.

(i) That proposals for the use of v.h.f. bands by "Restricted" licensees should not be accepted.

Comment: The committee feels that v.h.f. techniques and transmitters offer greater problems than those associated with h.f. operation. It is considered that the use of v.h.f. channels could produce t.v.i. problems to a greater extent than would be likely with h.f. allocations.

(j) That the listing of suggested frequencies for "Restricted" operation as indicated in Appendix C of this Supplementary Report should be used as a basis for negotiation with the P.M.G. Dept.

Comment: There have been criticisms of the original frequency proposals in the Report submitted to Easter Convention. Such criticism was anticipated and welcomed.

First, there was opposition to the use of the 1800 kHz. band. This was considered at length by the committee which includes operators experienced in this area. Local nets with low-powered transmitters appear to be quite practicable "Restricted" licensees would find it easy to adapt broadcast receivers for this band.

Second, the committee admits that the DX operators have a good case for wishing to retain the areas near the band edge for their special activity. Accordingly, the committee offers revised suggestions in Appendix C.

Third, the principle of keeping "Restricted" operators off the 14 MHz. band has been well supported and no variation is suggested.

Fourth, no objection has been received to the original proposals for the 21 MHz. band and opinions have been received approving the principle of overlapping with American Novice and Japanese Telegraphy allocations.

Fifth, in the original Report no listing of the 11 metre band for lower-level operation was made. It has been suggested that the area might be made available for "Restricted" operation, subject to "guard bands" at both ends of the existing allocation.

Sixth, it has been suggested by Mr. M. Bazley, VK6HD, that "there is no activity between 28,100 and 28,500 and active groups in this section would help us keep this frequency allocation". Also, the Japanese Telegraphy licensees use the segment from 28,000 to 29,7000 kHz. and this would offer Australian "Restricted" operators an opportunity to contact their counterparts.

RECOMMENDATIONS FOR ACTION BY THE WIRELESS INSTITUTE OF AUSTRALIA

(a) That in the event of a "Restricted" licensing scheme being introduced, each Division should devise means whereby such Amateur operators could be assisted, encouraged and further instructed to higher Amateur status.

(b) That "Restricted" licensees should be permitted to hold FULL membership in the Institute.

Comment: In the original Novice Report this committee recommended that lower-level licensees should be held to ASSOCIATE membership. This suggestion was in deference to the anticipated reluctance of established A.O.L.C.P. and A.O.C.P. members to share FULL membership with "apprentice operators". However, this committee has been quite surprised by the willingness of existing Amateurs to support the concept of "Full membership for Restricted operators" that we must, therefore, recommend this variation from the original suggestion.

(c) That "Restricted" operators should be encouraged to participate in the activities of the Key Section.

Comment: As "Restricted" operators will use the c.w. mode exclusively, it is considered by this committee that they would make a major contribution to building the Key Section into a very strong W.I.A. activity. However, it is suggested that the Key Section administration should make the "Restricted" operators feel that the Section has their welfare in mind, is interested in their problems, and will make some constructive efforts to encourage the art of Morse operating among the newcomers.

APPENDIX A

Proposed amended conditions for the award of Amateur Operators' Restricted Certificates of Proficiency

1. That candidates must pass Morse Code receiving and sending tests at an equivalent speed of FIVE words per minute.
2. That candidates must pass a written examination in P.M.G. Regulations at the same standard as for A.O.L.C.P. and A.O.C.P. candidates.
3. That candidates may gain "conceded" passes for the "Restricted" Certificate by gaining between 50 and 69 per cent. of the possible marks in the A.O.C.P. Theory examination.
4. That candidates for the "Restricted" Certificate must conform to the same age requirements as for A.O.L.C.P. and A.O.C.P. candidates.

APPENDIX B

Proposed Transmitting Privileges for Holders of "Restricted" Certificates

1. 10 watts input to final stage of transmitter(s).
2. Crystal control.
3. C.w. operation ONLY.
4. No time limit on holding "Restricted" licences.
5. Operation permitted under fixed, portable and mobile (passenger-operator) conditions.
6. Frequency allocations approved by the P.M.G. Department from the listing in Appendix C herewith.

APPENDIX C

Proposed Amended Frequency Allocations for use by Holders of "Restricted" Certificates

1. 1805 to 1855 kHz.
2. 3525 to 3570 kHz.
3. 7025 to 7065 kHz.
4. No operation on 14 MHz. band.
5. 21.030 to 21.150 kHz.
6. 27.00 to 27.20 MHz. (observing guard band principle).
7. 28.100 to 28.500 kHz.
8. No operation above 28,500 kHz.

NEW CALL SIGNS

SEPTEMBER 1971

VK3LP—L. T. A. Pearson, "Jubilee Cottage," Main Rd., Campbell's Creek, 3451.
VK3NT—R. J. L. Kelly, 62 Kilby Rd., Kew East, 3102.
VK3NZ—N. D. White, 59 Charles St., Ascot Vale, 3032.
VK3SC—W. G. H. Sargent, 11 Barkley St., Camperdown, 3260.
VK3AAX—F. Rogers, Ballarat Rd., Rockbank, 3335.
VK3ACO—D. G. W. Vernall, 46 Anderson Pde., Bundoora, 3083.
VK3ADM—D. M. Rosenfield, 5 Lygon St., South Caulfield, 3162.
VK3AMI—V. Cornett, 7 Adeney St., North Balwyn, 3104.
VK3AOK—R. F. Davis, 242 Grant St., South Melbourne, 3205.
VK3ATR—A. R. Atkins, 29 Flinders St., East Keilor, 3042.
VK3BCT—R. D. Trickett, Lot 13, Pelican Ave., West Meadows, 3047.
VK3ZDM—Croydon High School Electronics Club, C/o. 5 Macefield Ave., Mooroolbark, 3138.
VK3ZYZ—D. C. Parnell, Derril Rd., Moorooduc, 3933.
VK4CO—C. P. S. Wilks, 87 Main Rd., Maroochydore, 4558.
VK4NI—A. H. Nicholls, 179 Martyn St., Cairns, 4870.
VK4PH—N. G. Williams, Station: Tahiti Ave., Palm Beach; Postal: P.O. Box 224, Coolangatta, 4225.
VK4TU—K. W. Collins, Station: Portable; Postal: 15 McLean St., Goodiwindi, 4390.
VK4ZX—F. E. Earley, Range St., Mt. Lofty.
VK4ZIG—I. G. Morrison, 21 Abau St., Soldiers Hill, Mt. Isa, 4825.
VK4ZJI—J. B. Innes, 60 Peary St., Northgate, 4013.
VK4ZSS—S. S. Dellit, 23 Lorinya St., Mansfield, 4122.
VK6FE—B. M. Bain, 1 Falls St., Exmouth, 6707.
VK6GY—G. I. Guppy, 122 Dyson St., South Perth, 6151.
VK6KN—R. W. H. B. Jones, 61 Peoples Ave., Gooseberry Hill, 6076.
VK7RO—R. E. Rogers, 233 Bligh St., Warrane, 7018.
VK7ZRJ—R. S. Jarvis, 17 Araluen St., Gellston Bay, 7015.
VK8TH—T. M. Hester, 33 Roberts Cres., Alice Springs, 5750.
VK9CH—C. E. Harbour, P.O. Box 148, Kieta.
VK9ZDC—D. Clancy, P.O. Box 426, Port Moresby.
VK0RC—R. C. McPhee, Macquarie Island.

ALTERATIONS

VK3AX—H. D. Boast, 29 Havana Cres., Frankston, 3199.
VK3GM/T—T. G. Foster, 15 Wendouree Pde., Ballarat, 3350.
VK3HI—L. A. Grant, 23 Elliott St., Traralgon, 3844.
VK3QF—P. Dettman, 30 Hooper Cres., West Brunswick, 3055.
VK3RC—R. W. Hill, Station: Mia Mia Rd., Broadford, 3658; Postal: P.O. Box 48, Broadford, 3658.
VK3ARF—R. N. Fenton, 23 Grandview Gr., Rosanna, 3084.
VK3BAP—J. E. Nicholson, 10 Pickworth Gr., Dingley, 3172.
VK3BEQ—J. W. McCulloch, 17 Gap Rd., Riddell's Creek, 3431.
VK3BFD—A. A. George, Lot 162, Western Way, Narre Warren, 3805.
VK3YEQ—B. J. Kemp, 3 Cedar Crt., Glen Waverley, 3150.
VK3ZBC—B. G. Clift, 11 Morinda St., Ringwood East, 3135.
VK3ZFV—R. H. Baker, 37 Gerald St., Nunawading, 3131.
VK3ZIE/T—D. L. Seedsman, 16 Weder Cres., East Burwood, 3151.
VK3ZLK—W. H. Harder, Longmores Rd., Kilmore East, 3657.
VK3ZNZ—T. R. Powney, 91 The Terrace, Ocean Grove, 3226.
VK3ZTB—T. R. Bird, 9 Hosken St., North Balwyn, 3104.
VK3ZUX—K. C. James, 42 The Parade, Ascot Vale, 3032.
VK3ZVV—R. D. Miller, 4 Gordon St., Moorabbin, 3189.
VK4EI/R2—Gold Coast Radio Club, Station: Mr. L. Rabel's Property, Alpine Tce., Mt. Tamborine, 4272; Postal: P.O. Box 588, Southport, 4215.
VK4MA—A. E. Morrison, Fretwell Rd., White Rock, 4870.
VK4ZRY—R. W. Young (Dr.), 9 Boblynne St., Chapel Hill, 4069.
VK5HF—G. Harman, P.O. Box 95, St. Agnes, 5097.
VK5HS/T—K. J. Skewes. Addition of /T.
VK5VP—E. J. V. Willis, 42 Tusmore Ave., Tusmore, 5065.
VK5ZAD/T—G. C. Wiseman, 10 Mines Rd., Campbelltown, 5074.
VK5ZCB—T. R. Friebe, Lot 145, North St., Henley Beach, 5022.
VK6DB—D. F. J. Benck, 67 Omburman St., Wagin, 6315.
VK6FX—W. A. Fulton, Unit 12, Warren Gardens, 1 Rookwood St., Mt. Lawley, 6050.
VK6KQ—H. Sims, Lot 148, Ione Pl., Glenmere, North Whitford.
VK6WU—R. G. Jaeschke, 9 Duffy Rd., Hamersley, 6022.
VK7BM—W. S. Morrison, 19 Cornwall St., Rose Bay, 7015.
VK8ZFH—G. L. Stephens, P.O. Box 2274, Darwin, 5790.
VK9DH—D. G. Hallam, P.O. Box 56, Port Moresby.
VK9KA—O. S. Dahl, P.O. Box 5645, Boroko.
VK9RM—R. H. Murphy, C/o. Dept. of Posts and Telegraphs, Port Moresby.

CANCELLATIONS

VK3FN—B. M. Ferguson. Not renewed.
VK3KW—T. J. Keating. Not renewed.
VK3QG—C. K. Blake. Not renewed.
VK3AAB—A. B. Monks. Not renewed.
VK3ARB—R. A. Bouchier. Not renewed.
VK3BAG—R. J. L. Kelly. Now VK3NT.
VK3BDU—H. H. E. Westerhof. Transferred to Tas.
VK3BEW—N. D. White. Now VK3NZ.
VK3BFE—R. C. McPhee. Now VK0RC.
VK3YAN—J. W. Nairn. Not renewed.
VK3YDO—A. R. Atkins. Now VK3ATR.
VK3YET—P. M. Stewart. Not renewed.
VK3YPG—L. T. A. Pearson. Now VK3LP.
VK3ZOP—D. M. Rosenfield. Now VK3ADM.
VK3ZVL—D. G. Long. Not renewed.
VK4HF—C. H. Foley. Not renewed.
VK4JU—J. M. Joughin. Not renewed.
VK4MM—W. C. Mitchell (Dr.). Not renewed.
VK4RU—W. W. Newman. Not renewed.
VK4ZTU—K. W. Collins. Now VK4TU.
VK5ZM—K. M. Mathews. Not renewed.
VK5ZAA—J. D. Bishop. Not renewed.
VK6LJ—L. J. Smith. Not renewed.
VK6LL—C. E. Bishop. Deceased.
VK6ZAO—R. G. Smith. Not renewed.
VK7BH—B. H. Hall. Not renewed.
VK7ZDP—D. M. Potter. Not renewed.
VK7ZTK—A. J. H. Kendrick. Not renewed.
VK8AU—D. D. Tanner. Transferred to Vic.
VK8ZTH—T. M. Hester. Now VK8TH.
VK9VG—G. W. Van Galen. Transferred to Qld.

LICENSED AMATEURS IN VK

SEPTEMBER 1971

	Full	Lim.	Total
VK0	12	1	13
VK1	88	30	118
VK2	1419	496	1915
VK3	1310	665	1975
VK4	521	208	729
VK5	514	225	739
VK6	370	134	504
VK7	156	64	220
VK8	37	12	49
VK9	84	11	95
Grand Total	4511	1846	6357

FEDERAL REPEATER SECRETARIAT NOTES

Welcome to 1972. We would like to open the column this month with an up-dating report on Repeaters, both in Australia and overseas. Later this year it is hoped to devote more space to detailed reports and we would invite all groups to submit details to the Federal Repeater Secretariat during January.

New Zealand has concentrated repeater activity to date with a.m. systems. A recent issue of "Break-In" carried an ad. "Rent a Rock . . . Visiting Christchurch?" Amateurs visiting in the Christchurch area are invited to use the local 2 mx Repeater. Input 144.65 MHz., output 145.775 MHz. a.m. Hire crystals for the input are available on 8.0361 or 36.1625 MHz. in HC6/U holders. Refundable deposit $8. Rental 50 cents first week, 20 cents each subsequent week, paid in advance. Crystals can be posted prior to your visit. Further details, write "Rent-a-Rock," P.O. Box 1733, Chrichchurch"—a good way to encourage activity.

America appears to have been looking at their problem of many Repeaters and the many channels in use. Most Amateur Radio publications continue to carry Repeater articles or reports in each issue. The equipment market continues to expand and a recent magazine carried some 15 different types available in the ads., including auto channel scanning receivers.

In Europe Repeaters operate in Germany, Switzerland (70 cm.), Denmark and Sweden. There are moves afoot to try and get them introduced into Great Britain.

Back on the local scene we are advised that the Gold Coast (Ch. 1) system is operating from a new site on Mt. Tamborine. It is identified by a keyer VK4EI/R2. (Info. VK4RZ)

From the west a report in the Nov. W.A. Bulletin by Graham VK6BY, outlined local activity. An experimental Repeater has been used for a while which stirred up some interest. The report went on to invite increased support to solve the problems of time, financial and technical. (An up-to-date report will be included in a future issue.)

South Australia has been discussing the frequency clash between segments of the Repeater system and the satellite requirements. This problem is being investigated by the Federal Repeater Secretariat and will be detailed in a future issue. (Thanks to VK5ZFQ and VK5QZ for reports.)

Northern Tasmania has put their Repeater on Mt. Barrow to air using a temporary channel allocation of 4. This will most likely change when the uncertainty of what moves are needed to avoid satellite channels of the future. The equipment is a T.C.A. 1674 50w. base. Ident. keyer VK7WI/R2. Co-axial dipoles at 80 ft. tx and 60 ft. rx. Filters are used on both the tx and rx. Coverage has been good with mobile contacts 100 miles south (near Hobart) and west to Burnie. Over water paths to VK3 have produced contacts in Gippsland, Bairnsdale, Melbourne and Geelong. Best DX was 380 miles to Ararat, Vic. (Thanks Peter VK7PF for details.)

In Victoria the traffic round Melbourne is heavy at times. The Melbourne Ch. 1 system was moved from the city area to the hills with an increase in coverage. The Geelong system (Ch. 4) puts a good signal into Melbourne but this produces problems when working the Gippsland repeater (also Ch. 4)—they both key up. Since the Bendigo site will also have good coverage towards Melbourne, it would appear that a third channel may be needed to reduce the problem. The Australis activity has been responsible for the introduction of a 2 mx to 70 cm. repeater. One has been licensed under the call VK3WIA/R4 for the duration of the present A-O-B project. (Thanks to VK3ZTA, VK3ASV and VK3YDB.)

In N.S.W., the Sydney Ch. 4 system has had some changes to its operation. An experimental voice identification was tried with mixed reception from the users. This has been replaced by an IC keyer (VK2WI-R) which transmits at 5-minute intervals. The repeater, which is located at VK2WI Dural, is to be used as the 2 mx f.m. broadcast channel from this site in the future. This is to overcome the desensitisation of the receiver by Ch. B.

The Central West repeater (VK2AOA) at Orange is still using Ch. 1 in, Ch. A out. This will be changed to Ch. 1 out on a date yet to be announced. A full licence has been granted to Newcastle (Ch. 4), but the system is not yet on air. Manned licences have been granted to Ch. 1 areas of Central Coast (Gosford) and Illawarra (Wollongong). Wollongong is on air using a high band commercial repeater, but a suitable high ground site has yet to be obtained.

Work is under way for Ch. 1 systems for the Lower North Coast (Taree-Port Macquarie); New England and Northern Tablelands (Tamworth-Moree) and Murrumbidgee-Murray (at Wagga). Further information about N.S.W. systems may be obtained from: Sydney VK-2ZIM; Gosford VK2ZRQ; Newcastle VK2BSC; Orange VK2ZKN; Wollongong VK2AGV and VK2BHU; Port Macquarie VK2PA and VK-2ZHE; Tamworth VKs 2ZAY, 2ZCV and 2DK; Wagga VK2YS; State Repeater Co-ordinator is VK2ZPJ.

VK1 (Canberra Radio Society) intends to develop a 2 mx beacon. Chosen frequency is 144.475, at 10w. solid state unit to an omni-directional antenna. The site is yet to be selected. Sydney will have beacons on 6 and 2 mx—when approved—at VK2WI Dural. For this season there is a manned beacon on 52.2 under the call VK2II.

In a future report, the Federal Repeater Secretariat will discuss the possible need for a third repeater channel, the world requirements on 2 mx for an Amateur space allocation, the requirements for national band plans on 2 mx and above, the ideal frequency segments for beacons. We would like to thank the various groups and Amateurs for information supplied in 1971. We wish you all the best for 1972.

—Tim Mills, VK2ZTM, Chairman, Federal Repeater Secretariat, P.O. Box 342, Crows Nest, N.S.W., 2065.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

TO ALL CW OPERATORS

Editor "A.R.," Dear Sir,

In this issue you will find a report by me reference a Commercial C.w. Intruder station ordering a VK Amateur off the 14 MHz. band. Does the underlined segment of that report incense you as much as it does I?

With the above in mind, I have considered forming a band of operators into what, for a better name, I intend calling "The QRM Brigade".

The object of this brigade would be to cause as much QRM as possible in a legitimate manner to these c.w. intruders. The intruders under I.T.U. regulations should not be operating in the sections of the bands under question, and therefore the Amateur operators would be quite within their rights to cause this QRM.

The exclusive Amateur bands are as follows: 28000 to 29700, 21000 to 21450, 14000 to 14250, and 7000 to 7100 kHz., and it would be deemed that the Commercials are causing QRM and not vice versa.

The idea is as follows: Competent c.w. operators to scan the bands, and when an intruder (or pair of intruders) is heard passing traffic, to zero beat that station and call "CQ". If another Amateur comes back to the CQ to conduct a QSO zero beat with the intruder until he moves, and then follow him until he moves out of the band, or QRT. If nobody comes back to the CQ, to keep calling "CQ" until either of the above occurs.

This has been discussed with our Authorities, and the unofficial green light given so long as it is carried out on exclusive Amateur segments of the bands and Amateurs operate within their licence requirements.

Are you interested in trying to rid our bands of this insidious Commercial interference? Will you be a member of the "QRM Brigade"?

A letter, or call on the air letting me know your feelings in the above would be appreciated.

—Alf Chandler, VK3LC.

MORSE TEST—AND AMATEUR LICENCE

Editor "A.R.," Dear Sir,

Would those amongst us in VK land who moan and groan about having to pass a Morse test in order to obtain a full A.O.C.P. please read this bit of information which appeared on page 704 of the R.S.G.B. magazine, "Radio Communication," Oct. 1971 issue:

"Philip West, Jnr., son of G3JPN, having learned the Morse Code characters in three days, attended classes with his father and passed his code test at Portshead on 12th June. At nine years of age he was the youngest applicant ever in Britain. Philip's younger sister, Pauline, can also copy c.w.—she is eight!"

'Garn, it's easy—when you try!

—Eric Trebilcock, L3042.

R.D. CONTEST

Editor "A.R.," Dear Sir,

I have enjoyed the R.D. Contest for many years and feel some new thoughts are in order.

In Nov. "A.R." comment is made on percentage participation. The low percentage in VK2 and VK3 is due to three factors: (1) Phantom calls, (2) Limited calls, (3) Scoring.

(1) Phantom calls I define as persons holding a licence but not operating. I personally know four of these who have not and never will get on the air, let alone work in a contest. There must be many more in both States.

(2) Limited calls. VK2 and VK3 have many of these and the results show poor participation. WHY? I believe that the contest offers little incentive to the Limited call. Can't we make a v.h.f. section in the contest which will attract these undoubtedly keen operators?

(3) The points scoring system discriminates against VK2 and VK3 in that we are worth only 1 or 2 points to the rest and thus have to work really hard for contacts. If the points given/received were more equitable perhaps more would enter.

Finally, any contest in which non participants control the scoring (no State had over 50% participation) is a farce, no matter how enjoyable it is for those taking part. Could some of our brighter members get together and devise a system which would:

(a) Encourage v.h.f. participation.
(b) Base scores on those taking part only.
(c) Equate points to reduce handicapping of any particular State.

—Mike O'Burtill, VK3WW.

"A PRECISION INSTRUMENT"

Editor "A.R.," Dear Sir,

I have seen the No. 10 Crystal Calibrator advertised in "Amateur Radio" as "a precision instrument". I differ with this statement as I recently converted one as per July 1967 "A.R." I found the dial to have a marked amount of backlash and on investigation found the springs, separating the two gear wheels driving the tuning condenser, to be slack. I could tension the springs and mesh the gears, but rotation of the dial caused one wheel to slip and the springs were again slack. No matter what I did, this always happened so I finally accepted it and use it this way.

I converted my set to a.c. operation, using two 6AM6s and a 6BE6. The 500 kHz. crystal oscillator was squegging until I put a 1.5 meg. resistor across the crystal. It finally operated rather well after adjusting the calibration to be correct.

—J. Kitchin, VK6TU.

"NIMBLE FINGERED DIAL TWISTERS"

Editor "A.R.," Dear Sir,

I feel I must write in defence of the "nimble fingered dial twisters" referred to by Mr. A. J. C. Thompson, VK4AT, in his letter on Novice Licensing ("A.R.," Nov. '71).

Having been licensed only three years, I am now in the above category (though not very nimble fingered), with a third-hand s.s.b. rig which cost less than $500. However, during these three years I spent several months on 5w. xtal-locked, and over 12 months with 40w. (mostly c.w.). In that time I have experimented with eight antennae and have plans for a ninth; helped one Amateur gain his licence, which led to the formation of a very active youth club; am now actively connected with a youth club; worked 110 countries and contributed at times to DX notes in "A.R."

This is no great achievement I will admit, but I submit that it is fairly typical of many now in the dial twisting category. There are many mansions in Amateur Radio, and even dial twisters learn something of propagation conditions, if nothing else. From what I have listened to on air, NO Amateur is ever satisfied with his set-up, and the great majority are ever ready to assist others. If we gain a little entertainment and pleasure in the process, surely this is a part of any hobby? So don't knock the dial twisters too hard, OM.

Finally, I am looking forward with pleasure to reading an article by Mr. Thompson on his infra red and ultra violet experiments in the near future.

—Jack R. Dunne, VK3AXQ.

NOVICE LICENSING

Editor "A.R.," Dear Sir,

In injecting a slightly different point of view into the recent licensing discussion, I make some observations not so much on the detail expressed in the report by Mr. Black's committee or in subsequent correspondence, but on the philosophy, or perhaps lack of it, associated with this investigation.

Probably the most significant and important sentence in the report reads as follows: "The introduction of a Novice licensing system could be a factor in increasing band occupancy, easing the pressure from outside interests, **and justifying the continued existence of the Amateur Service**". The bold type is mine, but the latter phrase is, I believe the criteria by which the whole argument for the justification of any new form of licensing or regulatory amendment, has any validity.

It is a pity the committee did not follow through and develop that theme. Instead, much has been said of the benefits to the W.I.A., and the Amateur Service generally by the introduction of another form of licensing, but they are low priority benefits, and do not in themselves serve as argument for making out a case for another licensing scheme.

In my view, the case for justifying the continued existence of the Amateur Service has yet to be made and does not depend on the introduction of yet another licensing grade, and goes much deeper than a comparison with other societies, a reform of leisure time activities, or the production of operators. In themselves they are desirable aims and a possible by-product of Amateur activity—but not a raison d etre.

One senses in the quote, that the authorship of the report believes that Amateur Radio faces a challenge. World wide majority feeling has been amply demonstrated at the recent I.T.U. Space Services Conference—a feeling that Amateur Radio is a hindrance and nuisance to the development of more important services and we have all read of the concessions grudgingly made for the Amateur Satellite Service.

Let me give an example of the type of thinking that results in these attitudes. The following quote was relayed to me by Tom Clarkson, ZL2AZ, who attended the Conference as a member of the I.A.R.U. Observer team. In discussing affairs outside the conference, the following comment was made by a delegate from a more enlightened administration: "In . . . we licence Amateurs, they go and buy a Japanese transmitter and talk to people all over the place—what you say about education and training may have applied once, but not now, there's nothing in it. And if facilities are given for Amateur satellites, the same thing will happen in space—some manufacturers will bring out package sets to talk by space relay and the same thing will happen again—we oppose these things. Even in highly developed countries the Amateurs have given up home construction."

I offer this quote to illustrate why Amateur Radio finds its arguments accepted with so much difficulty in international circles. What this delegate said is not so important—it is the implied condemnation of the Amateur Service that is important, and it is this attitude multiplied around the world that has, somehow, to be changed.

What to do? At the beginning I mentioned philosophy—a philosophy of a practical kind.

To me it seems that we have to take stock of our complete operation; we need a review of the Amateur Service not only locally but internationally with the terms of reference so wide as to cover everything known and imagined. However, whilst there is no guarantee that an answer can be found to the command "justify or perish", the conclusions reached must have some bearing on our attitudes to the future of Amateur Radio. Only then would it be appropriate to consider the proprietary of additional licensing in our structure.

—Peter Williams, VK3IZ.

Editor "A.R.," Dear Sir,

Since my name appears in most of the letters this month (Nov.) I obviously owe you a reply —as short as possible.

E. C. Brockbank: I could write a long comment on why I have no faith in a "low grade licence for a limited time," but you had better talk to me on the radio about this.

The technical standard of the A.O.C.P. in 1930 was the same as it is today, in proportion to the advances in science. Why should the P.M.G. change it?

A number of writers repeat: "A.O.C.P. without any preparation whatsoever". This is a quotation out of context. If you are a matriculation student AND you are interested in gaining an A.O.C.P. you will have read lots of radio magazines and the A.R.R.L. Handbook. Please read page 17 of "A.R." for Oct., 2nd last para, left hand column.

I have made constructive suggestions as to how the recommendations in the N.L. report may be amended.

Mick Rodden: With reference to the regulations in A.O.C.P., this is again out of context —if you are keen, you will have read the handbook from cover to cover and on the night before the examination, you will re-read and refresh memory on "Q" signals.

R. C. Black, VK2YA: My letter to Mr. Black in Oct. "A.R." is not unfriendly, it contains carefully researched facts and an offer to have a QSO with his new FT200.

I am sure he will be happy with the way we anticipated his request by publishing his letter—since my letter is a reply, in Oct. "A.R."

A. J. C. Thompson, VK4AT: I believe Mr. Thompson is anti-Novice and he definitely represents the "experimenter". However, why not have multi-groups in the W.I.A.?—experimenters, key section, phone section, h.f., v.h.f., u.h.f., a.m., s.s.b., slow/fast scan t.v., DX, and finally, "award collectors".

J. Wright: Parts of the Amateur bands were not lost due to limited use, this is a myth. It was caused by the inroads of big business which uses its powers to acquire parts of the spectrum for commercial use.

If more Amateurs were members of the W.I.A. we would have a "bigger voice" in the overall world market for frequencies. Mr. Wright's last paragraph is so true.

Ian Loughnan: I hope he progresses well at school and as he sounds very keen, he should gain the A.O.C.P.

—Ivor Morgan, VK3DH.
Licensed 1930.

(Continued on Page 21)

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

With good conditions looming to the fore during the month of November, we can look forward to some very pleasant hours over the holiday period. Despite the QRM, QRN and anything else you care to name, there is still a lot of good DX to be excavated from the depths of the 40 metre band, and not for the sole edification of the c.w. expert either. The higher bands are good, with some excellent openings on odd occasions on 10 metres. George VK3ASV/T, for example, reports a good opening on this band at 0300 to 0600 on 10th Nov. with a MUF of 38 MHz. to JA.

I was more than interested in VK3ASV's comments on the activity on 11 metres where the 27.125 net is occupied by many of our Amateurs including VKs 2AAV, 3AUJ, 3BBB, 3ASV, 3AVI, 3IO, 3AMA, 3SS, 3DY, 3WR, 3AWW, 3TO, 3ABC, 5IF, 7CX, 7JV and some ZLs. Mac Hilliard, one of our experienced S.w.l's and long time W.I.A. member operating from a Sydney suburb, using one of the better class of American receivers, reports heavy activity on this band, much of it coming from legal VK sources, but a load of purely unadultered garbage hailing from American citizen band operation on 27 MHz. really gives us an idea how this monster has got out of hand.

Two points of interest arise here. Firstly, there is a lot of illegal activity by Australian pirates adopting American tactics on this band, and it would be in the interests of the VK Amateur fraternity for these chaps to be put out of action. I am in the process of compiling a report for the appropriate department on this one. Secondly, as an interested spectator to the current Novice discussions, I feel that it would not hurt some of the parties concerned to have a good listen to the goings on from the West coast of W land in the citizen band (U.S.) segment of 27 MHz., then go up and have a look at the sedate and correct operation by the licensed Novices in their own bands. It may correct a few mistaken ideas.

But on to DX. Firstly a few contest results of interest to the VK gang. In the 34th B.E.R.U. held earlier this year the winner was VK6HD with 5,362 points, with VK3MR 2,965, VK2BPN 2,680, VK2NS 880 and VK2BJL on 17th, 20th, 53rd and 56th positions. "CQ" Nov. honor roll shows VK3AHQ with 308 points in 3rd position in the c.w. section, whilst he is in fourth place on the WPX honor roll with 809. To make a clean sweep, the same op. now has earned his WAZ on s.s.b.

Ernie Luff, our senior S.w.l. from VK5, has been on the sick list for the past few months, but still manages to keep the gear working, and has sent in a welcome list of QTHs which will be at the end of this column. I would take the opportunity of wishing Ernie a speedy return to health, he has been a faithful ally to me over the years in which I have been doing notes.

Activity from the Pacific area is quite plentiful and well spread over all bands. WB6IKI/KB6 has been on from that location, but is now active as VR1AC, where he is to stay for a year. QSL for his operations go to Box 1248, A.P.O., San Francisco, Calif., 96401. Helen KC6YL is on s.s.b. from the West Carolines usually around 14253 and has W3FDP for her manager. His QTH is W. Sedore, Box 950, Denton, Texas, 76201. I understand Helen and OM Bill KC6WS will return to the States shortly, in fact they probably have already. Bill is W3FDP, Helen is WA7SFA.

WB9IAO/KG6 returned to the States recently due to the death of his father, but should be back again by now under the calls of KB6DB and VR1AB. Manager is K3RLY. KG6SV, SI and SW are active from Mariana Is., the latter's manager is W7YBX.

Advance publicity was given re a proposed jaunt to Kure Is. by KH6GMP and group, however one of the helicopters crashed into the Kure lagoon and all flights to Kure from Midway have been cancelled, as was the operation.

XU1AA club station now has 13 Cambodian operators, including XU1VS who is fairly active. 40 metres is the main band for XU1AA, however they plan a tri-band beam in the near future. F.C.C. now permits W stations to work XU, and JA1KSO had planned to operate all bands from there during the "CQ" Contest. HS3DR also anticipated a visit over the first week in November. A late item says that the JA boys arrived there on Oct. 27 and stayed for a week. The QSLs should go to Box 484, Phnom-Penh, Khmer Republic.

Prefixes of interest, XX7IK and XX7FR were specials on the "CQ" Contest, QSL to I.R.E.M., Box 1234, Beira, Mozambique, and it will be used again in the last week of Nov. by CR7IK and CR7FR. Several 9J2 stations used the prefix 917 during the 7th anniversary of Independence celebrations. FY0GW and FY0KP were used recently, no reason given, but QSLs to DJ5SM and DJ5AY resp. KY6PMR was used in connection with the Space Fair from Pt. Mugu California, QSLs to WA6WWC. XX6FL active in early Oct. were from the Luanda International Fair, QSLs go to CR6LA. II4FGM QRV from Marconi Commemoration Foundation, QSLs to Box 2128, Bologna, Italy, and finally a group for the contest: 4C1QB from Mexico, manager W5QBM; 4M1A from Venezuela, manager W2GHK; 4N0DX from Yugoslavia, via YU1SJ, and 5J3CC from Colombia, to HK3CC.

From the elusive Zone 23, JT1AG is on 14 s.s.b. usually around 14200 to 220 at times ranging between 1300z and 1500z. His QSL address is Dambi Bou, Box 639, Ulan Bator, Mongolia. Anybody who has mailed a UA9VH/JT1 card to W3HNK and has not yet had a reply, please send Joe another card with QSL info, as a batch may have gone astray.

Andy MP4MBL has been in the British Commonwealth Net on 21354 at 1500z, and asks for QSLs to his home address, A. Matheson, Paradise Wood Cottage, Hartfield, Sussex. Steve G3FVC also operates the station while awaiting his MP4 call.

YJ8XX is Eric ZL1AJI and puts a fantastic signal in down here. His cards go to ZL1AMO. Other activity there from YJ8BL whose manager is W6NJU. YB9UA Casey is QRV from Waigeo Island, West Irian, OC34 for IOTA hunters, and QSL to Box 171, Djakarta, Indonesia.

To cater for the DX hunters of 40 and 80, UF6FE operates on 80 metres first Monday in each month on 3645 at 2359z, then QSYs to 7040 or 7070. DJ6QT had planned to do some operating on 40 and 80 during his TZ2AB trip which was completed on Nov. 10. QSLs to home address plus two IRCs.

Willy LX1BW is QRV week-ends on 3795 and 7085 s.s.b. Fridays and Saturdays, 2300 0800, using T4X L4B R4A. Maybe of little use to us here, however he states that LX1BW who is using c.w. is a phoney.

If you were lucky enough to work or in the case of the S.w.l. hear EP1JY/AM, this was King Hussein of Jordan flying home from the Iran 2500th anniversary celebrations.

AWARDS

Paris Award.—For contacts with stations in Paris, France, except mobiles. Class one for contacts with 20 districts, class two with fifteen, and class three with ten. QSL and 12 IRCs to F6AZN, Andre Noel, 31 rue Deparcieux 75-Paris 14, France. A silk scarf for YL is given with class one.

Capital Cities Award.—There are five of these available, to give full details would take a full page in itself, but to summarise, All Capitals Award is simple. Work any 20 world capital cities for the basic award since 1st Jan., 1968, and send GCR list and 7 IRCs to DL2HQ or DL9OT. The other four are issued from Sweden and claims should go to SM5BTX, Patrullgaten 6, S-723-47 Vasteras, Sweden, with 10 IRCs for each award. They are Worked European Capital Cities, Worked African Capital Cities, Worked American Capital Cities and Worked Asia Capital Cities. For each award you need to work 15 capitals in that particular zone, and if you want a full list of the capitals in each zone, drop me a stamped envelope. All five awards are available on heard basis to S.w.l's.

TRANS PACIFIC 160 MX TESTS

Briefly, the ones which will concern the VKs are Jan. 1, Jan. 15, Feb. 5 and Feb. 19. VE/W stations call CQ DX test during first five minutes from 1330 to 1335, and the DX calls during the even 5 minutes. Tests last until 1600z. VE/W will be on 1800/1810, JA are on 1907.5 to 1912.5, VK mainly 1802 to 1805 with ZL on 1876. Special sunset to sunset tests between VE/W/JA on same dates at 0700 to 1000z on the same dates.

SOME QTHs

HC1ARE—James, Club Station, Box 289, Quito Ecuador.
HC6JB—Joe, QSL to DJ9ZB.
KR8EA—Box 96, Okinawa.
YV7IC—Box 72, Porlamar, Isle de Margarita, Venezuela.
YV4AFG—Box 18, Morocai, Venezuela.
5W1AU—Box 1069, Apia, West Samoa.
4J0BJ—Box 88, Moscow.

We have to curtail any further notes here, due to space limits, however I am now again receiving Geoff Watts DX News Sheet every week, and as this contains everything of possible interest I will probably be able to answer any queries which anybody has.

My thanks this month to VK3ASV/T, Albert Cash, Mac Hilliard, Ernie Luff and the Geoff Watts DX News Sheet, also to VK3CIF. 73 de Don L2022.

Late DX news from VK2QL: For those needing Sao Thome on c.w., CR5AJ has received a number of additional xtals and is reported active daily on 14000, 14013, 14026, 14040, 14046, 14050, 14065 or 14100 kHz. He expects to be there for five years. CR5SP is keeping the s.s.b. boys content. He has been reported as getting into VK round 0630z.

Juan de Nova was activated by FR7AE/J for 36 hours on Nov. 12-13. There will be a change of operators shortly from the Kerguelen station FB3XX. They will be F6APG and F6BPS. F2MO will remain as QSL manager. If you still need Chad Republic keep a close look for TT8AD. He closes down from there on Dec. 15. C.w. activity from Gambia on 3503, 7003, 14030, 21030 and 28030 by ZD3Q until Dec. 8; QSL via OZ3PO.

CORRESPONDENCE

(Continued from Page 19)

Editor "A.R.," Dear Sir,

I have been following the correspondence in your columns about the Novice licence debate and wish to add my strong support to those Institute members and others who have sent letters in favour of this form of licence.

Owing to family and business pressures I have found it too difficult to continue with the A.O.C.P. course, but feel that I could manage to cope with a simpler form of training such as the Novice licence implies. I am quite willing to accept the fewer transmitting conditions that would be available to me in this situation and am certain that, over a period of Novice experience, I would be able to improve my knowledge and operating skill to the A.O.C.P. standard. Please record this letter as a pro-Novice vote.

—Leon A. Sheers.

Editor "A.R.," Dear Sir,

I am an administration officer, stationed in a rather remote out-station in Papua, and, following an interest picked up while in school, I applied for an Amateur Radio Operator's Licence, only to be confronted by an archaic system of classes and tests. Surely a Novice-type Amateur licence could be introduced that would suit people in my special situation, of which, I am sure, there are many.

My friends in Japan and the United States assure me that these simplified Novice licensees are in operation over there, and quite successfully too. Why can't these types of licences come into operation in Australia as well?

I am sure many of your readers will share my views.

—Peter R. J. Turner.

Editor "A.R.," Dear Sir,

At the last meeting of this group all members present signed a petition to the Federal authorities of the Institute requesting that the W.I.A. might seek from the Postmaster General a third level of Amateur transmitting licence, mentioned generally as a Novice licence.

In submitting this petition we have given special thought to the value of this form of transmitting concession as a means of aiding the instruction of people wishing to enter the Amateur Radio hobby and using Amateur-band communications as a means of communication in the public interest. Our group has had experience of the need for capable radio operators under emergency conditions, especially during the 1968 bushfires in this area and we are planning ahead so that more of our members will be able to operate, instal and maintain the radio equipment available to our fire-fighting unit.

Furthermore, we have noted with interest your Federal President's statement in Nov. issue of "A.R." in which he stated (page 2): "In my view the Amateur Service over the next few years could face a questioning of its position and perhaps its very existence . . . It is clear that the Amateur Service as a whole must be able to demonstrate the usefulness to which it puts its frequencies." We put forward the suggestion that a Novice licence used as an aid to instruction in radio communications could well help to back up your President's contention.

—C. J. Hoppitt,
Captain, Nth. Springwood V.B. Comm. Group.

OBITUARY

ADRIAN H. MILLER, VK3AH

Adrian Miller, VK3AH, passed away suddenly on Sunday, 14th November, aged 54 years.

First licensed in 1937, having attended the W.I.A. classes with Bob Cunningham as instructor, Adrian remained reasonably active on all bands and retained a very active interest in all Amateur matters.

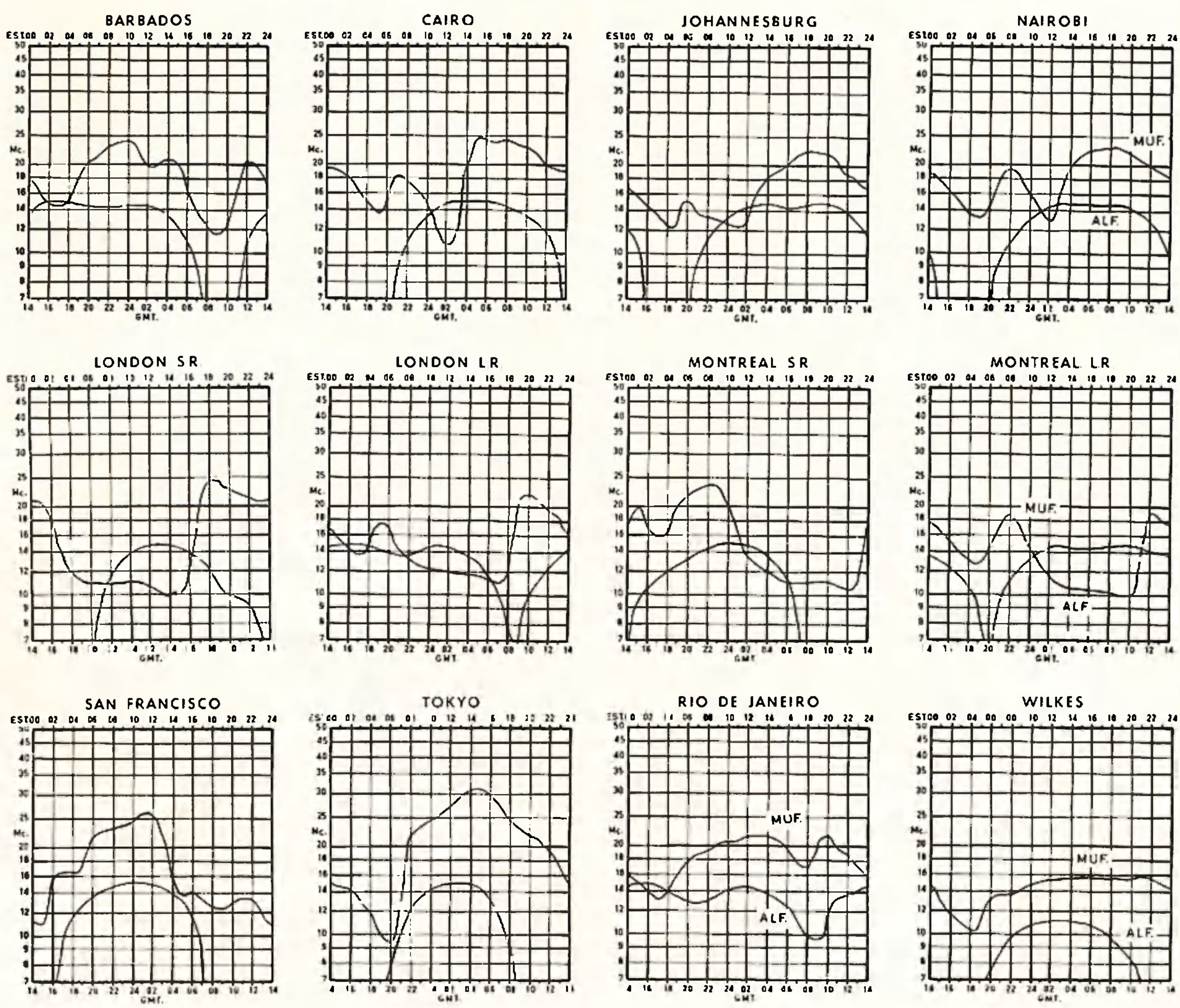
Five years' service in R.A.A.F. radar found him a Flt.-Lt. in charge of radar stations.

An accountant by profession, he was employed, from leaving school, by the Melbourne Herald-Sun organisation. He spent many years with 3DB and then when t.v. started, with HSV7.

Members of the W.I.A. extend their sympathy to his wife, teenage son and daughter.

PREDICTION CHARTS FOR JANUARY 1972

(Prediction Charts by courtesy of Ionospheric Prediction Service)



VHF

Sub-Editor: ERIC JAMIESON, VK5LP
Forreston, South Australia, 5233.

Closing date for copy 30th of month.
Times: Eastern Summer (Daylight Saving) Time.

AMATEUR BAND BEACONS

VK0	52.525	VK0MX, Mawson.
	53.032	VK0TM, Macquarie Island.
	53.544	VK0PF, Casey.
VK2*	52.200	VK2II, Sydney.
VK3	144.700	VK3VE, Vermont.
VK4	52.400	VK4WI/2 Townsville.
	144.390	VK4VV, near Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK9	144.600	VK9XI, Christmas Island.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	51.995	JA1IGY, Japan.
W	50.091	WB6KAP, U.S.A.
HL	50.100	HL9WI, South Korea.
ZK	50.100	ZK1AA, Cook Island.
KH6	50.101	KH6EQI, Hawaii.
	50.015	KH6ERU, Hawaii.

* This station operates as a manned beacon, i.e. attended.

There have been two further additions to the beacon list this month, firstly, VK4WI/2 at Townsville on 52.400 and VK6VE at Mt. Barker near Albany on 52.950 MHz. It is anticipated both of these beacons will be in operation by the time these notes are read. Eddie VK1VP mentioned during a contact a few days ago that a beacon for Canberra is "technically advanced" for the 144 MHz. band. When further news of this one is available details will be included. No news has come to hand from the Darwin area where there have been consistent reports of an impending beacon. It also seems probable a beacon will be established in the Gippsland area shortly on 144.450 MHz. The Sydney "attended operation" beacon is available through the kind courtesy of Michael VK2II and will be operational at least during the DX season, further information on future operation should be forthcoming in due course; the times of operation are variable, but it is expected to be operating some week nights and at week-ends.

The above beacon list has been maintained at its present strength for some time. It is intended to prune off the less likely beacons from the monthly listing after the next equinoxial period (April 1972) as with the declining sunspot numbers the likelihood of reception of beacons from U.S.A., Hawaii, etc., will be very remote indeed. It is intended to produce, probably twice a year, a list which will include these plus a few others for interest, so you can keep your records up to date. The list will continue each month of the Australian and New Zealand beacons, Christmas Island and Japan. It would be appreciated if those charged with the responsibility for construction of any future beacons could give me advice of such construction so the necessary advice can be given through these columns. Any frequency changes or corrections should be promptly advised to me to keep this list in "A.R." correct. I am indebted to those who do keep me informed, and for the many favourable comments I receive during QSOs on the various bands, v.h.f. and h.f., regarding the listing of beacons. This regular listing seems to have provided something people have needed.

Bob VK6BE and Aub. VK6XY are seeing to it that the Albany area will be on the map this year. The 2 mx beacon VK6VE has from 1st Dec. been running 24 hours a day instead of the off season period of 0730 to 0030 daily. Considerable time has been spent in upgrading the 2 mx beacon and efforts made to have the 6 mx one on 52.950 going for the DX season. Both have expressed considerable interest in 432 MHz. and efforts are being made to obtain parts for the construction of equipment by them for use on that band. It seems possilbe that if some help can be given from VK3 and VK5 to meet the power bill for the beacon set-up at Albany, a 432 MHz. beacon could be considered feasible. But as a small group costs pro rata are high, and it seems those most to gain in VK3 and VK5 should be prepared to help in some way. Leigh VK6WA in Perth beams to VK3 and VK5 at 2230 on Tuesdays, Thursdays, Saturdays and Sundays on 144.010 using c.w. If any contact eventuates and conditions are suitable, s.s.b. is available. Leigh usually spends five minutes calling, after which he listens.

While on the subject of people calling, David ZL4PG will be operating portable from a point 5,000 feet a.s.l. 40 miles west of Dunedin on 52.005 every ZL Field Day and VK3 Field Days, running 100 watts of a.m. Additionally, at week-ends David will beam VK from his home with a 5 element yagi between 0900 and 1130, same frequency and transmitter. Also he has available 50 watts of s.s.b. 51.0 to 51.5 MHz., and 144.0 to 144.5 MHz. He runs 100w. of a.m. on 2 mx, as well as 30w. s.s.b. on 432 MHz. A guy worth keeping in mind, particularly as he represents that elusive fourth district.

From George VK3ASV comes some news of the activities of the Eastern Zone (Gippsland) V.h.f. Group, who have been very busy during the winter months upgrading their equipment, and using the Latrobe Valley repeater VK3WI/R3 to swap ideas. In addition, Channel B was quite active, at times Channel C had to take the overflow! More than 50 f.m. operators in that area at present. The "one-up" crossband experimental repeater with an input on 147.760 and output 432.200 near Moe has operated successfully from Latrobe Valley to Melbourne. The current zone s.s.b./a.m. calling frequency is 52.100 and appears to be increasing in popularity.

George also advises that during the DX season the Eastern Zone 2 mx beacon should be operating experimentally from the Latrobe Valley floor near Traralgon on 144.450 MHz. The call sign will probably be VK3BEZ, pending P.M.G. approval. Initial power 1 to 3w. and running 24 hours per day.

Bob VK3AOT sends along his usual interesting notes and the following is extracted therefrom: "Brian VK7ZBY advises that a Ch. 4 repeater, VK7WI/R2 is now operating from Mt. Barrow, a site 4,600 ft. a.s.l. with 70w. output. A 2 mx beacon is also being considered for Launceston. The Devonport beacon, VK7VF, is now operating with 1w. output, but is soon to be increased to 10w. when a solid state amplifier being constructed by Brian VK3ZSJ is completed.

"Thursday, 11th November, was a particularly good night for 2 mx and 12 Melbourne stations worked VK7EM with signals to S9. On 432 MHz. the same night signals from VK7EM were also S9, and created quite a lot of excitement, but unfortunately Winston was unable to listen on 432 and stations had to be content to work crossband. Alan VK2ZEO was also very strong in Melbourne.

"For the interest of many with 432 MHz. gear, Alan VK2ZEO at Deniliquin has now completed equipment for that band, and only awaits a calm day to climb his 100 ft. tower to connect the 432 MHz. antenna. Alan is about 400 miles from Adelaide. Anyone interested?

"Mike Farrell, VK2II, has advised that a VK2 V.h.f. Field Day will be held over Jan. 1, 2 and 3. The only other official field day is in VK3 on Sunday, 3rd. Groups in other States usually also go out over that week-end, so possibilities of contacts over considerable distance could be availble." Thank you, Bob.

Six metres DX got away to a good start this season. The latter part of Nov. saw some excellent openings over most of the Continent. VK5 certainly came in for its share, 26th Nov. being a particularly outstanding day, with the band still open at midnight. States worked were VKs 1, 2, 3, 4, 5, 6 and 7 with many excellent signals, S9 plus from 1w. tx, etc., over 600 to 1,000 miles! The VK2 boys were heard to be having a ball on the f.m. net of 52.525 MHz.

It was noted a further increase in the number of stations now using s.s.b. on 6 mx, and with very good signals. Quite a few operators were caught with the new technique (to them) of having to call on the other station's frequency because of transceive operation. Until this form of operation becomes widely used on v.h.f., operators using transceivers could include in their calling procedure that they are "operating transceive". The station at the other end will then know it is necessary to v.f.o. on to the station calling or vainly hope the s.s.b. fellow tunes!

DAYLIGHT SAVING

With the introduction of daylight saving to VK1, 2, 3, 4, 5 and 7 until 28th Dec., some effects will be noticed for v.h.f. operation. Contests generally will be conducted on Eastern Standard Summer Time (or GMT) so that a contest commencing previously at say 0700 will still continue to start at that time, 0700 being in summer time. Some advantages do come out of this, in effect, as far as propagation is concerned, this is dependent quite largely on temperature changes. Therefore, those in the Eastern States and VK5 have the benefit of an extra hour for 2 mx operation in the morning before signals will deteriorate, i.e. 0700 is really 0600 propagation time! Similarly in the afternoon for sporadic E contacts, everyone should be home an hour earlier (propagation time) and signals which often decline or disappear with the approach of sunset will be there that much longer for you to enjoy. Eastern States should remember there is now a 3-hour time difference with VK6, and 1½ hours with VK8.

I note with interest from the pages of "The Victorian VHF-er" that someone even goes mobile on 576 MHz. Kevin VK3ZYP was heard operating mobile between Melbourne and Geelong. His tx produced 7w. output when fed into a turnstile antenna mounted on a ski-bar. A FET converter and valve tuneable i.f. were used on receive.

From the same source comes advice that Wally VK6ZAA has been appointed Director of Technical Education in Tasmania and will move to Hobart in Jan. 1972. Wally has s.s.b. gear on 6 and 2 mx and a.m. on 432. He has also been active on 576 MHz. (VK7 gain from VK6 loss.)

COMING EVENTS

1st, 2nd and 3rd Jan.—VK2 V.h.f Field Days.
3rd Jan.—VK3 V.h.f. Field Day.
23rd Jan.—End of Ross Hull Memorial V.h.f.-U.h.f. Contest.
12th and 13th Feb.—John Moyle Memorial National Field Day Contest.

To conclude, several bits of information have come to my notice: Dick VK2BDN has been doing some work on 3300 MHz. North Western V.h.f. Group has been formed in VK2 (up Tamworth way), and Chuck VK2DK is believed to be the Secretary. VK4ZTK, running 7 watts, reported to have worked a total of more than 200 JAs. The Devonport beacon VK7VF is using 16 stacked halos for an omnidirectional gain of 9 dB.

That's all for this month. Something for you to think about: "Man is slow, sloppy and brilliant thinker; the machine is fast, accurate and stupid." 73, Eric VK5LP, The Voice in the Hills.

[Flash from Roger VK2ZTB: The Mawson beacon VK0MX was heard in Sydney on Thursday/Friday, 25th/26th November.—Ed.]

DIVISIONAL NOTES

NEW SOUTH WALES

VK2 QSL BUREAU

Inwards: Despatched by the Hunter Branch to members. Each member should advise the Hunter Branch what they require to be done with their cards. Address: P.O. Box 134, Charlestown, N.S.W., 2290.

Outwards: Leave at 14 Atchison Street, Crows Nest, or send direct (with money to cover enclosed cards) to: Mr. T. Lackenby, P.O. Box 96, Frenchs Forest, N.S.W., 2086.

An information sheet outlining the operation of the QSL Bureau is available from 14 Atchison Street, Crows Nest, 2065. If a copy is required please enclose a stamped addressed envelope.

A list of publications and other Institute services may be obtained from the office. If enquiring by mail please send a s.a.s.e. for list.

Phone enquiries will not be accepted as there has been too much confusion with these orders in the past.

The Divisional office at 14 Atchison Street, Crows Nest, will be closed from Friday, 25th December, 1971, to Friday, 21st January, 1972, inclusive. All enquiries by mail will be dealt with as usual.

By the time these notes appear, the Divisional station VK2WI at Dural should be on the air with the Sunday morning broadcast. Frequencies available will be a.m. on 40 and 80 metres. On v.h.f. 52.525 f.m., 53.866 a.m., 145.13 a.m. and Channel 4 145.9 f.m. Later, transmissions will be added on 160 metres a.m. and 432 f.m. In addition s.s.b. facilities will be available on h.f. A trial broadcast was conducted on 28/11/71, but there were still a few gremlins in the new h.f. transmitters.

Members submitting information for "A.R." are reminded to have their information relevant to the month of issue.

Clubs are requested to advise the Secretary of their meeting dates, field days, etc., for the next six months so that we can include this information in "A.R."

Trading post items are being accepted by this Division for submission to the publishers of "A.R." Please refer to a statement, elsewhere in this issue, relating to Hamads.

Members are reminded that the Annual general meeting will be held on 24th March, 1972. A new Council is to be elected at this meeting and the closing date for nominations is 3rd March, 1972—in writing, with the Secretary at 14 Atchison St., Crows Nest.

Further details and the layout of nomination forms will be included in Feb. "A.R."

CLUB NET

A hook-up is held between officials of clubs and the Division on 7110 kHz. at 1000 EST every first and third Sunday of the month. This is to enable the exchange of information rather than a ragchew.

The frequency for the Divisional call-backs has been changed from 7050 kHz. (now a national calling frequency) to 7145 kHz. For the moment pre-broadcast calls will be made on 7050 kHz.

CLUB NEWS

The Canberra Radio Society held its annual general meeting on 19th Nov., 1971, and the following persons were elected: Reg VK1MP, President; Andrew VK1DA, Secretary; John VK1JL, Vice-President; and Gary VK1ZHG, Treasurer; Committee: Graeme VK1CG, Wal VK1ZWP, Ross VK1AW, Morrie VK1MF, Eugene VK1GT, Paul VK1ZPB, Eric VK1EP, Ron VK1ZRH and Eddie VK1VP.

VICTORIA

NATIONAL PARKS

This month many of us are on holidays and will be travelling in this State. The National Parks are very interesting places to visit and you can gain an award for contacts made either to or from a National Park.

The Victorian National Parks award is divided into two sections. Stations may claim an award for working from a minimum of 15 of the State's 23 National Parks. There is also an award for working stations operating from National Parks.

National Parks are located in all parts of the State and usually preserve some local scenery and the local flora and fauna. The locations of most parks are marked on the maps available from the major mapmakers. Most parks have good access roads and have a picnic area. A ranger is usually in attendance to assist you to find your way around and see the park's attractions.—VK3AUI.

EASTERN ZONE

The Eastern Zone held their second Zone general meeting since their annual convention last May, at Traralgon on 30th Oct. Peter VK3AUO, representing the lower class licensing proposal sub-committee (Novice licensing) gave the recommendations and proposals for the Federal Executive Novice Committee's meeting the following day in Sydney. The next Eastern Zone Convention to be held early in March, possibly at Moondarra or Licola. An activities group was formed to organise future field days, scrambles, film nights, a supper dance and possibly a regular zone annual dinner. The co-ordinator of this group will be Norm VK3YBD. The zone will participate in the National Field Day using h.f. and v.h.f. on Mt. Hoogley if the weather is favourable. David VK3SS outlined the zone h.f. DX "Wildcat Award" and it will now be also available for v.h.f. operators outside the zone. For further information write to the Zone Secretary, VK3ZNC, P.O. Box 175, Maffra, 3860, or any zone v.h.f. operator.

The Secretary reported that the insurance has been approved and that the Latrobe Valley Translator Club will move the L.V. Repeater VK3WI/R3 to Mt. Tassie. Brian VK3BBB was appointed as W.I.A. components officer and the sale of these will be made available at zone meetings and conventions, the A.O.L.C.P. classes and at the Latrobe Valley Electronics Club (Traralgon). The Zone will set up an Education Fund to promote Amateur Radio in Gippsland, assisting with future classes. At the moment classes are being run at Warragul (VK3UG), Traralgon (VK3BBB and VK3YEV), and Sale (VK3AXM and VK3KR). Visiting Chilian Amateur, Pedro CE6DR, who was staying at Dumbalk, now has moved to Mirboo North. —VK3ASV.

SOUTH AUSTRALIA

The swap and shop afternoon on Sunday, 14th Nov. organised by Marshall VK5QO and his willing helpers VK5NN, VK5XV, and VK5NB, was a great success with another undoubtedly on the way. The rather cool November weather allowed the drinks and ice cream at the v.h.f. group picnic on 21st Nov. to last all day, so assisting to make the day a success.

A special meeting of the V.h.f. Group decided that in view of the clash of frequencies of the Australis satellite with 145.9 MHz. of Channel 4 repeaters, and that the whole allocation of repeater frequencies below 146 MHz. could cause similar difficulties with spaceborn packages limited to the world-wide allocation of 146 MHz. down, recommend changing repeater frequencies to a separation of 600 MHz., but retaining existing mobile transmit frequencies of 146.1 to 146.4 MHz. and changing receive frequencies to 146.7 to 147.0 MHz. The V.h.f. Group feels that the cost of this at this time will be small compared to future costs and that satellite work is the greatest public relations aspect Amateur Radio has ever had. The V.h.f. Group invites comment.

The November Divisional meeting heard a most interesting lecture from Al Smythe, VK5MF, on slow-scan t.v. From the enthusiasm generated, there may well be many strange signals on 14 MHz. quite soon. The January meeting is the delayed lecture by John VK8AV on teletypes and r.t.t.y. The February meeting is the A.G.M.

The V.h.f. Group January meeting will probably be a barbecue on the Saturday afternoon and evening, the 8th. The Feb. meeting is the A.G.M. —Bart VK5GZ.

CALENDAR

EVENTS AND CONTESTS

2 Jan.—VK2: V.h.f. Field Day; 12-hour period, rules as per Ross Hull distance scoring table.

3 Jan.—VK3: V.h.f. Field Day.

8 Jan.—VK5: V.h.f. Barbecue.

12 Jan.—VK2: St. George Am. Rad. Society.

12/13 Jan.—ZL: V.h.f. Field Day.

23 Jan.—23.59 hours E.A.S.T.—end of Ross Hull Memorial V.h.f./U.h.f. Contest, 1971/72.

25 Jan.—VK5 and VK6 General Meetings.

28 Jan.—VK2 Divisional General Meeting.

29/30 Jan.—"CQ" W.W. 160 mx CW Contest, and French CW Contest.

3 Feb.—VK5 V.h.f. A.G.M.

4 Feb.—VK2: V.h.f. Group meeting; Gosford; Newcastle.

5/6 Feb.—A.R.R.L. Phone DX Contest.

9 Feb.—VK5 St. George Am. Rad. Society.

12/13 Feb.—National Field Day Contest, 1972 (refer Nov. "A.R." p. 13), also ZL V.h.f. Field Day.

"A.R." HAMADS

The following re-organisation relating to "Hamads" in "Amateur Radio" has been agreed to by the Victorian Division and also on behalf of Federal Executive. This agreement, naturally, is based on the present scope and format of the column in "A.R." and may require revision in the light of further experience.

With effect from the February issue of "A.R." "Hamads" will be printed free of charge for members of the Institute provided certain limitations and conditions are met. The maximum space allowance for a free insertion will be four printed lines. Four lines of print are taken to contain not more than 200 characters/spaces, which is equivalent approximately to 33 words of five letters each separated by one space. This free allowance will be inclusive of name and address but will exclude the nature of the requirement (e.g. "For Sale", "Wanted") and the first word in the Hamad specifying the place where the goods or services are located or are needed (this first word is the name of the city or town). In order to save words, the expression "QTHR" may be used to mean that the advertiser's name and address are correct in the current Australian Call Book. Thus a "Hamad" might conclude as follows: "VK7ZZZ QTHR Ph. 123456".

The telephone number obviously would be the home QTH and the city (town or suburb) would be as listed by the first word of the "Hamad".

If any "Hamad" exceeds the maximum free allowance, it will be charged at $6 per column inch and no free allowance can be claimed. The minimum charge will be $6 and each additional column inch or part thereof will cost $6. To achieve publication the charges must be prepaid. A column inch is deemed to be 12 lines each of approximately 50 characters/spaces.

Hamads is a service restricted to members of the Institute unless prior arrangements are made with the Editor if exceptional reasons exist, e.g. deceased's effects. Repeats of Hamads will carry the full rate of $6 per column inch irrespective of whether or not the initial insertion was free of charge. If publication is required in any particular month, the copy should reach the Editor on or before the third day of the preceding month. Payments will not be acknowledged unless specially requested and no correspondence can be entered into concerning Hamads.

It is regretted that it is not possible to comply with any instructions requesting bold face type or any non-standard display or typographical arrangement. It is also regretted that no responsibility can be accepted either in respect of any errors or omissions or concerning any goods or services on offer and no guarantee can be given that any material as submitted will be published at all or in any particular issue although, naturally, every effort will be made to meet the wishes of advertisers.

Each Hamad should preferably be in typescript, double-spaced on one side of the paper and must be signed by the member—together with a reference to his membership number. The Editor reserves his right to edit all material, including Hamads, submitted for publication in "Amateur Radio" but quite obviously these powers are very seldom required in respect of Hamads.

Any Hamad which is deemed to be of a commercial nature will be subject to rejection even if submitted by a member and no Hamads by or on behalf of clubs or organisations will be accepted except by prior agreement with the Editor. It is to be observed that any Hamad rejected on these grounds or for other reasons may, subject to the Editor's decision in relation to suitability, be accepted for publication in "Amateur Radio" as a normal "commercial" advertisement.

—P. B. Dodd, Federal Manager.

INTRUDER WATCH REPORT

Because of Intruder Watch vigilance the spurious transmission on 14240 kHz. from the B.B.C. relay at Johore in Malaysia has been cured, and is no longer heard. Your Federal Co-ordinator is keeping in close liaison with the Radio Branch, so keep those reports coming in.

The following is an extract from a letter received from a VK8, I quote:—

> "There is a ruffian on c.w. on the 14 MHz. band. He is very strong day and night time. His tx was very ruff . . . about 50 kHz. wide. I think he was keying the mains!!! Managed to QRM him down below 14000 at one stage, but he came back up again. At one time he got really hostile, abused me and TOLD ME TO GET OFF THE BAND!!! I just kept on calling 'CQ' as if nothing happened. Also had a ring from the RI re key clix reported by a VK4 Amateur who blamed me for his key clix."

Further ideas reference this matter appear in a "Letter to the Editor" in this issue.

—Alf VK3LC, Intruder Watch Co-ord., W.I.A.

SILENT KEY

It is with deep regret that we record the passing of—

VK3AH—A. H. Miller

COOK BI-CENTENARY AWARD

The following additional stations have qualified for the Award:

Cert. No.	Call	Cert. No.	Call	Cert. No.	Call
1414	AX6MA	1422	AX1AN	1430	AX2BD
1415	DK2PS	1423	I1TQ	1431	W7GXL
1416	ZS6GH	1424	I1IR	1432	AX4LV
1417	I1PML	1425	AX3VK	1433	AX5OH
1418	YB1BM	1426	HB9MO	1434	VE3ON
1419	SM2DR	1427	XW8CN	1435	VE3EWY
1420	EA1IM	1428	W2NR	1436	AX5AV
1421	G3IGX	1429	ZM1AFA	1437	K9LKA

V.H.F./U.H.F. SECTION

Cert. No.	Call
29	AX4ZFB
30	AX4ZTL

KEY SECTION

The Key Section is now seeking members. The full rules were published in November "A.R.," but in brief: 50 c.w. contacts lasting at least 15 minutes, which must include 25 contacts with other VK stations, are required. Write to Federal Manager, Key Section, P.O. Box 67, East Melbourne, Vic., 3002.

If you troubled to read the rules of the 1971-72 Ross Hull Contest in October "A.R." you will have noticed that a c.w. section is provided. This was re-instated at the request of the Key Section; it had been deleted through lack of support. The majority of c.w. operators are not interested in v.h.f. operating, but there are sound reasons for expecting c.w. to give advantages over other modes on these bands as well as on h.f. If you have v.h.f. gear, why not dust it down, install a key socket, and give the contest a bit of support.

There is a postal vote out to Divisions to provide a multiplier for c.w. contacts in the R.D. Contest. I have not heard the result yet. There was not enough time to alter the rules of the 1972 N.F.D. to provide a similar incentive for c.w. operation; this should be fixed for the 1973 N.F.D. however.

I am overseas until the end of March, so there will be a lack of topical items for a couple of months in this column. The processing of membership applications will go on, though, so do not let me stop you applying! 73, Deane VK3TX.

RECIPROCAL LICENSING—SWEDEN

The "Worldradio" issue of 25th October contains details of the rules applicable to foreign nationals in or visiting Sweden. An application form, as printed, is required to be submitted through certain channels to the Central Administration of Swedish Telecommunications, Radio Development Section, to reach them at least TWO months before the licence is required. Other requirements include a certificate of good conduct. No fee is payable for periods up to 30 days, after that the fee is a quarter of the regular annual fee (of 40 SW Kroner) for each three-month period.

SUNSPOT NUMBERS

By courtesy of the Swiss Fed. Observatory, Zurich, the smoothed monthly predictions: Jan. 37, Feb. 45, Mar. 43, Apr. 42. Smoothed mean for April 1971 68.0. Provisional numbers for Oct. 1971 ranged from 17 on the 15th to 87 on the 25th.

CHANGE OF ADDRESS

Ionospheric Prediction Service is now at: 162-166 Goulburn St., Darlinghurst, N.S.W., 2010

See letter Dec. "A.R.," page 15

HAMADS

Minimum $1 for forty words
Extra words, 3 cents each

HAMADS WILL NOT BE PUBLISHED UNLESS ACCOMPANIED BY REMITTANCE

Advertisements under this heading will be accepted only from Amateurs and S.w.l's. The Publishers reserve the right to reject any advertising which, in their opinion, is of a commercial nature. Copy must be received at P.O. 36, East Melbourne, Vic., 3002, by 3rd of the month and remittance must accompany the advertisement.

FOR SALE: FT-DX-400, new, never used, $450 O.N.O. VK2ZYH, DCOND, 38 Engadine Ave., Engadine, N.S.W., 2233. Phone 520-0325 after hours, week-ends.

FOR SALE: Heathkit HW32A Transceiver, complete with power supply/speaker unit, manual, and pair spare final tubes. Excellent working order, $120. VK4UC, 104 Camp St., Toowong, Qld., 4066. Phone 71-1309.

FOR SALE: Trio TR-2E 144 MHz. Transceiver. 24w. input to 6360 final. Full 144-148 MHz. coverage. Separate Tx and Rx VFOs. In-built 230v. a.c. and 12v. d.c. supplies. As new, very little used, still in original carton, with mic, a.c. and d.c. leads, and instruction book. $160 or suitable offer. J. Brown-Sarre, VK2ZVJ, Buronga, N.S.W.

FOR SALE: Yaesu Transceiver FT50 with FV50C VFO. Excellent condition, $190. R. Chalmers, VK3ARO, 6 Gatehouse St., Parkville, Vic., 3052. Phone 347-3826.

FOR SALE: 6 metre equipment: VK3 Converter, working, less crystal. X1760 Jindivik v.h.f. 10 watt a.m. transmitter, converted, working, less crystal and power supply. Five element yagi. The lot $38. R. Clarke, VK3BCL, 23 Glen Drive, Eaglemont, Vic. Phone 49-4246 (evenings).

RECEIVER, Star SR-500 double conversion. Ham bands 160 to 6 metres, SSB/AM/CW. Has 55 kHz. 2nd I.f. with selectivity switchable from 4 kHz. to 500 Hz. at 6 dB. down, $120. Mosley TA-33Jr 3 element tri-band yagi, lightweight beam, $60. C. Bicknell, VK3BCF, 13 Roland Ave., Strathmore, 3041. Phone (03) 379-2623.

SIX METRE equipment for sale: (1) FM MR6 Base Station, excellent condition with crystals for 52.525 MHz., modified and operating, suit table-top, going for $45. (2) Mobile FM MR10C, block filter in the receiver, modified and crystaled for 52.525 MHz., in good condition, also going for $25. Contact more information Phil Bowers, VK2YS, on 069-214343 or write to P.O. Box 551, Wagga, N.S.W., 2650.

WANTED: Band-change motors and L-R indicator drive transformers to suit 24 volt Bendix MN26 Radio Compass sets. Transformers are marked T16 or A15064. State price required. Also Vintage Radios complete with Horn Speaker, early 1920's, good price paid, send details. O'Brien, Edgar Rd., San Remo, Vic., 3925. Phone 107.

WANTED: Crystal Calibrator covering up to 250 MHz. on fundamentals with 1 MHz. spots or similar t.v. calibrator. State specification and price to P.O. Box 57, Raymond Terrace, N.S.W., 2324

WANTED: Johnson Matchbox. P. G. Broughton, 211 George Street, Sydney, N.S.W., 2000.

WANTED: Just starting out. I'm after a 2 metre transceiver, mobile or fixed, a.m. or f.m. 6 metre transceiver, mobile or fixed, 6 metre converter. Ring H.M.A.S. Anzac during working hours (8.30-3.30) or Tony Smith, 151/3 Slattery Place, Eastlakes, N.S.W. Phone 663-7336.

WANTED: Linear Amplifier, used. Suitable to be converted to 6 mx. Full 400w. p.e.p. output with p.s.u. included. Contact P. Jackson, VK6ZDY, 60 Anzac Terrace, Bassendean, W.A., 6054.

WANTED: Rotary Converter to restore R.A.N. Type S Synchronous Rotary Gap Spark Transmitter. Output 70 v.a.c. at high frequency, probably 500 Hz. Unit will probably have 24 field poles and can be identified by an extension shaft coming out one end for driving rotary gap. R. F. Fisher, VK3BAO, 241 Royal Pde., Parkville, Vic., 3052. Phone 340-5931 (business hours).

WANTED: Yaesu FTdx400 Transceiver; other items required include Table Microphone, "Autronic" Key and Keyer, and S.W.R. meter. Details to VK4SO, Mervyn Eunson, Box 1513, G.P.O., Brisbane, 4001. Telephone (business) 2-2831.

amateur radio

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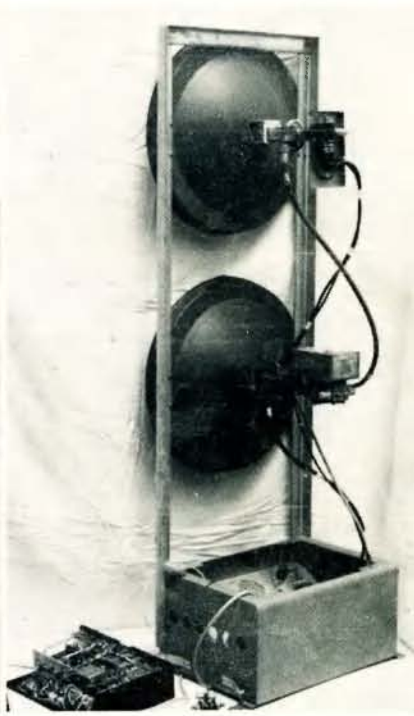

amateur radio

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FEBRUARY, 1972
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★

ACKNOWLEDGMENTS: If you write to Federal Executive or to the Manager no acknowledgment is sent out unless you specially request one. Better still, for important items, send them certified mail.

★

Members of the W.I.A. should refer all enquiries regarding delivery of "A.R." direct to their Divisional Secretary and not to "A.R." direct. Two months' notice is required before a change of mailing address can be effected. Readers should note that any change in the address of their transmitting station must, by P.M.G. regulation, be notified to the P.M.G. in the State of residence; in addition, "A.R." should also be notified. A convenient form is provided in the "Call Book".

CONTENTS

COVER STORY

Equipment used for 10 GHz. Australian record. At left, VK5ZMW's 10.01 GHz. Station; at right, VK5CU/P's Tx and Rx Parabolas for 10.04 GHz. See details in VHF Notes on page 13.

FEDERAL COMMENT:

CHANGES IN FEDERAL STRUCTURE

On 17th January, 1972, the Wireless Institute of Australia was incorporated as a Company limited by guarantee.

It is now nearly ten years since the changes proposed in the Federal structure that have lead to the incorporation of the Federal body were first advanced to the Federal Council by the Victorian Division. In fact the need for change has resulted in change taking place before the structural changes could be implemented. For example, when the Victorian Division put forward its original proposals it foresaw that at some time in the future the Federal body could wish, one day, to employ a Secretary or Manager. The structure proposed was designed to allow this to occur. In fact a Manager has now been employed for nearly a year, though interim arrangements have had to be made with the Victorian Division pending finalisation of the incorporation of the Federal body.

We can, as an organisation take, I think, no pride in the fact that we took so long to take these steps that now seem to be so obvious.

In effect, the Federal body now has a completely new constitution in the form of its Articles of Association. It is, I think, appropriate to point to some of the changes that have been made and the consequences that flow from them. These points may be summarised as follows:

1. WHY A COMPANY?

The Wireless Institute of Australia is incorporated in Victoria as a Company limited by guarantee and it holds a certificate of the Attorney-General enabling it to dispense with the word "limited" in its title and by virtue of that certificate certain requirements of the Companies Act in relation to the lodgment of documents are not applicable to it. The Company has six "members", namely each of the Divisions. A company is a separate legal entity from the individuals that comprise it. This enables it to enter into contracts and undertake liabilities which ordinarily raise no question of the personal liability of either its members or officers.

2. "AMATEUR RADIO"

This issue of "Amateur Radio" will be the last issue published by the Victorian Division. One of the important changes proposed by the Victorian Division when it advanced its original proposals was that this magazine and the other publications of the Institute should be published by all Divisions. We are a large national body. This magazine is sent to all members of all Divisions. It is only reasonable that all Divisions should have an equal say in its content and production. Therefore, the Federal Council appoints an Editor and a Publications Committee. The Editor is a member of the Federal Executive and is Chairman of the Publications Committee. He is, therefore, in a position to see the day to day problems dealt with by the Federal Executive. He is in a position to consult with the Federal Executive as and when it becomes necessary. He will, of course, have the assistance of the Manager who will undertake a large part of the work associated with the magazine.

3. THE FEDERAL COUNCIL

Each Division will continue to be represented by a Federal Councillor. The Institute meeting in general meeting is called the Federal Council. The Articles envisage the appointment of an alternate Councillor to represent a Division at any particular or special meeting of the Federal Council. The annual general meeting, incidentally, is called the Federal Convention. As you can see, most of the fundamental concepts of our Federal body are preserved in the new form. One important difference is that the Federal Councillors are required to have the written authority of their Divisions to vote on behalf of their Division and upon their vote being cast their Division is thereupon bound by it.

In the past the decisions have been subject to ratification by the Divisions —generally speaking decisions of the Federal Council made at Easter at the Federal Convention have not been ratified by all the Divisions until August or even September. However, the new Articles do provide that a Federal Councillor may withhold his vote and exercise it within 30 days of the end of the Convention if he so wishes. This provision is designed to deal with any matter in respect of which the Federal Councillor feels that it is essential that he obtains guidance from his Division. If he does not exercise his vote within 30 days he is deemed to abstain.

4. THE FEDERAL EXECUTIVE

The Federal Executive are appointed at each Federal Convention. Under the old constitution the Federal Executive are nominated by one Division which is nominated as Headquarters Division and the nomination of the individuals is subject to ratification by the Divisions. This is all done prior to the Convention by mail.

The new Articles provide that the members of the Executive are appointed by the Federal Council at the Federal Convention. The new "constitution" has no concept of a Headquarters Division. The only qualification to be a member of the Federal Executive is that the individual is a member of a Division. As a matter of practical reality the Federal Council will, no doubt, at least in the foreseeable future, continue to appoint the members of the Federal Executive from one Division as the costs of bringing a member of the Federal Executive to regular meetings from other States would be certainly more than we can afford at this time. Indeed, the new Articles go so far as to permit the Federal Council to appoint one of their members as President.

5. THE FEDERAL SECRETARY

I have already indicated how the Federal Executive are appointed and have also referred to the fact that the Editor of "Amateur Radio" is a member of the Federal Executive. Including the President and the Editor of "Amateur Radio" there are six members of the Federal Executive. In addition, the Articles provide that a Secretary shall be appointed by the Executive. The Secretary has no vote as a member of the Executive because it was envisaged (as will in fact be the case) that the Secretary will be a paid employee. The Attorney-General, in granting his certificate, requires that no paid employee can be appointed as a Director (in formal terms the members of the Federal Executive are the Directors of the new Company).

6. PROCEDURE

Generally speaking the procedural steps that will be utilised within the new framework parallel the procedural steps in the old structure. One important difference is that notice of motions must be given 30 days prior to a Federal Convention. A motion can still be passed at a Federal Convention even if notice has not been given. The Chairman has a discretion to permit such business to be brought forward but if he exercises his discretion to allow the matter to be considered, it requires three-quarters majority to be passed.

These, then, are some of the more important changes that take place with incorporation of the Wireless Institute of Australia. Many of the changes that have been incorporated in the Federal structure are designed primarily to facilitate the handling of its day to day affairs. The new structure does, however, permit the transfer of the publications to the Federal body so that they do become truly national. The structure will also facilitate many of the administrative changes that have already been implimented, such as the centralisation of subscription records and the E.D.P. processing of those records.

Ordinarily I am hesitant to pay tribute to the Victorian Division because I am mindful that, as a member of that Division, such comments could be misconstrued. However, on this occasion, I believe that I would have the support of all the Federal Councillors if I were to point out that these changes, which can only strengthen the Federal body, are due in no small measure to the foresight and truly national outlook of the members and the Council of the Victorian Division. We now have a far more effective structure thanks to that foresight. It is up to us to use that structure effectively.

—Michael J. Owen, VK3KI,
Federal President, W.I.A.

A Tracking FM-AM Demodulator using an IC

R. F. DANNECKER, VK4ZFD*

This is the second of two articles on the use of the phase-lock loop as an FM/AM demodulator.

The circuit to be described uses the Signetics Corp. NE561B IC and is based on Signetics' application notes. Besides providing demodulation of the f.m. component of a signal and perfect a.f.c. tracking of that signal, provision is also made for the synchronous demodulation of the a.m. component of the signal.

A block diagram of the NE561B is shown in Fig. 1; the portion enclosed in the dotted outline is in addition to the basic phase-lock loop already described. The a.m. input is taken before any limiter in the main receiver and its phase is shifted 90° with respect to the f.m./r.f. input. This is necessary to have the correct phase relationship between the a.m. signal and the v.c.o. input to the multiplier.

Shown in Fig. 2 is the basic demodulator. With reference to Fig. 1 we have the limited f.m./r.f. input applied between pins 12 and 13, phase shifted a.m. input applied at pin 4, the v.c.o. frequency determining capacitor (Co) connected between pins 2 and 3, the external components of the low pass filter between pins 14 and 15, and the f.m. de-emphasis capacitor (Cd) connected between pin 10 and earth. The muting function is accomplished by use of the output of the a.m. detector to open an audio gate in the presence of signal input.

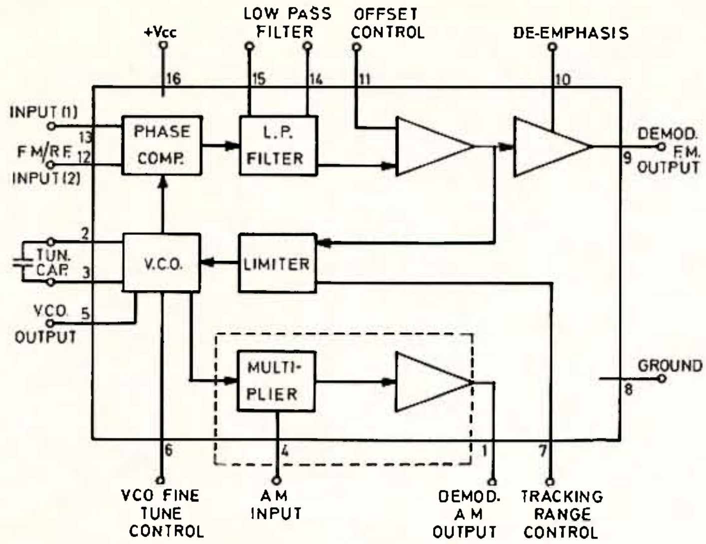
The circuit diagram for the complete demodulator is shown in Fig. 3. Circuit functions can be most readily seen with reference to Fig. 2. The design centre frequency is 2 MHz., but the NE561B will function from less than 1 Hz. to more than 15 MHz. Input signal is amplified by the 2N5486 JFET which is wired as a simple tuned amplifier at the required i.f. Three AY1101 transistors are used in the limiter, while the 90° phase shift is provided by an adjustable RC phase shift network.

Muting of the f.m. output is performed by the use of a suitably biased diode as a series gate. When no signal is present, the diode is reverse biased by the 2 x 2N3638 emitter coupled pair and when signal is applied the output from the synchronous a.m. detector causes the emitter coupled pair to forward bias the diode and allow signal through to the f.m. output.

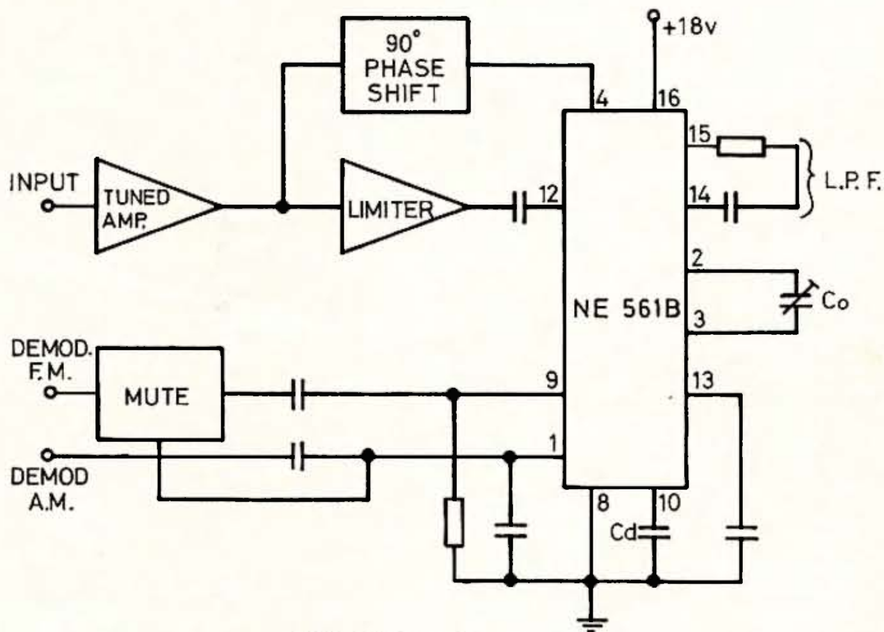
The AY1101 transistor is used to set bias levels relative to those of the IC. A.m. output is taken from pin 1 via a JFET source follower; an MPF102 would be suitable for this function. The a.m. detector can also be used to give an indication of signal strength. A suitable circuit is shown in Fig. 4.

(Continued on next page)

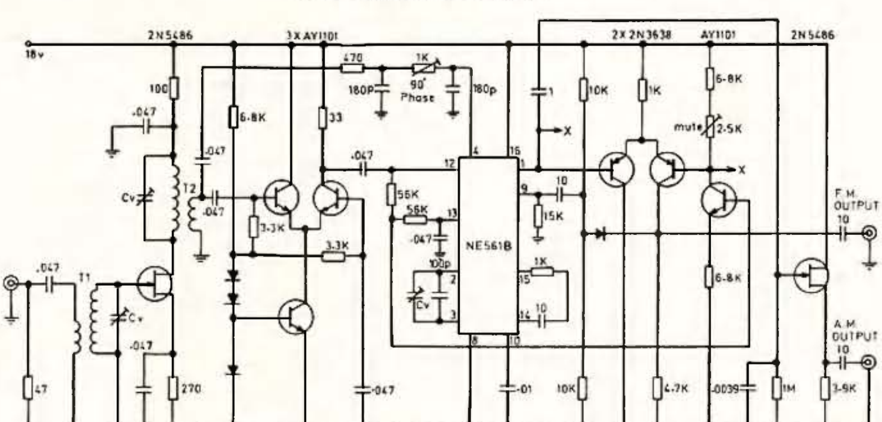
* 52 Pohlman Street, Southport, Qld., 4215.



BLOCK DIAGRAM OF NE561B – FIG. 1.



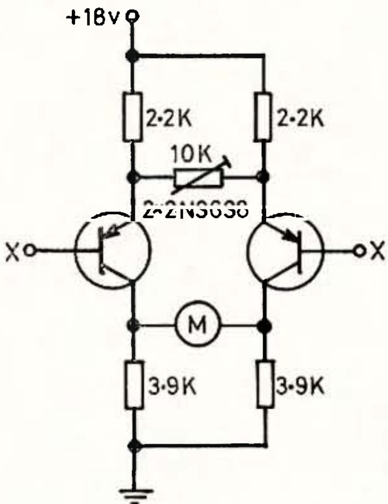
BASIC DEMODULATOR.—FIG. 2.



DIODES – OA 202 Cv – 10-60P CAPACITORS IN μF RESISTORS IN Ω

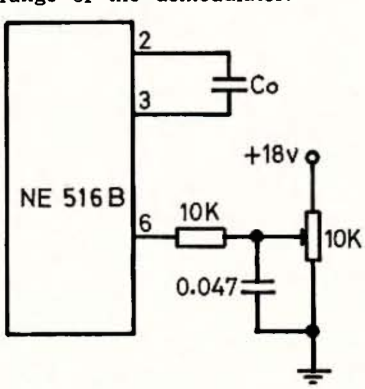
PHASE-LOCK DEMODULATOR – FIG. 3

If operation at some i.f. other than 2 MHz. is desired, (e.g. 455 KHz.) it would be necessary to change the resonant circuit in the JFET amplifier, change the v.c.o. timing capacitor Co (e.g. 600-800 pF.) and the 90° phase shift network (e.g. 2.2K, 5K pot., 2 x 150 pF.). If a frequency less than 500 KHz. is required, consideration could be given to the NE565 which will function as an f.m./p.m. detector but does not provide for a.m. detection and consequently muting.



SIGNAL LEVEL INDICATOR
FIG. 4.

An alternate method of fine tuning the v.c.o. is shown in Fig. 5 in which current is injected into pin 6 of the IC. A change of +12% is possible for an input current of 1 mA. This method of fine tuning will also affect the tracking range of the demodulator.

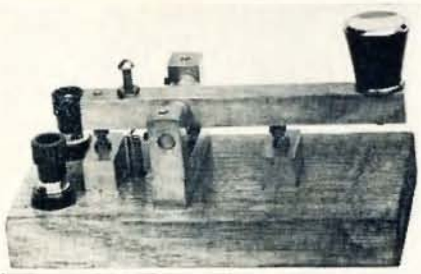


ALTERNATIVE VCO FINE TUNING — FIG. 5.

This completes the description of the phase-lock demodulator.

Such a unit as has been described in this article is in use in a satellite tracking receiver used for monitoring navigational and weather satellites. The principal use of the phase-lock type of detector for this application is the automatic tracking of the Doppler shift of the signal which is as much as ±4 KHz. at the frequencies used.

(Continued on Page 7)



A DROP OF HOME-BREW

C. A. CULLINAN,* VK3AXU

The plea by VK3UG in his letter to the Editor in the August 1970 issue of "Amateur Radio" (p. 21) regarding the shortage of Morse Code Keys prompted the writer to consider the possibility of making a Morse Key entirely with hand tools, the basic philosophy being that anyone within "A.R's" wide flung circulation area should be able to "home-brew" it with no more than an elementary skill in the use of tools.

A secondary consideration was that for a beginning Amateur as many of the tools as possible would be of use in other projects.

One of the great difficulties facing Radio Amateurs, as well as many other hobbyists, is the problem of finding sources of supply of parts. In the U.S.A. "QST" has devoted quite a lot of material to this problem and lately has been giving sources of supply with some constructional articles.

As far as this key was concerned no difficulty was experienced in obtaining the tools and most of the parts locally. (Hardware store, timber yard and automotive supply houses.) The other items were obtained readily from Radio Parts Pty. Ltd. Most of the tools can be obtained from Radio Parts too.

LIST OF TOOLS

1—snail counter-sink bit.
1—vyce, 2½" jaws.
1—hand-drill.
1—1/16" H.S. drill.
1—1/8" „ „
1—3/16" „ „
1—1/4" „ „
1—17/64" „ „
1—5/32" Whit. taper tap.
1—5/32" „ plug „
1—taper tap 3.5 mm. 0.6 mm. pitch
1—plug tap 3.5 mm. 0.6 mm. pitch
1—No. 33 drill H.S. (not No. 32)
(These are manufactured in Australia by P. & N.)
1—pocket knife

These metric taps and the No. 33 drill may not be available "over the counter" but a local hardware store got them quite easily for this project. They are used in the automotive electrical industry in drilling and threading holes for certain ignition points.

1—tap wrench or tap holder. (Be certain that it will hold the metric taps as they are rather small.)
1—hacksaw (preferably with at least one blade for brass and one blade for steel).
1—flat file, 12" long x 1¼" wide, mill bastard.
1—screw-driver, ¼" blade.
1—combination try and mitre square, with scriber.
1—hammer.
1—centre punch.

Note: The No. 33 drill is the correct size for the 3.5 mm. tap in brass. Its diameter is 0.1130" whereas the No. 32 drill is 0.1160".

The No. 33 drill and the metric taps may be useful later on when Australia goes completely metric.

LIST OF COMPONENTS

1—piece brass, 18" long x ½" square.
1—piece silver steel rod, 6" long x ¼" diameter.
1—piece brass tubing, 2½" long x ¼" bore with minimum wall thickness of 1/16"
or
1—piece brass rod, 2½" long x ½" diam.

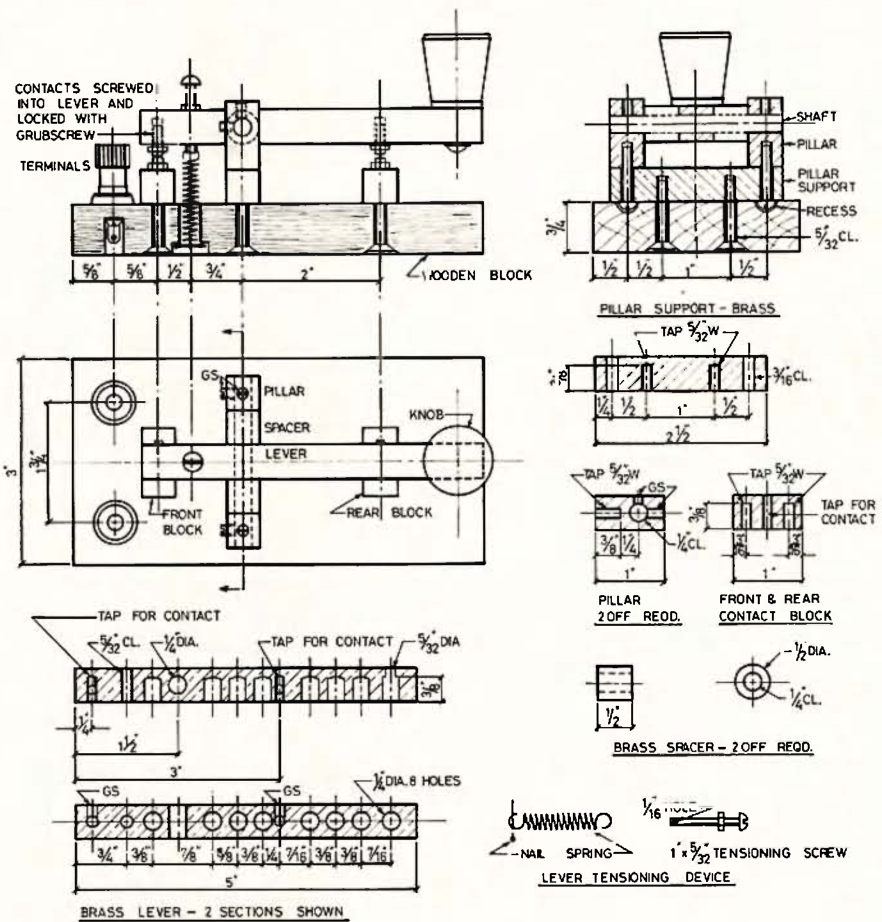
Any good hardware store should be able to obtain this material although it may have to get larger quantities as some wholesalers will not cut off small quantities.

1—Turner 727 cupboard door knob or similar.

(The brass, steel and knob were purchased for $2.53 from the local hardware store.)

4—Lorimer ignition points, S20 (made in Australia)
or
4—Lucas magneto contact sets, 484098 (made in Great Britain)
or
4—Schier Kontakte 2008 for Auto-lite IGP3028A or IGP3028LS (made in Germany).

Only the screwed contact of these sets is used—all have a 3.5 x 0.6 mm. thread.



NOTES:—
W—BRITISH STANDARD WHITWORTH THREAD, GS—5/32 GRUB SCREW
CL—CLEARANCE HOLE
ALL FIXING SCREWS—5/32 BRASS METAL THREADS
SCREWED CONTACTS — IGNITION COIL CONTACT — THREAD 3.5mm. DIA. 0.6mm. PITCH
SHAFT—¼ DIA. x 2½ LONG MILD STEEL
½ x ½ SECTION BRASS USED THROUGH OUT UNLESS OTHERWISE NOTED

* 6 Adrian Street, Colac, Vic., 3250.

1—Gee-Jay spring ES35, 1" x 7/32" close wound tension spring.

No trouble was experienced in obtaining these from a local auto-electrical repair firm. The finished key used a mixture of all three of the above contacts just to determine the availability of these contact sets.

It is possible, also, to use the screwed contact made for A Model Fords, but these have a different thread so would require a different drill and taps to those in the parts list.

The local Ford dealer could have supplied some A Model Ford contacts from stock. Also for American readers, Sears Roebuck's catalogue quotes them as part number 28H8290.

6—5/32" hollow pointed grub-screws.

2—terminals.

4—solder lugs.

2—5/32" lock washers.

1—5/32" hex. brass nut.

4—1" long x 5/32" round-head Whit. brass screws.

This material can be purchased from Radio Parts Pty. Ltd., although it may be necessary to purchase in gross lots, however the unused material will be useful in later projects.

1—piece hardwood 6" x 3" x ¾" nominal.

To be cut square. Top and bottom to be finished flat. Finished size may be slightly smaller than the above due to machining. This was obtained without any difficulty from a local timber yard.

1—piece tinned copper wire, about 1 ft. x 22 s.w.g.

1—1" nail.

CONSTRUCTIONAL DETAILS

The drawings give details and the following notes are for guidance.

The spring is cut in half and a loop formed at the cut end of one piece. One end of the spring goes through a 1/16" hole drilled cross-wise through the 1" x 5/32" tension screw. The other end of the spring goes through a 17/64" hole bored through the wooden base and is held in place with a cut-off nail which lies in a groove scored in the base with a pocket knife.

Remove the filigree from the knob by breaking it away.

The shaft hole in the lever and shaft holes in the spacers are ¼" diameter, but the shaft holes in the pillars are 17/64". The silver steel shaft should be ¼" diameter and may have to be forced into the lever and spacers if they have been accurately drilled to ¼".

The 17/64" holes in the pillars are a bit big but a drill in between 17/64" and ¼" was not available and it was not desired to go to the expense of reamers or scrapers. This is the reason for the two locating grub-screws in each pillar. The threads for these should be cut with the taper tap so that the grub-screws will be tight.

The different makes of ignition contacts may vary in length of thread and may have to be cut off, particularly the rear one for the lever.

A number of ¼" holes are counter-bored on the underneath side of the lever to reduce its mass, otherwise considerable exertion is needed when sending, to raise the lever, because of gravity, for spaces. If the tension spring is too tight then too much work is needed in sending.

Even as it is, the key is a bit "heavy," but has been operated at 30 w.p.m.

It can be made "lighter" if the lever is made from a piece of brass 5/16" wide x 7/16" deep and altering the length of the spacers. The rest of the brass work remains the same.

It is essential that the shaft holes all be drilled accurately or the shaft will bind in the pillars. This drilling may take some practice and is the reason that a piece of brass 18" long was purchased. Also, the ends of the spacers and the pillars must be filed flat.

If a drill press and lathe are available then it will be easier to make the key, however the one shown was made using hand tools only.

The cost can be reduced by using iron or brass screws for the two front contacts, in which case the key will probably have a "soft" feel.

The cost of this project, apart from tools, was $10, most of it being for the contacts as it was necessary to buy a "pair in a set" and discard the rivetted contact as no way could be worked out to use it.

So here is a key that won't blow up like some other "home-brew".

WIRELESS INSTITUTE OF AUST.
VICTORIAN DIVISION

A.O.C.P. CLASSES

Classes in theory and Morse will commence respectively on Tuesday, 15th February, 1972, and Thursday, 17th February, 1972, from 8 p.m. to 10 p.m. Subject to demand, a Saturday morning class in theory is also proposed.

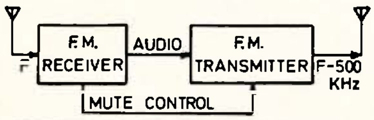
Persons desirous of being enrolled should communicate with the Secretary, W.I.A., Vic. Division, P.O. Box 36, East Melbourne, Vic., 3002. Phone 41-3535 10 a.m. to 3 p.m.

Barry VK2FE recently had the pleasure of receiving a painting, especially painted for him by talented Wollongong artist Kevin Pomfrett. The painting, a semi-abstract work, has Amateur Radio as the theme with personal touches of Barry's station throughout. Of significance is the "shadow" of the signpost. This would be something of a rareity in Amateur Radio to have a personalised painting with one's own station as the theme.

ON F.M. REPEATERS

The two basic forms of f.m. repeaters in use today are shown in block diagram form in Figs. 1 and 2.

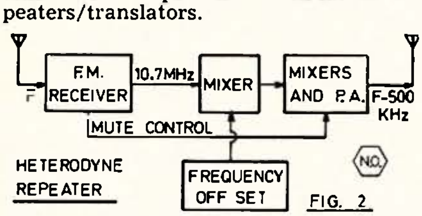
The system in Fig. 1 has the disadvantage that the signal must be demodulated with consequent distortion and receiver threshold problems. However, it does have the advantage that the audio can be processed (filtered and compressed) before re-transmission.



DEMODULATE—REMODULATE REPEATER
FIG. 1

The system in Fig. 2 reduces distortion and threshold problems, but no simple way of signal processing is available before re-transmission. Thus the incoming signal must be degraded by the repeater before being re-radiated.

A somewhat superior version of the heterodyne repeater is shown in Fig. 3. Though it is not an original idea, the writer advocates it because it offers significant improvement over the systems used at present in Amateur repeaters/translators.



HETERODYNE REPEATER
FIG. 2

Due to the action of the phase-lock loop (refer to articles in "A.R.," Jan., 1972, and this issue) we know that $F_I = F_O - F_R$, therefore $F_O = F_I + F_R$ and we obtain the offset in frequency. As outlined in a previous article on phase-lock loops, the output (F_O) of the loop is a cleaned up version of the input since the loop is effective a filter which rejects noise. Thus the incoming f.m. signal is not only translated in frequency, but the undesired noise on it is greatly reduced before it is re-transmitted.

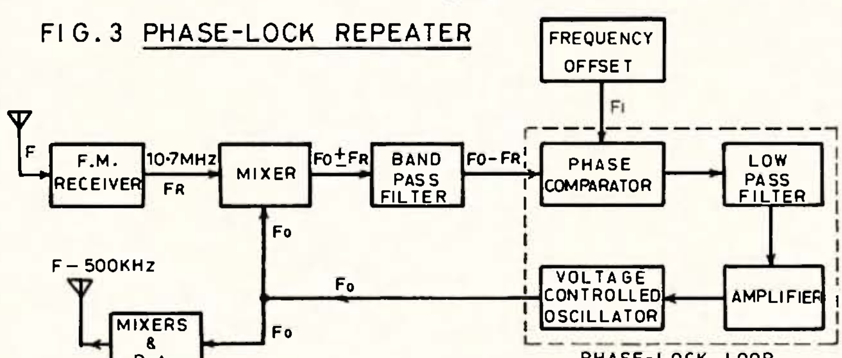
The only additional components required above those in a heterodyne repeater are the phase-lock loop (one integrated circuit) and the band-pass filter (tuned circuit). This is not a very large price to pay for the substantial improvement gained.

Improved mute control can also be achieved by using a phase-lock loop IC containing a coherent amplitude detector which is used to operate the mute.

The author would be interested to hear from any repeater group intending to build a phase-lock repeater who require a design.

—R. F. Dannecker, VK4ZFD.

FIG.3 PHASE-LOCK REPEATER



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Demodulator using an IC

(Continued from Page 4)

When the proposed Amateur satellite with the active repeater on 432 MHz. becomes operational, Doppler shift of at least ±10 KHz. will be experienced on the received signals from the satellite. It will therefore be necessary for stations receiving the signals to provide some form of tracking of the signal frequency. If such a tracking filter/demodulator as the one described in this article is used, the receiver bandwidth must be the signal bandwidth plus 20 KHz. to allow for Doppler shift.

NEW FIVE-MINUTE ADHESIVE

A new rapid setting epoxy adhesive, with a bond strength of 2,000 lb. per square inch, has been developed by Davis-Fuller Adhesives Pty. Ltd. The adhesive, known as Resiweld Five, sets in only five minutes, can be sawn or planed in 20 minutes and reaches its full bonding strength in only 30 minutes.

Combining the high bonding strength of epoxy resin with the quick setting characteristics of contact adhesives, Resiweld Five was formulated as an ideal adhesive for general repairs, bonding fine breaks and all types of hobby work.

A thin, flowable liquid in texture, Resiweld Five will sell for 80c retail and is packaged as two tubes which are mixed to produce the adhesive. Curing begins immediately on contact after mixing.

It may be used on timber, glass, stone, fibreglass, steel, aluminium, sheet metal and hard plastics. Davis-Fuller expect Resiweld Five to find ready acceptance for such tasks as radio and electrical construction and repairs, lapidary work, jewellery, glassware and such craft work as model aeroplane building.

Resiweld Five has a tensile strength of 1,000 lb. p.s.i. after 10 minutes and full tensile strength of 2,000 lb. p.s.i. after 30 minutes.

Davis-Fuller Adhesives is a division of Davis Consolidated Industries Ltd.

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COOK BI-CENTENARY AWARD

The following additional stations have qualified for the Award:

Cert. No.	Call	Cert. No.	Call	Cert. No.	Call
1438	DL9JI	1441	PA0VB	1444	WB6SMG
1439	AX2BNK	1442	AX5ST	1445	SM5AWO
1440	DK1LW	1443	HK4DF		

V.H.F./U.H.F. SECTION

Cert. No.	Call
31	AX5LP
32	AX3YET

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	320/344	VK2APK	289/296
VK6RU	316/342	VK4FJ	286/307
VK3AHO	310/326	VK4UC	285/285
VK4KS	307/322	VK4TY	284/288
VK6MK	303/324	VK3ZE	276/279
VK5AB	296/314	VK2AAK	274/279

New Members:

Cert. No.	Call	Total
124	VK3CR	101/101
125	VK5WV	100/100

Amendments:

VK2SG	262/264	VK3AMK	238/238
VK2AAH	243/253		

C.W.

VK2QL	305/328	VK3ARX	271/278
VK3AHQ	300/315	VK3XB	270/284
VK4FJ	289/315	VK6RU	266/289
VK2APK	286/294	VK3YD	263/282
VK3YL	286/303	VK4TY	259/272
VK3NC	273/300	VK3TL	254/260

Amendments:

VK3JF	195/201	VK2AAH	140/149
VK2SG	142/146		

OPEN

VK6RU	317/343	VK6MK	303/324
VK4SD	315/330	VK2EO	301/325
VK2VN	311/330	VK3ARX	301/308
VK4KS	308/327	VK2SG	298/304
VK4TY	306/321	VK4UC	298/298
VK2APK	303/315	VK4FJ	297/323

Amendments:

VK2AAH	255/269	VK3QV	130/130

FEDERAL REPEATER SECRETARIAT

Last year the F.R.S. was asked to investigate the clash of frequencies between the output of Channel 4 Repeaters and the proposed channels in the Project Australis Oscar 6 Satellite of 145.9 MHz. Although this problem has been temporarily averted, it must still be resolved because there will be future satellite programmes.

To understand the problem it is necessary to refer back to the formation of the 2 mx band f.m. nets in Australia. The availability of surplus f.m. equipment in the early 1960s prompted their use on the Amateur bands. The intended frequency was 146.000 MHz., but, as the story has it, a slip in the slide rule resulted in the evolution of Ch. A. In time, the three simplex Channels A, B and C developed. In VK2 another error resulted in 146.1 for Ch. C. About 1966/67 experimental repeaters (Orange 146.1 in, 145.85 out) and translators (Melbourne Z1 with 145.76 in, 147.6 out) existed. When the right to establish repeaters was secured in July/August 1968 it became obvious that a standard was required, hence the Wodonga Conference.

Because the basic frequency was set by the existing simplex operations a decision was required on the number of channels and the input-output frequencies. It was decided at that Conference that since the bulk of the equipment coming into service was built to a commercial specification the repeater system should be made to fit that specification. It was agreed to use four channels for repeaters with frequencies on the 100 kHz. points on either side of the existing simplex system for compatibility. This meant that the frequency range of tx tuning would be from Ch. A to Ch. 4, approximatetly 550 kHz. Likewise, the rx range extended from Ch. 1 to Ch. C, a similar 550 kHz. spread. It will be noticed that although the segment from 145.6 to 146.4 MHz. is 800 kHz., the tx and rx each use the overlapping 550kHz.

Most equipment operates satisfactorily without the need to re-tune from one channel to another. This was the specification reached. The greater the spacing between the input and the output frequencies at the repeater site, the less will be the rx desensitisation, but the practical limit is reached when the users' unit performances fall away. If there had been no simplex channels to be fitted into the scheme a separation of 2 or 3 MHz. could have been used.

In order that the maximum benefit could be obtained from the f.m. channels on a national basis it was decided to use three channels for the time being, namely one for simplex and two for repeaters. The channels chosen were Ch. B, Ch. 1 and Ch. 4. Development continued without major problems until last year when the Ch. 4 output frequency of 145.9 MHz. came into conflict with the "announced" satellite channels. As stated, although this is now clear for this satellite the problem remains for the future.

In the 2 mx band everything below 146.000 MHz. is in the International segment of the band. This means that if any future international system makes use of a frequency in use by an Australian system, then, Australia has an obligation to move. An ideal for Australia—but not necessarily the most practical solution—would be to shift all our channels that are within the International segment to spots above 146.000 MHz. (i.e. Ch. 1 and Ch. 4 outputs plus Ch. A and Ch. B). Against this there are basically the cost of replacement crystals and the ability to establish new national standards. Note that at the moment Ch. B is the prime channel in any part of the country. The adoption of this ideal would therefore leave the International segment clear of Australian fixed channel operations. However, this has received mixed reactions, VK2 and VK3 appear to oppose it, but some support is forthcoming from VK5 and VK7.

Since the rest of the world possesses various systems within the segment 145.5 to 146.000 MHz., it is important that International agreement should be reached in this region of the frequency spectrum. The available information indicates that the following frequencies are in use or allocated:

Region 1

Europe & G: majority of beacons 145.95-146.000;

DL repeater outputs: 145.7, 145.75, 145.8, 145.85, 145.9;

A.O.B. satellite channel: 145.925-145.975;

G satellite allocation: 145.85-145.95;

SM & OZ repeater outputs: 145.65, 145.75, 145.8, 145.85.

Region 2

No W repeaters;

Amsat input: 145.9-146.0;

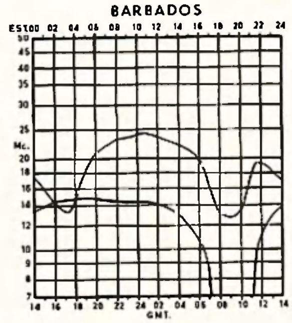
Some early Oscar satellites used 145.9.

(Continued on Page 11)

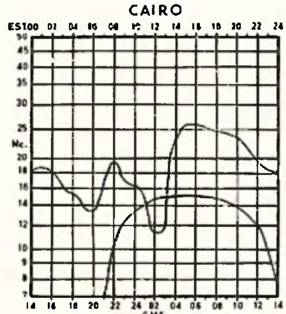
PREDICTION CHARTS FOR FEBRUARY 1972

(Prediction Charts by courtesy of Ionospheric Prediction Service)

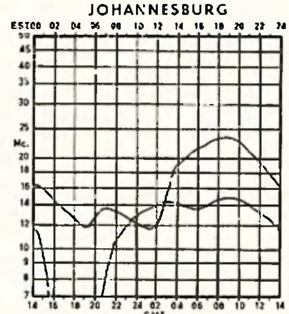
BARBADOS



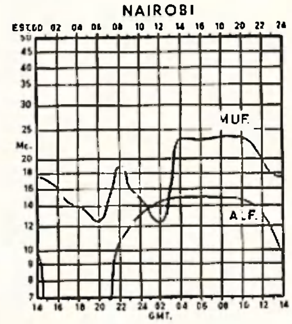
CAIRO



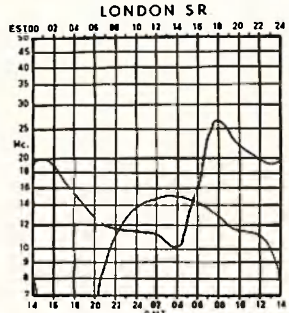
JOHANNESBURG



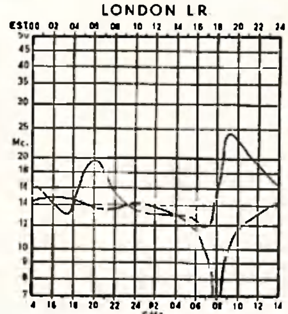
NAIROBI



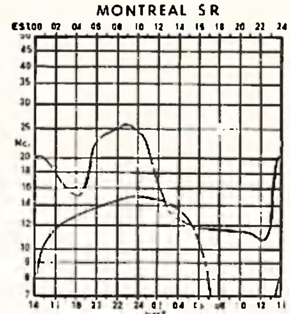
LONDON SR



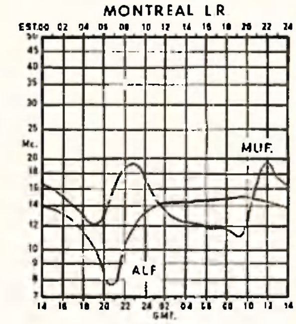
LONDON LR



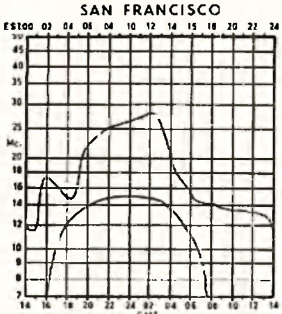
MONTREAL SR



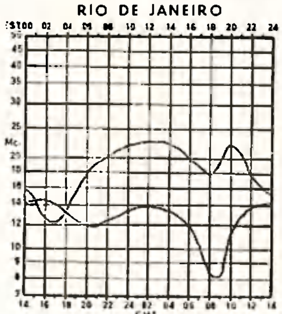
MONTREAL LR



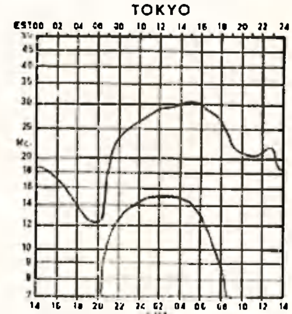
SAN FRANCISCO



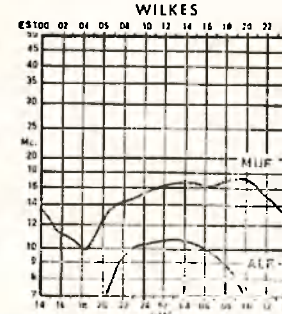
RIO DE JANEIRO



TOKYO



WILKES



Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

NOVICE LICENSING— SUPPLEMENTARY REPORT

Editor "A.R.," Dear Sir,

Admittedly, in the past, the question of so-called Novice class licensees has not impinged on my normal "live and let live" (apathetic?) nature, but after reading the Supplementary Report by the W.I.A. Novice Licensing Investigation Committee ("A.R.," Jan. 1972), I was quite literally stunned by the implications of the proposals as outlined.

At this point I would like to make clear that I am opposed to Novice licensing whether called by that name or any other. However, opinion being what it is, it appears inevitable that proposals regarding this class of licence will be submitted to the relevant authority, and it is to some of the proposals as recommended to which I take exception.

Section (e) states that there should be no limitation on tenure for Novice licensees. As the standard required regarding technical proficiency would be lower than that demanded for current licensees, it is obvious that any Novice should be expected, within a given time, to up-grade to the general standard. Twelve months, or at the most two years, should be more than adequate.

A portion of Section (g) recommends Mobile operation (as a passenger). No comment—except to suggest that there must be some incredibly naive people who could imagine adherence to a regulation of this nature.

Section (i) at least gives my somewhat deflated ego a boost, suggesting as it does that techniques involved on v.h.f. and u.h.f., to which I am relegated, are more complex than those employed by my h.f. brethren. My thoughts are that if Novice licensees are to be permitted on h.f. then v.h.f. and u.h.f. should suffer equally.

The third comment relating to Section (j) is undoubtedly the gem of the whole collection, implying as it does that wherever else the Novice is allowed to run riot, he must be kept at all costs away from the happy hunting ground of the DX fields on 14 MHz. My thoughts on this are the same as for the preceding Section.

Referring to "Recommendations for Action", Section (b), proposes full membership of the Institute for Novice licensees. I feel that this move should be resisted by all members as the voting power of this group would be out of proportion, considering the as yet unassessed worth of the scheme. Further, the voting power of the Novice licensees would naturally be predisposed toward any person or group championing their cause.

This letter was triggered off by a somewhat lengthy discussion this morning (Sunday, 9th January) on 52.525 MHz. in which was involved quite a large group of Amateurs holding both Full and Limited licences, and although I make it clear that all views expressed above are my own, the opinions of the other operators are worthy of comment. If my memory serves me correctly, only one person was for the scheme, with many reservations, whilst all other members of the group were against the proposals as they stood, or were against the principle of a Novice licence in toto.

One operator suggested that the scheme would create a "ghetto", a view to which I am inclined to subscribe.

I added my voice to the plaint that Novices would enjoy greater privileges than the present Limited licensee, and it was suggested that proposals for this group to be allowed to practice c.w. **on air** using m.c.w. crystal controlled, within their present permitted bands, would be of far more value in raising standards than jamming full the bands regardless.

The logical extensions of this idea would be to permit the present Limited licensee to pass a 5 w.p.m. c.w. test which would then allow him to use both phone and c.w. on his present allocations, **plus the 10 metre band.**

To conclude, I feel that any degradation of the present theory examination would be a retrograde step; rather, more time and effort should be expended on education programmes to assist prospective candidates in raising their degree of competence to the required level.

—Alex H. McKibbin, VK3YEO.

Editor "A.R.," Dear Sir,

I have been following arguments on Novice licensing, and was pleased to see the matter being thrashed out but I am dismayed at the final conclusion of the committee published Jan. 1972 "A.R." I am completely opposed to any reduction in the standard of the exam as it stands, the issuing of a certificate and a permanent licence on the substandard exam.

A certificate represents a degree of proficiency—not the lack of it. The standard of the exam is low enough as it is, particularly Morse code. A person can pass a 10 w.p.m. test and then completely forget it some short time later. What is the use of an exam in Morse code that does not determine whether the candidate can actually read it or not. It is a provision of the Wireless Telegraphy Act in accordance with the International Regulations that any person operating h.f. equipment must be able to read Morse code. Therefore anyone who completely forgets Morse code is an illegal operator. The test should surely be at such a speed that it will reasonably ensure that the candidate can read Morse code and will not forget it in a short time. The foregoing was a side track to illustrate that the exam is low enough in standard as it is, now back to the point.

I advocate that the Novice licence should be of limited duration and that no certificate should be issued (don't say "Oh that again" before you read the rest). The main purpose of the "restricted licence" as advocated by the committee would appear to be to provide a means of learning Morse on the air. It (the committee) does not consider that there will be a permanent group of restricted licensees or if there is they will not present a problem. I disagree on this point.

What sort of people are going to obtain lower class licences and what purpose are they going to serve? One group who, due to lack of experience or ability cannot pass the higher grade of licence in theory, Morse or both. I think these will form the minor part of the restricted licensees. The main part will be those who have some interest in the hobby but as yet have not yet gained sufficient interest to study for a full licence. Having obtained a lower class licence, people in this group will either lose interest and go out of existence or gain interest and obtain an A.O.C.P. or A.O.L.C.P.

In the proposal of the committee the licence will be permanent—the key to retaining the operator's interest in Morse code is that he can use c.w. only. There is no other reason why he should not have phone privileges as well. In fact if a large group of these operators do retain their licences, and also they will probably be given full membership in the Institute, they will form a disgruntled pressure group. After all, why shouldn't they use phone: Morse code is not the most important thing in the world. Give them phone and they will forget Morse code, defeating the purpose of the whole thing. There will also be some who will forget their code and cease to operate, retaining their licence for prestige reasons only—a licence deserving no prestige.

The main bone of contention about a limited period licence is that when the licence expires and the operator is still interested, he will become a pirate. Why this objection is raised when the solution is so simple I don't know—allow him to sit for the licence again.

The original proposal put forward in 1952 was that c.w. only be used in part of 3.5 and 28 MHz. and a.m. or c.w. in part of 144 MHz. with a limited period licence, 10 watts, xtal control, etc. What is wrong with that?

Consider the persons who may obtain such a licence. A large proportion will lose interest by the end of the period, in which case their licence will lapse. This could have prevented them becoming pirates for their period of interest. There should be a ready market for their old gear by the new Novices coming on. Some may lose interest in c.w. and operate 2 phone only, in which case they will obtain Limited licences. Others will, after a period of practice, obtain full licences. What about those who do none of these things and want to retain their Novice licence after the date of expiry? They simply resubmit for the Novice exam. This will ensure that they don't forget their Morse code and that they don't retain their licence for the sake of keeping it.

I advocate among other things:

1. That the period of the licence should be two years.
2. That no certificate be issued—the licence be issued on the exam results only (some statement as to the standard passed could be printed on the licence).
3. That since the licence is only temporary, they should be associate members of the Institute only.

—J. A. Adcock, VK3ACA.

Editor "A.R.," Dear Sir,

Could I add a thought to the accumulated evidence concerning Novice Licences?

The idea is a simple exam. not involving a Morse code test. Operation on Amateur segment of 27 MHz. band, phone, limited to one or perhaps five watts. Of course this would be in effect creating a sort of Citizens Band, with some favorable differences. The operators would be paying a licence into much needed government revenue, and using a call sign. Note: It is alleged many unlicensed operators are using 27.240 MHz., and if that is correct, this position would be largely rectified.

The W.I.A. should gain many more members who would mostly qualify in short time for Z calls, and many, later to A and B calls.

All the present suggestions I have heard and read about for Novice licences seem to call for a Morse test plus theory and regulation exams. These proposals together, would appear almost equivalent to the requirements for a Z call which does not require a Morse test.

Morse code seems to bluff many potential examinees. I know it's easy and should not bluff or deter anyone, **but it does.**

I personally know a large number of people aged from 16 to 60 years who would very much like to enter the ranks of Amateur Radio. Most of the younger aspirants are students who feel they have insufficient time to spare studying what **appears to them** (important point that) a difficult subject. Electronics seem so mysterious and complicated before you really study them.

Older worthy members of the community feel the days of studying seemingly difficult subjects are just beyond them, especially in rural areas where personal attendance at W.I.A. classes are not practical.

Many keen aspirants have tried the exam. sometimes two or three times, but they just cannot quite pass the present standards.

Give all these potential Amateurs an easier but restricted chance, and I am absolutely certain most of them would get the confidence and practical knowledge to upgrade their qualifications.

Concluding, I claim **considerable importance** should be attached to encouraging and helping youths with worthwhile hobbies, as a distinct community obligation by more senior citizens. Amateur Radio is one of the finest, as we all know.

—K. V. Scott, VK3SS.

[International Radio Regulations require Morse Code proficiency for operators of Amateur Stations on the 27 MHz. band—see page 32 of the Handbook.—Ed.]

REPEATER FREQUENCIES AND AUSTRALIS OSCAR "B"

Editor "A.R.," Dear Sir,

The Geelong Amateur Radio Translator Group notes with concern the suggestion in the VHF Notes in Dec. "A.R." that repeater frequencies may be changed to avoid a clash in frequencies with the Australis Oscar "B". We fully appreciate that the choice of frequencies was determined by international as well as (or instead of?) local considerations, but we believe that the choice of an up-link frequency for the satellite of 145.9 MHz. is not in the best interests of the Australian Amateur.

The problem arises because the satellite up-link frequency of 145.9 MHz. is also the output frequency for repeaters on Channel 4. The suggestion that Channel 4 repeaters be turned off during satellite passes (i.e. approximately every two hours) is impracticable, and contrary to the whole concept of a service repeater. It is unlikely that repeaters will get into the satellite; trouble is more likely with Amateurs working into the satellite being heard on earphones tuned to the repeater.

The suggested alternative is to shift the Channel 4 output frequency. This means at least one, perhaps more, new crystals for every Amateur who uses a Channel 4 repeater—or Channel 1, since Channel 1 will also have to shift for conformity. Taken over the whole of Australia, the value of crystals thus rendered useless would be considerable. And the cost of a replacement crystal is certainly no trifle. If, as has been suggested, the receive frequencies are shifted 1 MHz. up (Ch. 1 to 146.6, Ch. 4 to 146.9) the performance of most earphone receivers will fall off before those figures.

The repeater frequencies were fixed at the Technical Group Meeting at Wodonga in September 1968. These frequencies were fixed as permanent national frequencies, and the decisions of the meeting were publicised in "A.R." Licences have been obtained and a good deal of money invested on the basis that these frequencies would remain as fixed. Now, decisions seriously prejudicing the use of these frequencies have been made without publicity or opportunity for adequate discussion, and the

(Continued on Page 11)

Amsat 1971 Annual Report

The Radio Amateur Satellite Corporation (AMSAT) was formed in 1969 to provide Amateur satellites and space experiments for the Amateur Service. Membership currently numbers over 460, including over 40 member societies, and is world-wide with Amateurs from some thirty countries represented.

ACCOMPLISHMENTS TO DATE

Amsat-Aircraft Flight Tests.—In connection with the Amsat-Oscar-B satellite project, two series of aircraft flights of a prototype translator developed for the satellite were sponsored by Amsat during 1971, one covering the East Coast of the United States and the other covering the West Coast. The first series began with checkout flights on May 2 and 12, and culminated May 15-16 with a two-day flight which covered from Virginia to Maine, parts of Canada, and west to Illinois. The May 15-16 flight was scheduled in recognition of World Telecommunication Day celebrated May 17, and a report on Amsat's participation was sent to the International Telecommunication Union (I.T.U.). It is estimated that some 200 to 300 stations participated in this flight test.

The second series of flight tests was conducted by the Jet Propulsion Lab. Amateur Radio Club, an affiliated member club of Amsat, with flights over California on Aug. 28, Sept. 11 and 25. This series was perhaps even more successful, and one station alone reported completing 17 two-way contacts through the translator.

The main purpose of these translator flight tests aboard aircraft is to help interested Amateurs prepare for operation with the Amsat-Oscar-B satellite and to gain useful technical and operational experience to help assure readiness in using the satellite once it is in orbit.

World Administrative Radio Conference.—The I.T.U. World Administrative Radio Conference on Space Telecommunications and Radio Astronomy completed its meeting in July. The Space Conference defined a new "Amateur Satellite Service" and made provisions for Amateur satellites to operate in the 40, 20, 15, 10, 2 and ¾ metre bands, as well as in a new band, 24 to 24.05 GHz. Amsat provided much of the background supporting material on Amateur satellites to several of the delegations represented at the Space Conference, and also advised the I.A.R.U. observer team which represented Amateur Radio at the Conferenc.

Amsat Addresses and Presentations.—Amsat was represented at numerous Amateur gatherings during the year, and provided several lecturers for a University of Hartford graduate workshop organised to develop curriculum to assist teachers of all grade levels to use Amateur satellites as an educational tool for teaching science and physics in the classroom.

Amsat members presented a paper, "Spacecraft Telemetry Systems for the Developing Nations," co-authored with members of the W.I.A. Project Australis Group, at the I.E.E.E. National Telemetering Conference held in Washington in April, and also provided material for expanded Space Communications sections of the 1972 A.R.R.L. and R.S.G.B. Handbooks.

A report and recommendation on Amateur satellites were prepared by Amsat members and presented at the February Special Joint Meeting of the International Radio Consultative Committee (C.C.I.R.). Additional documents are now being prepared by Amsat for introduction into future C.C.I.R. meetings.

CURRENT ACTIVITY

Amsat-Oscar-B. — Significant progress was made during the past year on Amsat-Oscar-B (A-O-B), which is now being readied for possible launch next year. The prototypes and flight units have been completed on the following sub-systems of A-O-B: the 24-channel Morse code telemetry system developed by W5CAY; the 432-to-146 MHz. ten-watt linear translator developed by DJ4ZC and DJ5KQ in Marburg, Germany; the two-to-ten metre linear translator built by W4RUD, WA4DGU and K3JTE, the 35-function command system provided by W.I.A. Project Australis, and the instrumentation converter provided by W3GEY, A-O-B Project Manager. In addition, prototypes of the W.I.A. Project Australis 146-to-435 MHz. f.m. repeater and 60-channel teletype telemetry encoder were completed.

A breadboard of Codestore, a Morse code message storage device developed for Oscar satellites was constructed: This system is designed to store emergency messages, operational information on the satellite and orbit information, for repeated transmission to the ground over the satellite telemetry system. The messages can be loaded and reprogrammed by ground stations. A further description of Codestore is contained in the June 1971 issue of "Amsat Newsletter". Work is currently proceeding on flight and flight-backup hardware, and on the solar cell and wiring harness assemblies.

Amsat received word in February that N.A.S.A. will undertake the launch of A-O-B, and it now appears most likely that A-O-B will ride piggyback with the ITOS-D meteorological satellite into a planned 1500-km. polar orbit. In addition, the U.S. Federal Communications Commission notified Amsat that they would waive certain American regulations as they apply to A-O-B, and would permit Novices and Technician licensees in the U.S. to operate through the two-to-ten metre translator.

ATS-G Syncart Experiment.—Two years ago Amsat submitted a proposal to N.A.S.A. to provide Amateur experiments for launch on the ATS-G Applications Technology Satellite in 1975. Amsat recently amended this proposal and has now proposed a Syncart (Synchronous Amateur Radio Translator) experiment for ATS-G. As proposed, Amsat will provide to N.A.S.A., at no cost, a 146-to-435 MHz. 20-watt linear translator for integration into the N.A.S.A. ATS-G spacecraft. ATS-G is planned for geostationary (synchronous) orbit and will contain a 30-foot parabolic reflector available for the Syncart experiment, providing the rare opportunity for Amateurs to use a synchronous satellite on a regular basis with modest Amateur equipment.

Syncart is designed to demonstrate the usefulness of the Amateur satellite service in providing emergency communications, educational training, and experiments with small-terminal multiple-access communications. Further details on the proposal and the characteristics of the experiment were published in the June 1971 "Amsat Newsletter".

Skylarc-Skylab Amateur Radio Communications.—Another proposal was submitted recently to provide, again at no cost, Amateur station equipment for Skylab-A, N.A.S.A's manned orbiting laboratory scheduled for launch in 1973. The project, named Skylarc (for Skylab Amateur Radio Communications), is designed to encourage the use of space techniques by Amateurs throughout the world, while providing the opportunity to communicate directly with astronauts in Skylab operating on 10 metres s.s.b. during their spare time. In addition, Skylarc could provide emergency backup communications for the astronauts who will be out of contact with N.A.S.A. tracking stations for periods as long as ninety minutes. Skylarc is also expected to have useful educational applications in schools and at home.

Amsat members at the N.A.S.A. Goddard Space Flight Centre, Manned Spacecraft Centre, and Marshall Space Flight Centre have been actively assisting with the project. Dr. Owen Garriott, one of the astronauts in training for Skylab, has indicated his interest in participating in Skylarc activity. He is one of Amsat's more recent members, and happens to be W5LFL.

Skylab-A is planned for a 430-km. circular, 50-degree inclination orbit expected to bring it within range of most Amateurs around the world. The use of the 10 metre band for Skylarc would enable widespread participation using readily available Amateur equipment. Further details on the Skylarc proposal can be found in the Sept. 1971 "Amsat Newsletter".

FUTURE ACTIVITY

In summary, Amsat is now involved in three major projects, extending through the mid-seventies. Amsat-Oscar-B, expected to be launched in 1972, has a planned lifetime of one year, thus providing Amateur satellite communication service to 1973 or possibly 1974. Skylarc, if accepted for flight aboard Skylab-A, would be expected to fly around April 1973 and last until the end of 1973. The third project, Syncart, if approved, can be expected to fly on the ATS-G satellite around 1975, providing a regular communications capability from geostationary orbit until 1978, or even later if all goes well. It is hoped that these three projects will bring about new achievements in the Amateur satellite service for which we can all be proud.

(Sgnd.) Perry I. Klein, K3JTE.

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KILOVAC VACUUM RELAYS

From R. H. Cunningham Pty. Ltd. comes a brochure detailing the specifications of Kilovac vacuum relays with rated operating voltages upwards from 2.5kv. The Kilovac Corporation of Santa Barbara, California, also market Dowkey co-axial relays and Penta r.f. power tubes.

CORRESPONDENCE

(Continued from Page 9)

fait accompli hidden in a para. in the VHF Notes. We are told to communicate with the W.I.A. Federal Repeater Secretariat if we have any problems or suggestions concerning repeaters, but I am still waiting on their replies to letters of mine dated 25th May and 12th July, 1971. As the number of Amateurs using repeaters far exceeds those who will be using the satellite, the Committee of the Geelong Repeater would like to hear their views expressed.

—D. J. Laidlaw, VK3ZTA, Secretary, Geelong Amateur Radio Translator Group.

[The Federal Executive of the W.I.A. wish to assure the Geelong Amateur Radio Translator Group and other interested parties that no decisions have been made concerning repeater frequencies and that it is not the intention of the Institute to make changes of this nature without members being given prior notice and opportunity for discussion. It is true that a problem has arisen since the 1968 Wodonga meeting and that this has assumed a greater degree of importance since the I.T.U. Space Conference held in Geneva last year. The question will no doubt be raised at the next Federal Convention (held in Melbourne this year over the Easter week-end) and all interested parties are asked to make sure they contact and pass along their views to the Federal Repeater Secretariat and their Federal Councillor to enable all points of view to be fully discussed at this Convention.—D. H. Rankin, Federal Vice-President, for Federal Executive.]

"SALTY" W2HWA PASSES ON

Editor "A.R.," Dear Sir,

I was recently in contact with WB2OZW in New Jersey and received information regarding a very well known Amateur to Australia has passed away.

W2HWA, Sidney ("Salty") C. F. C. Belcher passed away on November 13, 1971.

"Salty was a very well known Amateur in Australian circles on c.w. and s.s.b. and was especially known while he was active as Chief Radio Officer of the "Queen Mary" before the ship was sold to an American company.

—Howard A. Lilley, VK2AYT.

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OVERSEAS MAGAZINE INDEX

Key (all 1971): 1, "Ham Radio," July; 2, "CQ," Oct.; 3, "73," July; 4, "QST," Aug.; 5, "Radio Communication," Sept.; 6, "Shortwave" Magazine, Aug.; 7, "Radio ZS," Aug.

Antennas: Rejuvenating that old Prop-Pitch Rotator (4); Review: Kirk Helicoidal Beams ($90 to $1,100 in U.S.A.) (4); Dipole Facts (6).

Accessories: CRT Intensifier for R.t.t.y. (1); 6 mx Antenna Coupler (1); Audio Signal Generator (3); A Filter Box for C.w. Ops. (3); A Technique for Burst Two-Tone Testing of Linear Amps. (4); How to make a low-cost Keying Mechanism (4); R.F. Triggered C.w. Monitor (this fellow has designed the very thing) (6).

General: Scandanavia, The Balkans and North Africa, the story of their Amateurs (2); Why use f.m., advantages and disadvantages (2); 2 mx f.m., simply and economically (2); "CQ" Reviews: The Swan Twins (600R and 600T, reviewer liked them) (2); "CQ" Reviews: The Swan FM-2X (2); Semiconductor Curve Tracer for the Amateur, Part 1 (4); A Tale of Two Crystals, crystals are not always stable (4); Cruise of the "Chamaru", maritime mobile in a tri-maran (6); Moonlight Madness, ZS1SP tells the story of an emergency communications operation in Capetown during flooding (7); History of Amateur Radio in South Africa (7).

Receiving: IC Rx for 80 mx (1); Pip-Squawk Mk. II. (4); Review: Ten-Tec RX10 Comm. Rx (4); Tuning the V.h.f./U.h.f. Spectrum (7).

Transmitting: The Motorola 80D on 220 MHz. f.m. (2); Solid State 2 mx f.m. Tx (1); Miniature Add-on Oscillator for 2 f.m. (3); A 3-4 MHz. Franklin V.f.o. (claims extremely good stability) (4); The Cabover Kilowatt (mobile/portable in comfort) (4); 80 mx Integrated Circuit Transceiver (5); Transistor Modulator, a.m. is not yet dead (6).

Other: An IC Audio Processor (3); Camera Conversion from fast to slow scan t.v. (1); Home-brew DX prediction (4); A Pulse Count Discriminator Unit (5); Varactor Triplers for v.h.f. (6); High Impedance Voltmeter (6).

SMALL MECHANICAL DRIVES

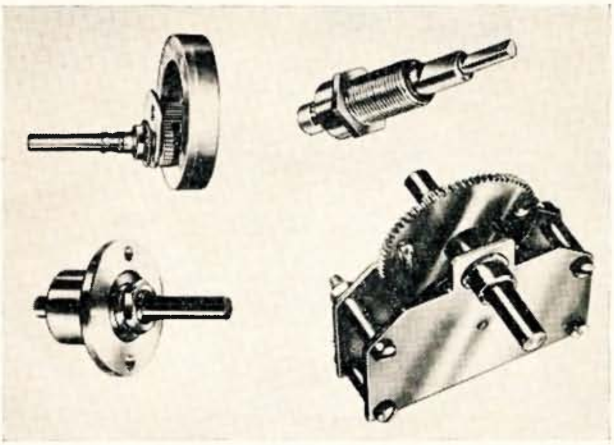

Fig. 1: top left; Fig. 2: bottom left; Fig. 3: top right; Fig. 4: bottom right.

Four new miniature drives, suitable for fine manual tuning of equipment ranging from domestic radio receivers to professional telecommunications equipment and scientific instruments, have been added to the range of small mechanical drives made by Jackson Brothers (London) Ltd.

The **Accelerator Spinwheel Drive** (Fig. 1)—Cat. No. 5810—is a cord drive unit intended for modern radio receivers with extra-long scales. It incorporates a 2¼-inch diam. (57 mm.) zinc-alloy flywheel driven through nylon-to-brass step-up gears at more than twice the speed of the drive-shaft. The complete unit weighs only 6 oz. (170 g.) but provides an inertial effect equivalent to a much larger flywheel, permitting rapid traverse of the scale.

The **Nylon-Bearing Spinwheel Shaft**—Cat. No. 4589/Nylon—is another new cord drive, to which various flywheels can be attached. To provide an ultra-smooth 'quality' feel suitable for expensive stereograms and radios, it incorporates—in place of the usual brass-to-brass bearing—two molybdenised nylon rings placed between a stainless steel shaft and a brass bushing.

The 10:1 **Epicyclic Ball Drive** (Fig. 2)—Cat. No. 5857—is a powerful but compact drive suitable for transceivers, capacitance bridges, signal generators, etc. It provides a 10:1 reduction ratio between coaxial input and output shafts, with a limiting output torque (beyond which internal slipping occurs without damage) greater than 30 oz.-in. (2.2 kg-cm.). It measures 2-1/8 inches (54 mm.) overall length by 1-7/16 inches (36.5 mm.) diameter of mounting flange.

The **Twin-Speed Epicyclic Ball Drive** (Fig. 3)—Cat. No. 5845—is intended for driving a single potentiometer or variable capacitor—e.g. in small radio receivers. Two co-axial inputs provide direct drive for coarse adjustment and a 5:1 redutcion for fine adjustment. Limiting output torque is 8 oz.-in. (0.6 kg-cm.).

The earlier **G80 Drive** (Fig. 4)—Cat. No. 5599—built to British Post Office specification and intended for professional telecommunications receivers, is now available with either 180 or 360 degrees movement of the output shaft. It provides an 80:1 reduction ratio, without backlash, between co-axial input and output shafts, and consists of a 10:1 friction drive and an 8:1 gear drive in series. Limiting output torque is 24 oz.-in. (1.7 kg-cm.).

Further information can be obtained from Jackson Brothers (London) Ltd., Kingsway, Waddon, Croydon CR9 4DG, England, or from the Australian agents, British Merchandising Pty. Ltd., Shaw House, 49/51 York Street, Sydney, N.S.W., 2000.

AROUND THE TRADE

Our good advertisers Hy-Q Electronics Pty. Ltd. announces the opening of their office in Sydney from Feb. 1 in Suite 204, 284 Victoria Ave., Chatswood, N.S.W., 2067, telephone (02) 419-2397 (Telex 22631), under Mr. Jeff Wratten as Area Manager for N.S.W. and A.C.T., providing technical and sales assistance to their many clients in these areas.

From Bail Electronic Services and from "Ohm" Magazine comes news of a raffle to win a Yaesu Musen FT101 for just $US2.00. Further details from "Ohm" Magazine (available through F.E. Publications), HARTS, of Hong Kong, or from Fred VK9FH, the recipient of the proceeds towards a tractor for the Airmen's Memorial School, Ewasse, New Britain. Bail Electronic Services are Australian Agents for Yaesu Musen and offer both sales and service.

Andrew Antennas of Melbourne announce a successful $750,000 contract by P.M.G. Dept. to supply and instal equipment for the Darwin-Mt. Isa radio telephone link, comprising 105 microwave antennas on 48 towers due for completion early 1974. The 10 and 12 ft. dish antennas are for manufacture at their Reservoir plant where they operate Australia's largest metal spinning machine.

FED REPEATER SECRETARIAT

(Continued from Page 8)

Region 3

ZL repeater channels: 145.6, 145.65, 145.7, 145.75;
ZL simplex channels: 145.8, 145.85, 145.9, 145.95, 146.0 (only 145.85 and 146.0 to be used);
ZL a.m. repeaters: 145.725, 145.775, 145.825;
VK repeater outputs: 145.6 (Ch. 1), 145.7, 145.8, 145.9 (Ch. 4);
VK simplex channels: 145.85 (Ch. A), 146.0 (Ch. B);
Satellite: 145.8.

If a segment were to be set aside it would appear that the present A-O-B selection of 145.95 MHz. centre frequency plus or minus 25 or 50 kHz. is best. Whilst this is in the part of the band occupied by Region 1 beacons it is currently free from fixed channel operations. It is as unlikely that the Germans would enthuse about closing down or shifting their repeater frequencies as we are.

The following Ch. 4 systems are current in VK: Adelaide, Geelong, Gippsland, Sydney, Newcastle (not yet in use) and Northern Tasmania (temporary allocation).

There is a Federal Convention to be held this Easter in Melbourne. A policy is needed on future Australian involvement in the Amateur satellite programme and the frequencies of our systems. Arising from this would be the frequency segments in the area for International satellite work and the policy to be adopted if World Agreement places the International segment within the present Australian allocation. Ought we to move all our systems now outside the International segment? The possible answers to these and allied questions should be discussed NOW by interested parties and the decisions passed on to your Federal Councillor for his guidance during the Convention.

Other questions which the active v.h.f./u.h.f. operator should be considering are:

(1) The necessity for band planning so that all modes and systems can be accommodated without undue confusion;
(2) The need to determine a beacon policy so that the development, location, method of operation and frequencies can be implemented to achieve the best possible results for Amateur and scientific uses;
(3) It was suggested that the 2 mx simplex Channels A and C be altered by 4 kHz. from their present frequencies so as to become 145.85 and 146.15 MHz. respectively. Is there any desire for this move?
(4) The relative need to consider the adoption of a third repeater channel if the co-channel interference (as in the Melbourne area) becomes too great. If one is adopted it would have to fit into a national scheme so that all users could equip themselves to suit.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

These notes are being written on Dec. 15; the calendar says that summer has arrived, however a glance out of the window shows that there is a mistake someplace. Our glorious Blue Mountains are black today, a condition which seems to prevail in the DX bands at the present moment. I have noted some good signals coming in on 15 and 10, and at the time of writing 10 metres is open to the West Coast of America and the Pacific. As a matter of interest, the New Zealand t.v. is belting in on Channel 0 with 5 by 9 sound and a trace of picture.

As the closing date for the February issue is well before the end of the month, I have nothing from the VK gang at this early stage, and thus the basis for all notes in this issue will be Geoff Watts DX News Sheet and the Florida DX report.

Operation by CR5XX from Sao Tome had been promised for Dec. 3, but a late report said it had been delayed until Dec. 12. The operators were CR6GA and XX; QSL information s.s.b. QSOs to WA3HUP and c.w. to CR6NN.

Yonten AC5TY has been reported on 14205 with 4S7PB acting as MC, also said to be on 14024-030 c.w. with the W6 stations at 1600z. Bhutan expects to be assigned an official I.T.U. prefix shortly, as AC5 is not official. AC3 and AC5 with CE0X and Clipperton are on a list of possible operations for Signal One operation with Larry K2IXP/6 as one of the operators in 1972.

DL0EM from Borkum Lighthouse in the East Fresian Is. is currently active for a few days and asks that all QSLs for this operation go to DK3JQ. Another DJ station who has been travelling around is DJ6QT who has just been on from CT3. He asks that QSLs for his recent operation from EA8GK be sent to the home QTH.

GB3MSA operating from Poldhu and VB1MSA from Signal Hill were active from Dec. 11 to 16, the former by the Cornish Radio Club, the latter by the Society of Newfoundland Radio Amateurs under the direction of President VO1FX. 15 to 80 metres were used on this occasion to commemorate the 70th anniversary of Marconi's first Trans-Atlantic wireless message on Dec. 12, 1901. A special QSL via S.O.N.R.A., Box 1226, St. Johns, Newfoundland, will be issued, and they also plan to issue a special certificate to all who work both stations during the period of operation. Other speial stations were DL0EM, GB3MNI and GB3PMA.

Some news from ET3 says that ET3USC is frequently active from 1105 on 21 MHz. c.w., QSL to Lee Spencer, Box 201, Company "A", U.S.A.F.S., Asmara A.P.O., New York, 09843, or to his WA4AGT home QTH. Another station, Dave ET3DS, who is ex 8R1S/5H3MA now has a new manager, VE2DCY.

HK0BKX from San Andres is a regular in the YL net 14332 s.s.b. 1800z with manager WA6AHF. WA6UCW/HK0 was due to go there for 160 metre operation from Dec. 25 to Jan. 7. HB0XHS as far as we here are concerned has K0IQM as manager.

Prefixes of interest seem to be in the news every week, PJ9JT and BF were on for the contest week-end up to Dec. 1, W1BIH and W2CCE were the respective managers. PJ4HT for a week to Dec. 7 by PJ2HT from Bonaire, QSL to home QTH. C. de Wit, Box 879, Curacao, Neth. Antillies. Karl TU4AA with another special cards to VE7BWG. WC4BCC from Dec. 16 to Feb. 29 from Birmingham, Alabama, whilst WM1NSA to Dec. 13 from Framingham, Mass. YA2AG has been issued for some unspecified reason, and his address is A. Baron, Kabul (I.D.), C/o. Dept. of State, Washington D.C., 20521, U.S.A. HS0UDN is a club station, address of which is via the HS Bureau, Box 2008, Bangkok.

Some current or recent activity from the VP call areas commences with VP1BH on all bands and very active on 80 metres, manager is VE2AKZ. VP2DAE from Dec. 20 to 24 by WA3IIRV on all bands; manager is K3RLY. VP2VAI Dec. 4 to 6 by the KP4 boys, also VP2VAG whose manager is VE3GMT or direct to Box 440, Tortola, B.V.I. Pete VP2VAM has the same manager. Other VP operation of interest is VP2EQ from Anguilla; QSL to WB2ZMK. VP2GI from Grenada, address is Box 421, St. Georges. VP2KF from St. Kitts, now has VE2DCY as manager. From down in VP8 we note that VP8LK is on Adelaide Is., where he has been for most of 1971. His cards go to G3NOM. Mike VP8MH is on from Argentine Is.; QSL to M. Hinchcliffe, 40 Elmwood Drive, Thornton-Cleveleys, Lancs., whilst VP8MJ is also there.

Geoff Watts is anxious to have all QTH and QSL information for all stations currently active in the VP8 call areas. He would appreciate a line to QTH, 62 Belmore Rd., Norwich Nor 72-T, England.

VR1, British Phoenix, has VR1AB giving us some fine operating. He is regularly in the Pacific net, and asks for his cards to be sent to K3RLY who also handles this chore for VR1AC. VR1W due to go QRT about mid-Dec.; QSL to W6CUF. Danny VR1AA, of course, is still active from Gilbert and Ellice, and I mean active, 4046 QSOs between August and December, 75 per cent. being on s.s.b., so he is concentrating on c.w. QSLs also handled by K2RLY.

Bill VQ9WF currently active from Chagos using 350 watts to a three element beam, expects to return home to his WA2UUV locale in 1972. He asks for all cards to go to his home address or to W4NJF after his return, which will be very shortly.

Ascension Island is not very often in the news, but there is usually some activity from there. ZD8KO, Keith Orchard, C/o. B.B.C., Ascension Is., South Atlantic (QSL with two IRCs). ZD8CS, QSL to K1BTD; ZD8JK, manager WA3FNK, are the regulars, whilst ZD8TS returns to his G3ZST QTH in Dec.

5N2AAN and 5N2ABG are QRV 7005 c.w. week days 0545-0600. ABG will be on 14180 0600-0630 beamed to the Pacific on the long path and asks for no breakers.

KS4CJ, Swan Is. operation by KV4AM from Dec. 8 to 21, has been reported under way successfully, and they ask for all QSLs to the home QTH. Transfer of the Island to Honduras has still to be approved by the U.S. Senate, but as they are only 100 miles from the HR coast, they will cease to count as a separate DX country once the transfer has been completed.

Still an abundance of K stations populate the bands from the Pacific areas. KB6DB, manager K3RLY; KJ6CF, Box 101, A.P.O., San Francisco, Calif., 96305; KM6DX, L. Collins, Box 100, U.S.N.A. Commsta, F.P.O., San Francisco, Calif., 96614, active from Midway, whilst down in the colder regions WB0CUB/KC4, Gary, is located on Byrd Station. His QSLs go to K0YKJ.

As I am running out of space here, I will briefly list some stations just appearing in the news sheets. Their managers, where known, will follow the call in brackets. HS1ABD (K5QHS), JX1AK (LA1FH), OH0NI from Nov. 27 to 28, QSLs direct. TG9YN, who is ex YA1BW, QSL manager DL8DF. 5H3LZ (G3-USY), 9L1VW (W9FIU). VK9CH on Bouganville to WA6MRG, this counts as New Guinea; VR5FX (ZL2AFZ), 9M8FMF (W1YRC).

Silent Key.—W6LN, Thor E. La Croix, well known in the DX field, passed away on Nov. 20, while Bob Rowley, HP1BR, whose call was also prominent amongst the DX'ers, died on Nov. 28. I would like to add a word here in recognition of the late Graham VK2AGH, whose passing a few months ago left a void in Amateur circles. I would like to take this very belated opportunity of acknowledgment of a truly great operator who is sadly missed. Graham was one of many VK2 Amateurs who gave me help and encouragement when I turned to Amateur Radio as a relaxation after the war, and one whom I will always remember as a friend.

AWARDS

Minor States Certificate. For working countries in the list C3 (PX), HB0, HV, LX, MI (9A) and 3A. DX stations need any two for the basic award. GCR list plus 10 IRCs to OE7PR, Herbert Prettner, Pradlerstr 68, A-6020, Innisbruck, Austria. This award, which to me seems rather pointless and expensive, is also available to SWLs.

Sargenda Award. For working Sardinia stations since 1st June, 1965. DX stations need 10 points on the basis of one point per IS station per band. GCR list plus 10 IRCs to Sezione A.R.I., Box 25, Cagliari, Sardinia, Italy.

Worked All GITMO. For working six KG4 stations since 1st Jan., 1971. GCR list to W.A.G. Award, C/o. KG4EY, FTG Box 551, F.P.O., New York, 09593.

Worked Sweden Award. There are five awards here. Worked 80 SM on 80 metres, 40 SM on 40, 20 SM on 20, 15 SM on 15, and 10 SM stations on 10 metres. Each application for any single award must include all SM call areas, SM1 to 0, SK or SL stations also counting. GCR list plus six IRCs to Gotland Island Radio Club, Box 336, S-621-03, Visby 3, Sweden. Extremely hard to get the five, but who knows. The awards are available to SWLs on a heard basis.

Amendments. For the **All Capital Cities Award** which I prepared for the January issue, please amend custodian to read DL2HQ or DL9OT. Add Liberia and Sth. Africa to I.A.R.U. region 1 award.

Awards are always a subject of interest. In the past many of my contacts have expressed their appreciation of "A.R." for publishing these when available, and a friend of mine in England, who is rather involved with the C.H.C. set-up, is forever mentioning his inability to do little else than look after the awards for which he is custodian. Personally I feel that the award situation has become similar to the D.X.C.C. list, somewhat top-heavy. I'm not knocking awards, I'm very much in favour of them as an incentive, but any goal has to be worth getting and I feel that some of the awards which are available are just not worth the paper on which they are printed. They are so easy to get and the cost is so high, that one does not have to look too hard for the reason of their existence. They are part of the general Amateur Service, and as such, I write them up. This does not imply that I agree or disagree with the ethics of any award listed, but I do suggest that if an award looks too rediculous or the cost is out of proportion to its value, then forget it and concentrate on one of the better ones.

All for this month, 73 de Don.

DX-PEDITIONING HOT NEWS

Alf Matthews, VK3ZT, comes up with plans being formulated by John Martin, VK3JW, for an all-Australian activation of Mellish Reef, and, if A.R.R.L. agrees to new country designation, of Frederick Reef, in May or June this year.

Mellish Reef, thanks to earlier efforts of Larry Pace, VK4CGB (now K2IXP/6) and John was given new country status last year. Both would be new "countries" and are believed never previously activated.

Dates and plans are still tentative. Support is solicited from VK operators to enable the operation to get under way. Apart from anything else, a boat is being sought so as to coincide with the most favourable wx conditions in the changeable Coral Sea. They want to make this an all-Australian effort although several overseas interests are most keen to participate. The loan of equipment is also sought to make this DX-pedition cover all bands (including 160 mx) as well as s.s.b. and c.w.; generators and other gear would be needed quite apart from running stores.

John also has made application for a possible "second string" operation for an all-Australian DX-pedition to China and Tibet, but here again some assistance is required.

How about it? Can you help in any way? If so, now is the time to come to their aid. Mellish and Frederick Reef may not be as tough a proposition as Rockall in the Atlantic, but it will be hard work. Please write now to VK3JW or VK3ZT (QTHR) or telephone 03-088-2897 (a.h.) to Alf for further details.

CONTEST CALENDAR

Feb. 12/13: John Moyle Memorial National Field Day Contest, 1972 (see Nov. "A.R.," p. 13).

Feb. 12/13: ZL V.h.f. Field Day.

Feb. 12/13: R.S.G.B. 1st 160 mx Contest.

Mar. 11/12: R.S.G.B. B.E.R.U. Contest.

Mar. 25/27: B.A.R.T.G. Spring R.t.t.y. Contest.

SUBSCRIPTIONS DUE

All members of the W.I.A. are reminded that annual subscriptions are due and should be remitted to the office of the Federal Manager, P.O. Box 67, East Melbourne, Vic., 3002, as early as possible.

"A.R." will not be despatched to anyone listed as unfinancial and as back copies may not be available on request some discontinuity may occur.

The error in this Notice on page 15 of Jan. "A.R." is regretted.

VHF

Sub-Editor: ERIC JAMIESON, VK5LP
Forreston, South Australia, 5233.
Closing date for copy 28th of month.
Times: Eastern Summer (Daylight Saving) Time.

AMATEUR BAND BEACONS

VK0	52.525	VK0MX, Mawson.
	52.100	VK0ZVS, Macquarie Island.
	53.839	VK0PF Casey.
VK2	52.200	VK2II, Sydney.
VK3	144.700	VK3VE, Vermont.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4VV, near Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VE, Bickley.
VK7	144.900	VK7VF, Devonport.
VK9	144.600	VK9XI, Christmas Island.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
W	50.091	WB6KAP, U.S.A.
KH6	50.101	KH6EQI, Hawaii.
	50.015	KH6ERU, Hawaii.
HL	50.100	HL9WI, South Korea.
ZK	50.100	ZK1AA, Cook Island.

Some changes to the beacon list this month. Firstly, a letter from Mr. J. K. Walter, of the High Latitude Section of the Commonwealth Bureau of Ionospheric Prediction Service Division advises a frequency change of the Casey beacon from 53.544 to 53.839 MHz. The present power of that beacon is 11 watts to a four element yagi, but this is expected to be increased to 100 watts shortly. Mr. Walter also confirms that two 6 metre beacons will be taken to both Casey and Mawson in 1972, both with an output power of about 400 watts. Call signs and frequencies will be advised when the P.M.G. Dept. finally gives approval.

The second item from Mr. Walter's letter indicates that several Sydney Amateurs reported reception of a 6 metre beacon with a call sign believed to be prefixed with VK0 (probably VK0PF at Casey) on 52.525 MHz. on 27/11/71. At this time and for the following two days Phil VK0PF at Casey reported receiving 6 metre beacons from Australia. These reports are not definite, but they do suggest a distinct possibility of the occasional use of Sporadic-E propagation between Antarctica and Australia. If any readers have received the Antarctica beacon, Mr. Walter would be pleased to hear of it. Address: Assistant Director, I.P.S. Division, 162 Goulburn St., Darlinghurst, N.S.W., 2010.

While we are talking about beacons and the Antarctic area in particular, I am pleased to report the first hearing of a VK0 beacon, that on Macquarie Island at 1945 hrs. on 2/1/72 by Ross VK4RO. Call sign VK0ZVS, freq. 52.100 MHz., call sign in m.c.w. 1½ times before fading into noise, sigs. SI-2. Further details of this station from Chris VK0RC and Tony VK0KA indicate power output to be 20w. p.e.p., 4 el. yagi up 30 ft. Tape loop connected via vox circuit of FT200 gives "CQ VK0ZVS Macquarie Island" then pauses for 35 seconds while listening with vox open, then repeat. If you hear this station, you must reply in the pause period with an accurate signal as the receiver bandwidth is 2 kHz., preferably using c.w. at 4 to 5 w.p.m. (due to auroral flutter effects making a.m. and s.s.b. signals unreadable). Tony indicates an interest sufficient to go ahead with a linear using a 4CX250B for contact purposes, but generally for beacon purposes the 20w. power level will be used. Good luck to you Ross, hope you can make it a two-way next time.

52 MHz. DX

The 1971-72 Sporadic-E DX season for 52 MHz. has certainly been a very good one. Something has been available almost every day since mid-November. Several things have stood out this year, the probably the most prominent being the greatly increased number of stations using s.s.b., mostly transceive. Coupled with this, more and more of the remaining a.m. stations were calling "CQ DX—listening this frequency before tuning," indicating a greater awareness of the increase in transceive operation.

Two further points come out of this of course. One is that all stations will need better frequency stability with a greater number of narrow-band s.s.b. receivers being used—a drifting signal, particularly if a.m. with frequency modulation, is well nigh impossible to receive on a sharply tuning receiver. There are at the present time some very poor s.s.b. signals on 52 MHz., signals very hard to tune. It is hoped that another year will give these stations a chance to improve their signals too, and some of those occupying 20 to 40 kHz. of the band due to shouting into the microphone with the gain control well up when operating DX might well look at their operating procedure—and, I might add, this applies equally as well on 20 metres too. I could name several consistent offenders on this band!!

Other interesting things to have happened on 52 MHz. during December mostly have been the working of the four ZL districts, and of particular interest to VK5 that ZL4 has been worked after a break of quite a few years, with David ZL4PG and Stan ZL4MB most active. Stan has indicated he intends doing some portable operation for the greater part of the year on Saturday and Sunday mornings, beaming VK, before their t.v. stations commence. Likely operating times will be between 1100 to 1200 hours, frequency 51.980 MHz., and on s.s.b. He may also try 52.007. Geoff ZL3RZ was just about jumping up and down one day when he could near VK6WA and VK6ZDY but could not get them to tune below 52 MHz. That's a long haul to the West, and a path not often open, so can understand Geoff's ire! Geoff was a good signal in VK5 this year and worked plenty of stations.

Not content with spanning the Continent east to west, the Amateurs then turned their beams north on 29th December, and quite a few worked Rex VK9ZAP. Barry VK5ZMW has not forgiven me yet for working Rex over him. Barry was trying out his new s.s.b. QRP rig (5w.) and apparently tried calling Rex at the same time as I did with my 100w., the result was obvious! However, Barry did eventually make it, which is a pretty fine effort (1850 miles with 5w.). Geoff VK5ZGF/8 gave quite a number their first VK8 contact for the year from Alice Springs, so there would be quite a few people who Worked all States this year, plus VK9 and four ZL districts, not bad going chaps!

While all this sort of thing goes on, Wally VK5ZWW plods along with his meteor scatter experiments, and on 11/12/71 worked VK3AUU by this mode, with one burst of 8 to 9 seconds at 5 x 9.

Geoff VK5LT heard Channel 5A in Wollongong on 29/12/71 and saw a relatively snow-free picture for about 10 minutes. Ch. 5A was also heard rather weakly at my own QTH on the same date at 2000 hrs. This is the first time I have positively heard the t.v. station, and lends some support for my hopes that 144 MHz. DX will start to come back again next season.

MOONBOUNCE ON 144 MHz. FIRST VK TO VE CONTACT

Whilst others have been making good use of 52 MHz. Sporadic-E propagation, Ray VK3ATN succeeded in making two contacts via the moon on 1/1/72, on 144.005 to K6MYC and on 144.004 to VE7BQH.

Ray started to transmit at 2140 to 2142 (his normal transmitting period) and stood by for three seconds and back came W6MYC, and operated with him from 2142 to 2150, signals 439; then from 2150 to 2156 with VE7BQH, signals 329. Signals continued to be heard until 2206-2208, by which time the moon was getting too high for antenna.

Ray reported the half hour "window" for contact via the moon as being rather unusual, and the longest he had experienced.

A fine effort Ray, and we are glad to be able to rank you amongst the v.h.f. fraternity of Australia.

10 GHz. AUSTRALIAN RECORD

On 10,000 MHz. at 1245 on 30/12/71, Des VK5CU/P located at Black Top Hill, Elizabeth, contacted Barry VK5ZMW/P at Kulpara, South Hummocks—distance 61 miles. Signal strength at VK5CU 5 x 9, and at VK5ZMW 5 x 5. VK5CU on 10040 MHz. and VK5ZMW on 10010 MHz. I am indebted to Barry for the following report:

"The weather was overcast with an extreme haze which made visibility poor, in fact the location could not be seen. Wind and rain was the forecast, and tossing the coin was the deciding factor whether to go or not. A 2 mx link was used as a back-up with a 4 el. yagi, which proved invaluable for determining the correct direction for 10 GHz. Des VK5CU first located himself at a hill above Salisbury but no 3 cm. contact was made so a new location was decided, this being Black Top Hill.

"After about 30 minutes and no contact being made, we decided to review the situation. The 2 mx yagi d.f'ed Des through the centre of Port Wakefield, which was then visible from Kulpara. Les' antenna should therefore be pointing through Port Wakefield, and a check indicated Les' antenna to be too far north. A re-alignment of his antenna and contact was made. The parabolas did not seem to be too critical in direction, some 5 degrees swing could be made with very little change in signal.

"The equipment consisted of all solid state gear except the klystron. VK5CU used a separate transmit and receive dish, and VK5ZMW one single dish. Power output from the transmitters about 100 mW. This contact was made after some 20 years of building, trying, modifying, trying, etc., made Des VK5CU a v.h.f. (Very Happy Fellow!)."

Congratulations to both of you, this distance will set a target for someone else to better. It will certainly be an Australian record and may not have been bettered by many anywhere.

GENERAL

From Bob VK3AOT comes an item or two, mentioning that on 27/12/71 Peter VK3BFG heard Phil VK0PF at 419 on 6 mx and they are keeping skeds on 20 mx each night to keep their interest doing. On 28/12 short skip was evident and allowed some operators their first contacts from VK3 to VK1 by working Eddie VK1VP. Eddie also worked VK7ZIS by short skip. On the same day, VK3ZTK worked VK9ZAP. On 432 MHz., Ron VK3AKC has worked VK7LZ a distance of 270 miles. Bob also advises that the VK4 beacon VK4VV is temporarily off the air due to an impending call sign change, a new electronic keyer will then be used. He also reports Kerry VK5SU at Ceduna, on 30/12, had heard VK6VE, the 2 mx beacon near Albany at S8, and on 31/12 at S4, while VK5VF had been S5. No contacts had been made.

John VK7JV writes to advise Col VK7KW left for Casey in the Antarctica in January and has the call VK0JV, and John VK7JV will be his QSL manager. Col has, or has access to, equipment to work the Australis 144-432 MHz. and the AMSAT 144-28 MHz. translators.

The VK5 Field Day (5/12/71) proved a great success. The band opened to VK6 for an hour or more and up to 16 stations were worked from there on 52 MHz. Few contacts also to VK2 and VK4.

So, generally speaking and looking back over the past month, the v.h.f. operator has really had a ball and with gradual improvement in equipment, distances covered must inevitably increase no matter what the frequency. I conclude this month not really with a thought for the month as more particularly a short joke taken from the pages of the W.A. V.h.f. Group News Bulletin, and which appealed to me: "Speaking of gifts, did you hear about the character who gave his ma-in-law a Jaguar for Christmas? Both he and the animal were well satisfied."

Finally, it appears the deadline for copy for "A.R." has been altered. My notes now need to be in Melbourne by the 3rd of the month, so it will be necessary to ask correspondents to have their information in my hands by 28th of each month. Your help in this direction will be much appreciated. 73, Eric VK5LP, The Voice in the Hills.

Stop Press.—The I.P.S.D., supported by the W.I.A., has received P.M.G. approval for one year from Feb. 1 to establish two keyed radio beacons to conduct radio propagation experiments between Antarctica and Australia. The mode is 2A2 at 200w. final input and the call signs, frequencies and locations are:

VK0GR—53.10 MHz., Casey.
VK0MA—53.20 MHz., Mawson.

VK0ZVS Macquarie Island has started transmitting on the 6 mx band—52.1 MHz.—and will be on between 7 and 9 p.m. Melbourne time. Is looking for contacts.

During the VK2 Field Day on 2/1/72 Doug VK2ZZI/P on Mt. Bindo worked ZL2TGT, ZL2TLY and ZL3AR/2 on 2 mx, probably via Es. VK2ZZI was using a.m. on 144.21 MHz. Peter VK2TK/2 worked two ZL stations. On 3/1/72 Bob VK5ZDX in Adelaide had a scratchy contact with Aubrey VK6XY at Albany, a distance of almost 1200 miles on 144.21 MHz. a.m. Kerry VK5SU at Ceduna worked Bob VK6ZFY/6 who was portable near Mt. Barker, and VK6XY. These contacts are believed to have been via a trapo mode. With three stations now active in Albany on 2 mx, no doubt many more trancontinental contacts will be achieved over the next couple of months.

NEW CALL SIGNS

OCTOBER 1971

VK3GZ—G. J. Zimmer, 1/15 Clendon Rd., Armadale, 3143.
VK3JK—C. W. Gliddon, 9 Gloria Ave., Dandenong, 3175.
VK3MA—D. L. Bradford, 2 Ralund Rd., Doncaster, 3108.
VK3YH—A. A. Varley, 65 Lasiandra Ave., Forest Hill, 3131.
VK3ADB—B. B. Hocking, 45 Wallace St., Morwell, 3840.
VK3AFM—F. M. Wrobel, 38 Hilton St., Glenroy, 3046.
VK3AFX—O. R. Hosking, 62 Thomas St., East Brighton, 3187.
VK3AMQ—M. G. White, 62 Peter St., Box Hill North, 3129.
VK3ASM—K. Moore, Lot 17, Mast Gully Rd., Upwey, 3158.
VK3ATE—Footscray Institute of Technology Radio Club, Ballarat Rd., Footscray, 3011.
VK3AUU—D. D. Tanner, Lye & Dixons Rd., Ripplebrook, 3818.
VK3AZG—I. B. Williamson, 62 French St., Lalor, 3075.
VK3AZT—J. B. Payne, 97 Ringwood St., Ringwood, 3134.
VK3BFW—W. F. Colborne, 80 Hill Rd., North Balwyn, 3104.
VK3BGC—R. G. Clay, 13 Brown St., Traralgon, 3844.
VK3ZGS—K. G. Slade, 23 Russell St., Greensborough, 3088.
VK3ZGY—W. J. Kirkhope, 271 High St., Lower Templestowe, 3107.
VK3ZJP—J. C. Parker, 7 Wellington St., Middle Brighton, 3186.
VK3ZWF—W. A. White, 1861 Dandenong Rd., North Clayton, 3168.
VK3ZWP—C. J. Gamble, Lot 19, Rosemar Circuit, East Rosanna, 3084.
VK3ZYR—R. H. Young, 1 Bland Ave., Dandenong, 3175.
VK3ZZX—J. L. Watkins, 4 The Grove., South Camberwell, 3124.
VK4LH—L. C. Kelso, 46 Gavegan St., North Bundaberg, 4670.
VK4ZA—R. C. Atkinson, 136 Marshal Lane, Kenmore, 4069.
VK4ZCL—G. J. Castledine, 10 Park Rd., Arana Hills, 4054.
VK4ZJV—R. J. Williams, 20 Nerang Coast Rd., Miami Keys, Broadbeach, 4217.
VK4ZWP—P. L. Williamson, 11 Harley St., Enoggera, 4051.
VK5JV—J. W. Williamson, 2/33 South Esplanade, Glenelg, 5045.
VK5NU—G. A. Dowse, C/o. Supt. Radio Branch, 30 Flinders St., Adelaide, 5000.
VK5UU—Z. P. Azary, C/o. Supt. Radio Branch, 30 Flinders St., Adelaide, 5000.
VK5UV—R. J. Cunningham, 59 Teusner Dr., Morphett Vale, 5162.
VK5VZ—C. G. Wilson, 50 Willcox Ave., Prospect, 5082.
VK5ZT—D. J. Brown, 17 Kentish Rd., Elizabeth Downs, 5113.
VK5ZBB/T—B. Boden, 12 Cungena Ave., Park Holme, 5043.
VK5ZPS—P. R. Smith, P.O. Box 49, Moana Beach, 5169.
VK6DQ—W. R. Woodley, 52 Marrawa Way, Manjana, 6107.
VK6EG—G. A. Warner, 82 Broadway, Bassendean, 6054.
VK6SO—J. Sollis, 33/59 Herdsman Pde., Wembley, 6104.
VK6ZCW—O. J. Willoughby, 48 View Tce., East Fremantle, 6158.
VK6ZGK—G. J. McDonald, Station: 36 Hope Cres., Lesmurdie, 6076; Postal: 1 Markham Way, Maidavale, 6057.
VK6ZHI—P. A. Bradshaw, 24 Riga Cres., Willetton, 6155.
VK6ZIW—A. D. Wallace, Station: 30 Sulman Rd., Wembley Downs, 6014; Postal: P.O. Box 23, Scarborough, 6019.
VK6ZJF—J. G. Farnell, Station: 41 Brighton Rd., Scarborough, 6019; Postal: P.O. Box 87, Scarborough, 6019.
VK7ZGS—G. A. Simpson, 217 Best St., Devonport, 7310.
VK8RM—R. W. Maginness, 56 Gregory St., Parap, 5790.
VK9AJ—R. Nimmo, C/o. S.I.L., P.O., Ukarumpa.
VK9EL—E. Seumahu, P.O. Box 793, Lae.
VK9GS—G. Sodencamp, P.O. Box 3155, Port Moresby.
VK9HT—Hitech Radio Club, P.O. Box 793, Lae.
VK9VG—G. W. van Galen, P.O. Box 723, Lae.
VK9XW—G. C. Woodford, Christmas Island, Indian Ocean.
VK0JV—C. S. Perger, Casey Base, Antarctica.

ALTERATIONS

VK3OQ—J. F. Dalstead, 14 Firth St., Doncaster, 3108.
VK3SJ—A. J. Simms, Forest Office, Gellibrand River, 3239.
VK3AKQ—K. J. Echberg, Lot 94, Thurloo Dr., Safety Beach, 3936.
VK3AVU—C. R. Lobb. Addition of initial R.
VK3AWF—W. J. Falconer, 30 Stanley Gr., Canterbury, 3126.
VK3AXR—C. G. Williams, Flat 6, Parton Crt., Glenhuntly, 3163.
VK3BDF—R. N. Field, 1242 Burke Rd., North Balwyn, 3104.
VK3WIA—Wireless Institute of Australia (Federal Executive), 10 Cannes Gr., Beaumaris, 3193.
VK3ZCQ—G. D. Johnson, 56 Holmes Rd., Moonee Ponds, 3039.
VK3ZCR—B. J. Alsop, "Tree Mist," One Tree Hill Rd., Ferny Creek, 3786.
VK3ZKL/T—A. Slamin. Addition of /T.
VK3ZPS—P. J. Armstrong, Church Rd., Yulecart, via Hamilton, 3300.
VK3ZRF—F. W. Banks, 901 Centre Rd., East Bentleigh, 3165.
VK3ZTA—D. J. Laidlaw, 4/24 Northam Ave., Hignton, 3216.
VK3ZWC—T. J. Conboy, 793 Ferntree Gully Rd., Wheelers Hill, 3170.
VK4HV—R. J. Thorn, 3 Madison St., Sunnybank, 4109.
VK4IS—A. L. Stehn, Station: Bli Bli Rd., Nambour, 4650; Postal: M.S. 1505, Nambour, 4650.
VK4KD—K. D. Ayers, 42 Thomas Dr., Chevron Island, Surfers Paradise, 4217.
VK4QQ—C. R. Rutson, 79 Park Rd., Yeronga, 4104.
VK4ZZG—G. D. Dixon, 9 Emily St., Deagon, 4107.
VK5RX—G. W. Luxon, 203 Belair Rd., Torrens Park, 5062.
VK5TA—R. A. Couzens, 20 Catalina Rd., Elizabeth, 5112.
VK5WI—Wireless Institute of Australia (S.A. Division), C/o. C. G. Luke, Loma Linda Gr., Wattle Park, 5066.
VK5WR—W. L. Russell, 33 Devonshire St., Walkerville, 5081.
VK5YA—J. M. Gluyas, 67 William St., South Plympton, 5038.
VK5ZQ—M. R. Burford, 261 Belair Rd., Torrens Park, 5062.
VK5ZKE/T—J. L. Jones, 70 Clayson Rd., Salisbury East, 5109.
VK5ZKP—K. J. Pearce, 25 First Ave., St. Peters, 5069.
VK6ZK—T. M. Stanicic, C/o. M.K.M.O. Camp 7, Roebourne, 6718; Postal: P.O. Box 350, Roebourne, 6718.
VK9MM—M. McBride (Fr.), C/o. Capuchin Mission, Tari, S.H.D.

CANCELLATIONS

VK3FS—A. J. O'Brien. Deceased.
VK3GJ—L. F. Schmidt. Transferred to Qld.
VK3ADB—D. L. Bradford. Now VK3MA.
VK3ALV—L. G. Watson. Not renewed.
VK3ALY/T—L. J. McKay. Not renewed.
VK3BBM—R. C. Marschke. Transferred to Qld.
VK3BEM—G. N. Marks. Transferred to Port Moresby.
VK3YBL—R. K. Peters. Transferred to N.S.W.
VK3YFD—F. M. Wrobel. Now VK3AFM.
VK3ZEM—Footscray Institute of Technology. Now VK3ATE.
VK3ZGA—T. D. Gregory. Transferred to Qld.
VK3ZHL—C. W. Gliddon. Now VK3JK.
VK3ZJW—R. J. Williams. Now VK4ZJV.
VK3ZNQ—K. Moore. Now VK3ASM.
VK3ZQL—J. A. Blanch. Not renewed.
VK3ZWP—B. B. Hocking. Now VK3ADB.
VK3ZZX—G. J. Zimmer. Now VK3GZ.
VK4DT—J. H. Ginsberg. Transferred Interstate.
VK4UL—L. P. Hubsher. Deceased.
VK4US—P. L. Hubsher. Deceased.
VK4ZLK—L. C. Kelso. Now VK4LH.
VK4ZRT—R. C. Atkinson. Now VK4ZA.
VK5AW—D. A. Carthew. Not renewed.
VK5IN—K. V. Hanson. Not renewed.
VK5TZ—J. B. Dennis. Transferred to N.S.W.
VK5XC—E. E. Leist. Not renewed.
VK5ZAT—C. A. Pay. Not renewed.
VK5ZCT—R. J. Cunningham. Now VK5UV.
VK5ZFR—N. F. Francis. Not renewed.
VK5ZGU—J. W. Coates. Not renewed.
VK6EJ—E. J. R. Cowles. Not renewed.
VK6MD—M. D. Scott. Left country.
VK6PA—K. C. Parker. Transferred to T.P.N.G.
VK6RW—R. J. Watson. Not renewed.
VK6WQ—W. M. F. Wattleworth. Not renewed.
VK6ZCZ—I. J. Hosie. Not renewed.
VK8DW—D. W. Stephens. Returned to U.S.A.
VK8SS—S. S. Stephens. Returned to U.S.A.
VK8ZRM—R. W. Maginness. Now VK8RM.
VK9EP—E. A. Parker. Not renewed.

DIVISIONAL NOTES

NEW SOUTH WALES

NOMINATIONS FOR NEW COUNCIL, 1972

Article 6: "Nomination of a candidate for election to the Council must be received by the Secretary in writing not less than 21 days before the Annual General Meeting of the Institute, with an intimation in writing that such candidate is willing to act. Each nomination must be signed by two members proposing the candidate."

(A member means a member of the Institute in Grade A, that is, a Full Member of the Institute.)

Article 67: "The instrument appointing a proxy shall be in writing under the hand of the appointer and shall be deposited at the Registered Office of the Institute at least 24 hours before the time appointed for the Meeting at which the person named in such instrument proposed to vote in respect thereof."

The "Registered Office" of the N.S.W. Division is located at 14 Atchison Street, Crow's Nest, N.S.W., 2065, and NOT Box 1734, G.P.O., Sydney, N.S.W., 2001.

NOMINATION FORM—COUNCIL ELECTION MARCH 1972

We, the undersigned, being Full Members of the W.I.A., N.S.W. Division, do hereby nominate

....

for election as a Councillor of the N.S.W. Division for the year 1972/73.

Signed .... (1) Usual Signature.

Signed .... (2) Usual Signature.

I am willing to act as Councillor of the W.I.A., N.S.W. Division, if elected by members to do so.

(Signature) .... Date ....

This form must be received by the Secretary not later than 3rd March, 1972.

FORM OF PROXY

Date ....

I, ... a member of the Institute, hereby appoint Mr. .... also a member of the Institute to act for me as my proxy and in my name do all things which I myself being present would do at the meeting of the Institute to be held at .... on ....

(Signature) .... Witness ....

ELECTION OF COUNCIL

Your earnest consideration is requested for this important occasion, the election of your official representatives on Council. Past years have shown a lack of interest, and it would be a note of confidence in the future if we had an active and virile election. This of course would provide an active and virile Council. Let 1972 be a year to remember.

VK2 DIVISION

Mar. 3: Closing date, nominations for the Council.
Mar. 24: Friday, Annual General Meeting, 7.45 p.m. at 14 Atchison St., Crows Nest.
Mar. 25: Saturday, Dinner at Artarmon Bowling Club, $5 per double.
Mar. 26: Sunday, Convention/Field Day.

VK2 DIVISION, W.I.A.

ANNUAL DINNER

to be held at

ARTARMON BOWLING CLUB

Burra Road, Artarmon

on

SATURDAY, 25th MARCH, '72

at 7.30 for 8.00 p.m.

Tickets: $5.00 Double

are available from the Admin. Secretary.

Dress: Black tie.

The next monthly general meeting of the VK2 Division will be held on Friday, 25th February, 1972. The lecture is the annual lecture supplied by the V.h.f. and T.v. Group and the lecturer will be Mr. Jamieson Rowe, VK2ZLO, the Editor of Electronics Australia. Mr. Rowe will talk on Antenna Matching and Measurements, a topic which will appeal to all members no matter what their particular operating interests may be.

Country members interested in v.h.f. are reminded that the V.h.f. and T.v. Group has now been publishing for some time a newsletter of mainly technical content each month. The V.h.f. Newsletter may be collected from the Wireless Institute Centre, free of charge, or obtained by post by forwarding a 9 x 4 inch stamped addressed envelope to the Editor, V.h.f. & T.v. Group Newsletter, 14 Atchison Street, Crows Nest, N.S.W., 2065.

Intending Amateurs are advised that a new A.O.C.P. class starts this month at W.I.C. Details of this or the Correspondence Course may be obtained from Course Supervisor, C/o. 14 Atchison Street, Crows Nest, N.S.W., 2065.

South-West Zone.—There is to be a meeting at Lockhart at 2 p.m. on 27th Feb., to discuss the venue and arrangements for this year's S.W. Zone Convention to be held as usual over the holiday week-end in October. Should you have problems finding your way, Ch. B will be monitored. Further details from Phil VK2YS.

SUPPORT OUR ADVERTISERS!

Support yourself also by saying you saw it in "Amateur Radio"

VICTORIA

The major event in February is the John Moyle Memorial Field Day on 12th and 13th February. Many stations will be in the field in this event. Both individual portable stations and those set up by clubs will be competing. Most Zones and clubs intend operating and the Victorian Divisional Council will field VK3AWI portable at Point Nepean.

The field day is an excellent opportunity to work from National Parks and it is to be hoped that many stations do this so as to activate as many National Parks as possible. This is one way of generating some interest as many are looking for contacts for the National Parks Award.

Conventions are once more in the news, with the Eastern Zone planning one in early March and the V.h.f. Group organising an Easter Convention at Wandin East, in the heart of the beautiful berry country behind the Dandenongs.

The Eastern and Mountain District Radio Club will be operating their station VK3ER for the Lilydale Centenary Celebrations from the 12th to 19th Feb. Visitors are welcome and special QSL cards will be issued.

New A.O.C.P. classes commence on 15th Feb. (theory) and 17th Feb. (Morse) and I would like on behalf of Council to wish success to all those attending.

Finally I would like to remind v.h.f. operators that the Ionospheric Prediction Service would like to have details of DX contacts, particularly those made to VK0 and also transequatorially. More details may be obtained from the Ionospheric Prediction Service at 162-166 Goulburn St., Darlinghurst, N.S.W., 2010.

Congratulations to Arthur Lock, VK3AUL, of Wodonga, on being awarded the British Empire Medal in the New Year's Honours List for services to the community.

The Eastern Zone publicity officer, George VK3ASV/T, reports that their Intruder Watch Group have been very active; that Norm VK3ZQC of Yallourn has been given permission to test and operate an experimental 2 mx beacon (144.925 MHz, initially, horizontal halo aerial); that the Latrobe Valley repeater VK3WI/R3 has been moved to Mt. Tassie, and the Zone welcomes many new operators recently successful in the exam.

VK3 S.W.L. GROUP

As from February 1972, the VK3 S.w.l. Group will hold only one meeting per month, on the last **Wednesday** in each month. This replaces the Friday meeting, and will commence on Wednesday, 23rd February, 1972.

Y.R.C.S. VICTORIA

The Council of the Youth Radio Club Scheme in Victoria is now under the Honorary Patronage of Major-General Sir Rohan Delacombe, K.C., M.G., K.C.V.O., K.B.E., C.B., D.S.O., K.St.J., and Lady Delacombe, C.St.J.

The following persons constitute the Victorian Divisional Council of the Scheme: Kenneth J. McLachlan, VK3ZDK, Supervisor; Dorothy E. McLachlan, Secretary; Keith A. Nicholls, VK3ANI, Treasurer; Jim Linton, Media Publicity Officer; Bob J. Callender, VK3AQ, Projects Officer; Chris Van-Lint, Education Officer.

The I.R.E.E. Pennant for the best School Club in Victoria was presented on 13/12/71 at the Assembly Hall of St. John's College, Braybrook, to their Radio Club which comprises eighty members. This is the first time the Pennant has been awarded in Victoria. Many certificates of different levels—mainly in the Honours range—were also distributed to the students.

Many new clubs are being formed for 1972 and anyone requiring further details should write to the State Supervisor, Y.R.C.S., P.O. Box 39, Mooroolbark, Vic., 3138.

RECIPROCAL LICENSING—BELGIUM

"World Radio" of Sept. 9, 1971, reports that since 1964 Belgium has made the unilateral gesture of granting licences to all, irrespective of officially-negotiated reciprocal facilities. Information about visitors' licences is stated to be obtainable from Rene Vanmuysen, ON4VY, Diepestreet 52, 1970, Wezembeek-Oppem, Belgium.

EASTERN ZONE, VIC. DIV., W.I.A.

ANNUAL CONVENTION

on

18th and 19th MARCH, 1972

at MOONDARRA G.E.T.H.

Bring your YL or XYL to win some of the prizes

Bookings and more details from E.Z. Sec., P.O. Box 175, Maffra, Vic., 3860.

CENTRAL COAST AMATEUR RADIO CLUB

will hold their **15th Annual**

FIELD DAY

at

GOSFORD, N.S.W.

on

SUNDAY, 20th FEB., 1972

PROGRAMME

9-9.30—Mobile Scramble, in six sections: H.f., 6 mx net, 6 mx tunable, 2 mx net, 2 mx tunable, u.h.f. Log extract to announcing table before 11 a.m.
8.45-10.30—Registration OM $2, XYL or YL $1, children or full-time students 50c.
9.30-10.00—Morning Tea provided.
10.00—Disposals opens.
10.00-10.45—40 mx Fox Hunt.
10.15-10.30—2 mx Pedestrian Fox Hunt (for people without 40 mx only!).
10.15-10.45—Ladies' Throwing Contest in 2 divisions: Rolling Pins, Radio.
11.15-12.00—2 mx Fox Hunt.
11.15-11.45—Ladies' Hat Making Contest (materials supplied).
12.00-1.30—Lunch provided.
1.30—Quiz closing time.
1.30-1.45—2 mx Pedestrian Fox Hunt.
1.30-4.00—Visit to Reptile Park or bus tour of area.
2.00-2.45—2 mx Fox Hunt.
2.45-3.15—Afternoon Tea provided.
3.10-3.40—6 and 2 mx Net combined Map Talk-in (52.525 and Ch. B).
4.00-4.15—2 mx Pedestrian Fox Hunt.
4.15-4.30—Lucky Dips.
4.30-5.00—Prizes.

Other attractions: Local Jam and Cake Stall, 807s, soft drinks, lucky door prize, quizzes, trade displays, disposals (must be in before 9.45 a.m.), children's events, Amateur Television, weaving display and demonstration.

14th JAMBOREE ON THE AIR

In his report, the national organiser, Hon. Commissioner Noel I. Lynch, 15 Noeline St., Dorrington, Qld., 4060 (SWL L40034), covers JOTA held on Oct. 16/17 last year. The use of Liaison Scouters and Link Camps in conjunction with JOTA are proving popular and worthwhile. Local work by W.I.A. and Amateurs receives praise, especially in N.S.W. and T.P.N.G. On the national level the blessing of JOTA by the Radio Branch receives special mention and appreciation. The use of local time instead of Z was much favoured.

There was a small decrease in the number of participating Amateur stations partially offset by multi-operator stations on a shift basis. Contacts were up and all helpers and hospitalities were acknowledged.

The next JOTA is Oct. 21/22, 1972. Good luck.

SILENT KEYS

It is with deep regret that we record the passing of:—

VK3NJ—K. Meallin.
VK3ARX—C. Serle.
L30150—A. G. McKrell.

6 METRE AMATEUR BAND

A rumour has recently been circulating amongst some v.h.f. operators that it is proposed to impose transmitting restrictions in the six metre Amateur band within a specified radius of Channel 0 t.v. transmitters.

All Amateurs are advised that the Central Office of the Radio Branch of the P.M.G. Department has made no such proposal, does not intend to make such a proposal, and is aware of no such proposal.

There is therefore no basis for the rumour.
—Michael Owen, VK3KI, Fed. Pres., W.I.A.

BOOK REVIEW

ELECTRONIC CONSTRUCTION PRACTICES

A very informative book, not only for the beginner in construction of electronic equipment, but also for the experienced builder.

The easy-to-read chapters, complete with very clear diagrams and photographs, cover the selection, use and mis-use of tools; equipment planning and layout; metal working including partitions, shielding and some novel methods; finishing by etching, painting, lettering; the correct mounting of components; and wiring and testing the completed unit.

The one shortcoming of this book is that it does not include any reference to construction of transistorised equipment.

Author: Robert Lewis, W8MQY; Publisher: Radio Publications Inc.; availability: Divisional Secretaries or Federal Executive Publications.

VHF PROPAGATION

Ionospheric Prediction Service Division,
Commonwealth Bureau of Meteorology,
162-166 Goulburn Street,
Darlinghurst, N.S.W., 2010.

Editor "A.R.," Dear Sir,

The Ionospheric Prediction Service has expanded its interests in v.h.f. propagation and we are now interested in receiving reports from Amateurs and SWLs on transequatorial propagation, Sporadic-E, and tropospheric propagation in the v.h.f.-u.h.f. spectrum.

To assist interested individuals we have standard report forms and a letter of explanation which can be supplied on application to me at the above address.

Log extracts from the past as well as future observations are welcome.

We value the efforts that Amateurs have made in the past to assist research into propagation and would appreciate any assistance in our current research.

A great deal of enthusiasm has been displayed by N.S.W. and some Interstate Amateurs with our current propagation research and we are anxious to foster this on a national scale. I would be grateful if you could give publicity on our project in "Amateur Radio" magazine at your earliest opportunity.

Next March, I.P.S. should have a short-term warning service operational for transequatorial propagation events. I hope to be able to give more details shortly.

—Roger Harrison, VK2ZTB, ex-VK3ZRY
Senior Technical Officer
Low Latitude Section.

[Those interested in this field are requested to write direct to Mr. Roger Harrison.—Ed.]

HAMADS

Four lines FREE for members only.
See Jan. 1972 "A.R." page 23 for complete details.

FOR SALE

Frankston, Vic.: HRO-60. The finest communications receiver of the HRO series. S.s.b./a.m./c.w., gen. cov. 1.7 to 30 MHz., plus bandspread all Ham bands including 10-in. loudspeaker and built-in 110/230v. a.c. p.s. Perfect condition. Cost $1250, gift $495. VK3TD. Phone 783-9611 or 787-1407 (a.h.).

Cowell, S.A.: All-band 8236 linear, genuine 400w. output without flat-topping. Professional appearance with p.s.u., passive grid needs little drive. $100. VK5BI QTHR: Cowell Phone 62.

Townsville, Qld.: Vidicon Camera, fully transistorised with F1.9 25 cm. Dalmyer J.V. Lens, new E.M.I. 1-inch Vidicon, printed circuitry and full circuit diagrams. $175. W. Sebbens, P.O. Box 1105, Townsville, Qld.

Perth, W.A.: Two Heath Bandpass Filters, 8.4 to 8.9 MHz., $10 pr. VK6TU, QTHR.

Turramurra, N.S.W.: "Frontier" Digital 500 Transceiver. Fully solid state except driver and final. 500w. p.e.p., Nixie readout to 1 kHz., vox, p.t.t., 32 integrated circuits, 20 transistors, covers all bands 500 kHz. plus 28-30 plus 2 spare channels. Commercial p.s.u. with in-built speaker, brand new (original cost $715 plus $92 for p.s.u.). My price $650, will swap for FT101. VK2TO, T. T. Tatham, 38A Holmes St., Turramurra, N.S.W., 2074. Phone 02-449-3274.

Bulleen, Vic.: Galvanised steel lattice tower, telescopic crank-up to 42 feet, in good condition, ready to transport. Phone VK3VG, 850-1894.

Canberra, A.C.T.: Hallicrafters SR150 Transceiver, 80-10 metres, 150w. p.e.p. s.s.b., crystal calibrator, mains p.s.u., handbook, elect. A1, external fair, $350. VK1VB, Vic. Burman, 140 Badimara St., Waramanga, A.C.T., Phone Canberra 88-2103.

Frankston, Vic.: HRO Senior Communications Receiver, c/w coils or 1.7 to 30 MHz., loudspeaker and components or p.s., $120. Baluns 10 to 80 mx, Heath type B-1, new, $10 each. VK3TD, Phone 783-9611 or 787-1407 (a.h.).

Townsville, Qld.: Variac, brand new, variable Transformer, 2 amp. 240 volt input, 0-280 volt output. Model W5MT. Bargain at $40. Write L. Dancey, VK4LY, QTHR.

Cowell, S.A.: Filter s.s.b. tx 4-band, works well. $50. Heavy duty p.s.u. to match $30. AR7 convert-for modern tubes and prod. det. with h.d. p.s.u. and 15-20 mx converter $50. VK5BI QTHR (Ph. 62).

Kempsey, N.S.W.: "Centralab" 20A 160-10 mx s.s.b. Exciter, $60. "Acitron" Mobile P.S., $80. Type "S" P.S., $25. "Command" 6-9 MHz. Rcvr., $10. VK2AHH, Box 137, Kempsey, N.S.W., 2440.

Frankston, Vic.: Power Supply, h.d. com. unit, 12v. d.c. input, 800v. 250 mA., 300v. and —125v. output, $75. Power Supply, Heath Model HP-10, 12v. d.c. input, 600v. 200 mA., 300v. and —125v. output, new, $55. VK3TD, Phone 783-9611 or 787-1407 (a.h.).

Mt. Waverley, Vic.: HRO Comm. Rx, original condition, all coils, p.s.u., match. speaker, handbook, $60. SCR522, unmodified, complete original condition, $25. Heavy duty a.c. p.s.u. or same, $15. VK3ZXX, QTHR (Ph. 03-277-9172).

WANTED

Boisdale, Vic.: Three-band Transceiver, Galaxy III, Swan, etc. Price and details to VK3BAO, QTHR (Phone 454364). Cash sale.

Miranda, N.S.W.: Converter, 27 or 28 MHz., output 7 to 9 MHz. VK2TN, I. Bailue, P.O. Box 169, Miranda, N.S.W., 2228. Phone (02) 520-8165.

Sandringham, Vic.: Disposal Crystal(s) for 1825 MHz. and any other freq. on 160 mx. Write with price and freq. VK3SL QTHR.

SUPPORT OUR ADVERTISERS!

Support yourself also by saying you saw it in "Amateur Radio"

THE WIRELESS INSTITUTE OF AUSTRALIA

Insert - February A.R.

STATE OF VICTORIA POWER RESTRICTIONS

February A.R. is late every year because of holidays and, consequently, printery shut down. It is not much later this year than any other.

The outlook for March A.R. at this moment appears gloomy because the printing house for A.R. has been closed — due to power loadings. There is no immediate evidence of the general power restrictions being lifted. At best, therefore, March A.R. - the first to be published by the Federal organisation - may be late.

The situation is under constant review and numerous alternatives are in mind - most are impractical, some are feasible. Any economically-sound ideas which any member might care to make would be most welcome and would be closely examined having regard to changing circumstances as each day passes.

Every endeavour will, of course, be made to get March A.R. printed and distributed by the First of the month. Failing this, any delay will be minimised.

73

Peter B. Dodd.

P. B. Dodd
Federal Manager

Office of the Executive,
P.O. Box 67,
East Melbourne, Vic. 3002

9.2.1972

S T O P P R E S S: Items (in expanded form) for March included -

Oscar A-O-B has now been re-scheduled by AMSAT for 1973. A-O-C will be launched about June and will contain only the 2-metre / 10-metre U.S.A. transponder of the three systems originally planned for A-O-B.

Major "Bill" Mitchell, VK3UM, died of a heart attack on 2nd February. There were several other "silent keys" for March A.R.

Federal Convention is at Easter - MARCH 31ST - APRIL 3RD

amateur radio

MARCH, 1972

☆ Slow-Scan TV

☆ Mobile Antennas

☆ Ordering Crystals

☆ Drake 2B Rx

☆ Old Rx and SSB

☆ Australis

☆ Band Planning

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA

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Price 30 Cents

amateur radio

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA. FOUNDED 1910

MARCH, 1972
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P.O. Box 67, East Melbourne, Vic., 3002.

Copy is required by the third of each month.

The Editor reserves the right to edit all material, including Letters to the Editor and Hamads, and reserves the right to refuse acceptance of any material, without specifying any reason.

Advertising:
Advertisement material should be sent direct to the Manager by the first of each month.

Hamads should be addressed to the Manager by the third of each month.

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Phone 42-2419.

★

ACKNOWLEDGMENTS: No acknowledgments are sent out unless specially requested. Better still, for important items, send them by certified mail.

★

NON-RECEIPT OF "A.R.": Members of W.I.A. please inform your Divisional Secretary—others, please address the Manager. Unavoidable communications and processing delays can be alleviated only if adequate notice is given of address changes. Do not forget to inform the P.M.G. of address changes.

CONTENTS

COVER STORY

Close up of VK3ABM's call on SSTV from Melbourne. Photograph taken from his monitor. Note the good use of the Kangaroo.

QSP

UNDER NEW MANAGEMENT

This issue of "Amateur Radio" is the first published by the Federal body. For the first time the magazine becomes the direct responsibility of not just one Division but the responsibility of all Divisions. The ultimate decision as to its content, cost, and format will be made by the Federal Council. Any profit becomes the profit of all the Divisions, but on the other hand, if the production of the magazine results in a loss, this loss is borne by the Divisions in the sense that they together constitute the Wireless Institute of Australia. This is as it should be.

I am pleased to tell you that Bill Roper, VK3ARZ, is now able to again assist the Institute; he has become the Editor, and as such is a member of the Executive and Chairman of the Publications Committee. His task is to co-ordinate the activities of the many people who contribute to the production of the magazine. He is supported by an experienced and enthusiastic committee as well as by Peter Dodd who is the Manager of the magazine and as such will devote a very substantial part of his time to publications.

We should be careful not to underrate the importance of "Amateur Radio". A good magazine is one of the tangible benefits of membership of the Institute. A poor magazine will hardly attract new members. Equally, "Amateur Radio" is the medium by which the Institute can inform all of its members, Australia wide, of what it is doing and why. Remember, also, that many people who are not members, read our publication, both in Australia and overseas. Some may become members; some may learn a little of Amateur Radio, some may learn more of the Institute.

Over recent months I am aware of a number of criticisms levelled against the magazine. A number of factors have contributed to justify some of that criticism. The resignation of Ken Pincott as Editor and the fact that this occurred some months prior to the transfer of the magazine to the Federal body is one factor. That "in between" period has now passed. Another factor restricting the expansion of the magazine has been the problem of ever rising costs, including postage costs. A third, and equally serious factor, has been the "fall off" of advertising and therefore revenue. Therefore the newly re-constituted committee faces a period of intense effort in trying to overcome these problems as well as incorporating publications as part of a new administrative system, and, at the same time, trying to improve the magazine. You will note in this issue, for example, the first of a number of changes. I hope you think they are for the better. Please don't hesitate to write to the Editor if you have any suggestions.

You may ask "Is there anything I can do apart from the submission of material for publication?" There is. I have referred to the loss of advertising revenue. We need more advertising. We must re-assure those that already advertise that they are getting value for money. By letting advertisers know that you buy their products as a result of their advertising in "Amateur Radio," and perhaps if you are in a position to do so, by encouraging new advertisers to come to the magazine you will be helping the Institute in a vital way, and at the same time be contributing to one of the Institute's services that is received by all members.

MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

END OF AN ERA

As the President has said, this issue marks the end of one era and the start of the next. For almost 40 years "A.R." has been produced and published, on behalf of the Institute as a whole, by the Victorian Division. The work now has been passed to the Executive of the Institute following upon the Incorporation of "The Wireless Institute of Australia" and agreements between the Federal Council, the Executive and the VK3 Division.

PROJECT AUSTRALIS

A fully-tested single-channel satellite translator unit to assist with experimental work in Divisions was received and has been allocated initially to the VK5 Division until Easter. It is then intended to transfer it to the VK4 Division. The frequencies are 145.8 MHz. in, 435.1 MHz. out, input 12-15v. at 400 mA.; output 1w. or better into 52-75 ohm co-ax.

THE EXECUTIVE

At the first formal meeting of the Executive in terms of the new Company on 26th January those elected until the next Convention were Michael J. Owen, VK3KI, President and Chairman; David Rankin, VK3QV, as Vice-Chairman; W. E. J. (Bill) Roper, VK3ARZ, as Editor; Drs. David Wardlaw, VK3ADW, and James Goding, VK3DM, and W. A. (Bill) Faul, VK3AGZ. Peter B. Dodd, VK3CIF, was appointed Secretary. The official name of the new Company is "The Wireless Institute of Australia", the word "limited" being dropped by special licence. The new Company is a public company limited by guarantee and the Registered Office is 478 Victoria Parade, East Melbourne. During a transitional period the old unincorporated body with its "Federal Executive" and the new Company will operate in parallel.

TRANSLATORS/REPEATERS

An editorial by Bob Clark, WB4SMH, in Amsat Newsletter of December 1971 indicates disagreement even amongst experts on the definitions of "translators" and "repeaters" (not to mention "transponders"). "Transponder" he accepts as the most all-inclusive term, "repeater" means just that even if there is a frequency difference, and a "translator" changes the r.f. of the signal before re-transmission. After the Wodonga Agreement in 1968 "service" and "experimental" translators were adopted here, but nowadays nearly everybody uses "the repeater". However, as Bob says, a translator does not transcribe Japanese into English—for which you would still need an interpreter presumably.

STATISTICS

The P.M.G. lists at 30th September, 1971, reflect 6,447 licensed Amateur Stations in VK of which some 2,000 were A.O.L.C.P. This is an increase of about 1,700 in three years.

TECHNICAL ARTICLES

These are always welcome. Unfortunately, there have been long delays in getting them into print caused by draughting problems and hospitalisation. We have on hand a number of very good technical articles under process and planning for future "A.R's". These include articles by VKs 2ZTB, 5YS, 5ZIP, 3UG, 3BAF, 5BI, 2ON, 3ZKC, 4ZFD, 3QV, IPSD "TEP", 3AXU, 8KK, Clift and Tobin Rx Pt. 5, 5MF, 2ZQJ and 2BSG. Keep your fingers crossed for us that the ever increasing paper costs and printing charges can be overcome and, therefore, that these articles will appear in the journal as they should appear.

10 GHz.

A Conference organised by the I.E.E. in London for April 1973 will deal with propagation in the spectrum above 10 GHz. as there is such enormous congestion in the microwave band below 10 GHz. in the commercial segments. The Amateur bands at 10, 5.65, 3.3, 2.3 and 1.215 GHz., although shared, might appear somewhat unpopulated by comparison.

FEDERAL CONVENTION

The venue of the 1972 Convention at Easter (early this year) will be the Zebra Motel in Parkville, Melbourne. W.I.A. members are always welcome to come and listen to the proceedings. Assistance will also be needed in various fields such as recording, photography and general help.

A NEW POSTAGE STAMP

A new postage stamp is scheduled to be issued in Australia next year to commemorate the 50th Anniversary of the first regular radio broadcast in VK (W.A. Bulletin).

INCREASING LIFE OF TX VALVES

A brief article by VK3AXU on this interesting subject is contained in the November 1971 issue of "The Asian Broadcasting Union Technical Review". If interested, try an enquiry at your nearest b.c. or t.v. station, engineering branch.

SIZE OF "A.R."

The size of the journal has been under much discussion in addition to every other aspect. No change in the 11 x 8½ inch size was considered possible before next January.

SLOW-SCAN TELEVISION — THE AUSTRALIAN WAY

PART TWO

J. A. WILSON, VK3LM/T, and A. H. McKIBBIN,† VK3YEO*

Since our last article published in January 1972 "Amateur Radio", the authors have received a flood of mail and S.T.D. telephone calls from all over Australia and New Zealand requesting more information on S.S.T.V. in Australia. Are you still interested? Then read on.

AN S.S.T.V. MONITOR (SOLID STATE)

During the last month, a large number of requests have been received for an s.s.t.v. monitor, the demand for solid state or valve type being about equal.

Because our experimental units have not yet been fully evaluated, we propose to present the simple solid state monitor of Robert F. Ischannen, W9LVO, published in "QST" of March 1971—the valve boys will have to be patient for a little longer!

This monitor is simple and consists of several limiters, a discriminator, sync. and video detectors, video amplifiers and display c.r.t. (refer to the block diagram in Part 1, "Amateur Radio," January 1972). The sync. separator is followed by one-shot (monostable) multivibrator, discharge circuits and deflection circuits. A power supply supplies several different operating voltages and can use a high voltage generating system using circuits as used in t.v. receivers here in Australia, utilising standard t.v. components.

* 14 Merrilong Street, Ringwood East, Vic., 3135.
† 27 Beverley Street, East Doncaster, Vic., 3109.

CIRCUIT OPERATION

Transistors Q1 and Q2 (Fig. 1) provide limiting of any amplitude variations which may be present on the signal. The emitter follower Q3 drives a simple discriminator that consists of only a parallel-resonant circuit. An f.m. sub-carrier input to this circuit results in a sub-carrier output which is amplitude modulated. The signal splits at the output of the discriminator and is detected by two separate full-wave detector systems. (Note that full-wave detection doubles the sub-carrier frequency, permitting more effective filtering of the video and sync. signals from the sub-carrier.)

The video detector output passes through a low-pass filter and the video amplifier before reaching the c.r.t. (It should be noted that d.c. coupling is used from the video detector to the c.r.t. and also that direct coupling is used all the way from the limiter through the sync. amplifier and through all the deflection circuits.)

The sync. system is designed to provide good performance in the presence of noise and other undesired signals. The 1200 Hz. bursts which appear across the 1200 Hz. tuned circuit in the collector of Q6 drive the full-wave sync. detector and the sync. clipper. Only peaks of the detected signal forward bias Q8 so that sync. pulses and unfiltered sub-carrier appear at the collector of Q8.

Separate horizontal and vertical integrators provide clear sync. pulses to the two integrated circuit monostable multivibrators. These multivibrators provide the discharge pulses from which the saw-tooth sweeps are derived.

(Continued on Page 5)

DIVISIONAL DIRECTORY

NEW SOUTH WALES

Rooms: 14 Atchison St. Crow's Nest, N.S.W., 2065. Mon.-Fri. 10-12, 13-15 hrs. (15-21 hrs. on 4th Fri.). (Box 1734, G.P.O., Sydney, N.S.W., 2001.)
Admin. Sec.: Mrs. Judy Deans, ph. (02) 43-5795 (rooms).
Gen Mtgs.: 4th Fri. (Dec.—3rd Fri.).
Council Mtgs.: Fri. before and Thurs. after Gen. Mtgs.
V.h.f. Grp.: 1st Fri. (Ch. VK2ZGW/T, Sec. VK2II).
Correspondence Courses: VK2IR.
Y.R.C.S. Supervisor: VK2BSJ.
W.I.C.E.N.: VK2GN.
Disposals: VK2ZIM.
QSL Bureau: Inwards—Hunter Branch, Box 134, Charlestown, N.S.W., 2290; Outwards—leave at rooms or to VK2ZTL (Box No.).
VK2AWI: Sun. 1100 hrs. 3595 kHz. a.m., 7146 s.s.b., 52.525 MHz. f.m., 53.866 MHz. a.m., 145.13 a.m., 145.9 f.m. (Ch. 4). Commun. Off. VK2AXJ, ph. (02) 793-9021. Hunter Branch, Mon. 1900 hrs. 80 mx.
Morse Code: VK2BWI nightly 1930 hrs. 3550 kHz.; Wollongong Tues. 53.982 MHz. a.m. For Morse Tapes contact VK2BMK.

VICTORIA

Rooms: 478 Victoria Pde., East Melbourne, Vic., 3002. Mon.-Fri. 10-15 hrs. (Box 36, East Melbourne, Vic., 3002).
Admin.: Federal Manager and Mrs. Enid Bellairs. Ph. (03) 41-3535.
Gen. Mtgs.: 1st Wed.
Council Mtgs.: 4th Mon.
V.h.f. Grp.: 3rd Wed. (Ch. VK3AUI, Sec. VK-3ZYK, Publicity VK3AOT/T).
S.w.l. Mtg.: Last Wed.
Theory Classes: Mon., Tues., Fri. (VK3ATP, VK3BCL, VK3ATT).
Corresp. Course: VK3ZZP and VK3AOH.
Y.R.C.S. Vic. Supervisor: VK3ZDK.
W.I.C.E.N.: VK3OR.
Components: VK3AS (Box 65, Mt. Waverley, Vic., 3149).
QSL Bureau: Inwards—to rooms, or Mr. E. Trebilcock, 340 Gillies St., Thornbury, Vic., 3071; Outwards—rooms or VK3XM.

Victoria (continued)

VK3WI: Sun. 1030 hrs. 1825 kHz. a.m., 3600 kHz. s.s.b., 7146 a.m., 53.032 MHz. a.m., 144.5 a.m., 146.0 (Ch. 1).
Morse Code: Lessons at rooms Thurs. by VK3JL.

QUEENSLAND

Address: G.P.O. Box 638, Brisbane, Qld., 4001. Mtgs. at Qld. Motor Sporting Car Club, 23 Boyd St., Bowen Hills.
Gen. Mtgs.: 2nd Thurs.
Council Mtg.: 1st Thurs.
V.h.f. Grp.: 3rd Fri. (VK4ZHA).
Y.R.C.S. Supervisor: VK4EV.
Classes: Wed. 1930 hrs.; Library VK4RL; Business Manager VK4OF.
QSL Bureau: Inwards VK4UA; Outwards VK-4RF (Stickers $0.65 per 100).
VK4WI: Sun. 0900 hrs. 3580 kHz. a.m., 7146 a.m., 14342 s.s.b., re-broadcast by VK4IE on 52.4 MHz. a.m. and 146.0 MHz. (Ch. 1) f.m., B/C off. VK4HB.
Morse Code: Tues.-Fri. 1930 hrs. 3580 kHz.

SOUTH AUSTRALIA

Address: G.P.O. Box 1234K, Adelaide, S.A., 5001. Mtgs. at Master Builders' Assn., 47 South Terrace.
Gen. Mtgs.: 4th Tues (exc. Dec.).
Council Mtg.: 3rd Fri.
V.h.f. Grp.: 1st Thurs., and Theory classes 3rd Thurs., at Goodwood Boys' Tech. High School (classroom on North side), Lily St., Goodwood.
Y.R.C.S. Supervisor: VK5FD.
QSL Bureau: VK5RX.
VK5WI: Sun. 0930 hrs. 1815 kHz. a.m., rebroadcast by VK5ZQ on 7125 kHz. a.m., by VK5KF on 14170 kHz. s.s.b., by VK5XV on 52.150 MHz. a.m., by VK5ZDX on 144.100 MHz. a.m., by VK5AWI and in Mt. Gambler 2 mx by VK5DK, in Darwin 2 mx by VK8CM. B/C Off. VK5XY.
Morse Code: VK5LG Mon. 1900 hrs. 3545 kHz.

WESTERN AUSTRALIA

Address: G.P.O. Box N1002, Perth, W.A., 6001. Mtgs. at Science House, 10 Hooper St., West Perth.

Western Australia (continued)

Gen. Mtgs.: 3rd Tues. (exc. Jan.).
Council Mtgs.: Last Fri.
V.h.f. Grp.: 4th Mon. in D.C.A. Workshops Canteen, 86 Guildford Rd., Maylands (Sec. VK6ZAF).
Y.R.C.S. Supervisor: VK6LO.
W.I.C.E.N. Off.: VK6DD.
QSL Bureau: VK6RU. Equipment Off. VK6DD. News ph. (092) 45-4793.
VK6WI: Sun. 0930 hrs. 3600 kHz. s.s.b., 7080 kHz. s.s.b., 52.656 MHz. f.m., also Sun. 1730 hrs. 14100 kHz. s.s.b. B/C Off. VK6HP.

TASMANIA

Address: G.P.O. Box 851J, Hobart, Tas., 7001. Mtgs. at the Club rooms, Room 6, 147 Liverpool St., Hobart.
Gen. Mtgs.: 1st Wed. (exc. Dec.).
Council Mtgs.: 2nd Mon.
V.h.f. Grp.: 3rd Wed.
Y.R.C.S. Supervisor: VK7KK/T.
Equipment Off. VK7ZMK.
QSL Cards: G.P.O. Box 371B, Hobart, Tas., 7001.
VK7WI: Sun. 0930 hrs., 3672 kHz. s.s.b., 7130 a.m., 53.032 MHz. a.m., 144.10 a.m.

OTHER AREAS

QSL Bureau: See 1971 Australian Call Book, page 55.

FEDERAL DIRECTORY

Rooms: 478 Victoria Pde., East Melbourne, Vic., 3002. (Mon.-Fri. 10-17 hrs.). Ph. (03) 41-3535. P.O. Box 67, East Melbourne, Vic., 3002.
Manager and Sec.: Peter B. Dodd, VK3CIF.

NOTES

Times given are local. Mtgs. begin 2000 hrs. unless otherwise stated. It is hoped to publish this Directory each half year and updating information is requested. Part 2 will appear later after Annual General Meetings have appointed office-bearers—for 1971-72 details, please see Sept. "A.R." p. 15. W.I.A. Clubs/Zones are requested to advise similar reference details for inclusion in a future issue.

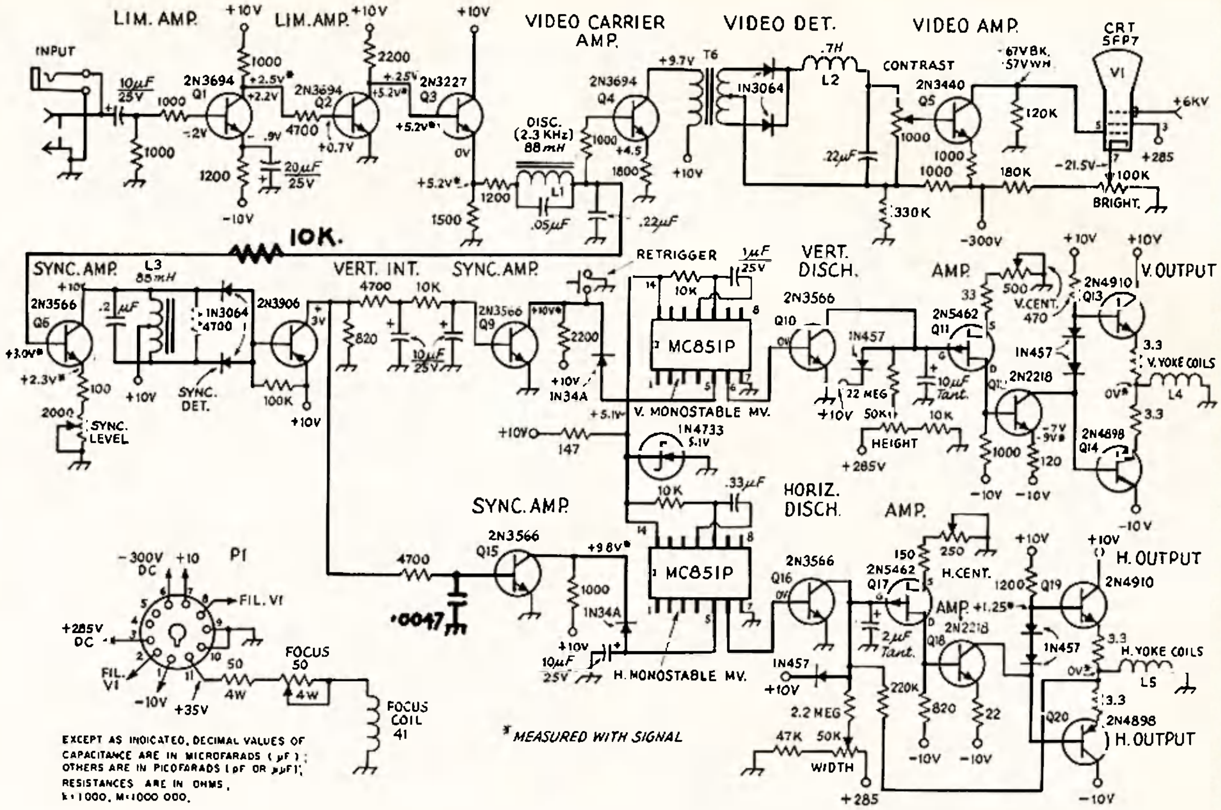
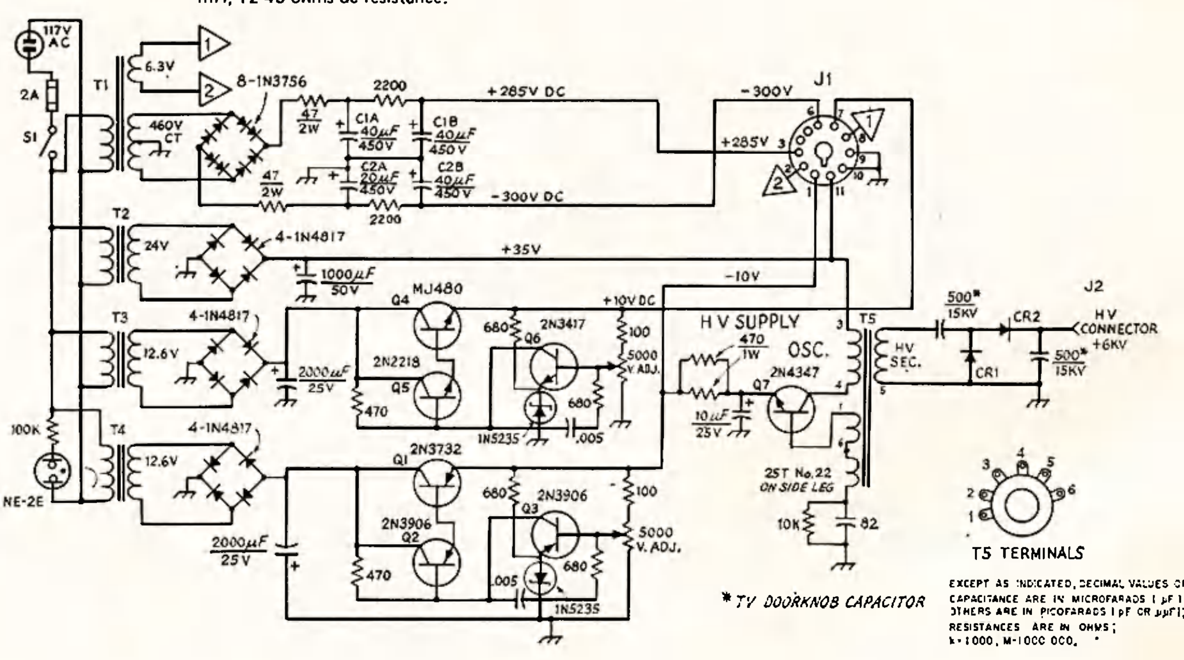


Fig. 1 — Circuit Diagram for the slow-scan monitor. Fixed-value resistors are composition. Fixed-value capacitors are disk ceramic, 600 volts, unless otherwise indicated. Polarized capacitors are electrolytic.

Fig. 1B — Circuit diagram of the power supply.

CR1, CR2 — 6-kV PRV rectifiers (Varo VB-60).
L1, L3 — 88-mH toroid.
L2 — .7H filter (Stancor A-3876, primary).
L4, L5 — Deflection yoke for 50-degree CRT. Typical values are: Vertical coils, 30-65 mH, 30-60 ohms dc resistance. Horizontal coils, 8-30 mH, 12-45 ohms dc resistance.

T1 — Power transformer (PC 8418 Stancor).
T2 — 25.2 V, 1 A (Knight 54D1421).
T3, T4 — 12.6 V, 1.5 A (Knight 54D1420 or Triad F25X).
T5 — Flyback transformer (RCA 116122).
T6 — Interstage, 500 ohms (Knight 54D4174).



The sync. level control in the emitter of Q6 permits the operator to adjust the clipping level to enable him to cope with some types of unusual interference. In general the control can be left set or may be altered to receive and lock pictures being received from either 50-Hz. or 60-Hz. systems.

Early in the study of on-the-air performance of the monitor, it was found that good noise immunity could be obtained only if direct coupling was retained throughout the sync. and deflection systems. For example, if different charging paths are present in the sweep generation system, there will be a tendency for the trace to take several sweeps to stabilise after a burst of noise or interference. This condition is intolerable, particularly in the vertical deflection circuits where several sweeps would require a total time of 16 or more seconds.

The principles of operation of the vertical and horizontal sweeps are the same. The output of the monostable multivibrator provides a positive pulse. The tantalum timing capacitors charge until a positive pulse drives the discharge transistors Q10 and Q16 into high conduction. This immediately discharges the capacitor and the process begins again. A saw-tooth wave is of course the result.

The "N" channel junction FET transistors Q11 and Q17 present high impedances at their inputs and do not discharge the saw-tooth forming capacitors via their input circuits. By setting the operating point of the FET, centering of the trace is achieved. This system is simple and does not degrade the sweep linearity when used within the normal range of centering.

Complementary symmetry transistors in the output system provide a convenient means of maintaining d.c. balance through the deflection coils. The two diodes permit both output stages to remain in conduction during the **"overlap"** region near the centre of the sweep. In other words, an offset bias between the two transistors is provided so that neither of the two transistors will cease conduction before the other takes over.

DEFLECTION YOKES AND FOCUS

5FP7 and similar type tubes have a magnetic deflection angle of 50°, therefore we can use a 70° yoke obtained from early model t.v. receivers. The types found most suitable were located on early model Classic and Bush Simpson t.v's. These units have an **iron** core and **require small amounts** of current to deflect the trace to enable correct picture scanning. Other type yokes that have ceramic cores are only suitable in solid state circuits when high current output transistors are used.

Suitable yokes and magnetic focus magnets can be found in early type t.v's fitted around the following picture tubes:—

Tube Type	Deflection	Focus
14BAP4	Mag.	E/S.
14CP4	"	Mag.
17BP4B	"	"
17BP4D	"	E/S.
17DWP4	"	"
172K	"	Mag.
173K	"	"
CRM171A	"	"
CRM172A	"	"
MW43-64	"	"
MW4-369	"	"
21BCP4	"	E/S.
21YP4	"	"
21ZP4	"	Mag.
21ZP4B	"	"
21ZP4C	"	"
CRM211	"	"
CRM211A	"	"

C.R.T. TUBES

Since the publication of Part One of this article, 3FP7 tubes previously available in Melbourne have been purchased by prospective s.s.t.v. constructors. However, it is understood that 5FP7 tubes are still available in Sydney, **but** beware of the high prices that are being asked for them in some areas.

RE-GUNNING OF OLD GLASSWARE

As mentioned earlier, negotiations with a picture tube re-gunning company to produce tubes suitable for s.s.t.v. are continuing. At present they are setting up a line to re-phosphor and re-gun any type glassware, whether c.r.o. type tubes or picture tubes. You provide the glass and the tube will be re-built using a standard t.v. gun assembly, and re-phosphored.

A sample tube from this company has been received and is at present being evaluated. The major advantage is that the phosphor is not sensitive to external light being placed on the surface of the tube, therefore the pictures can be displayed under normal room lighting conditions. As it may be realised, the disposal type tube has a P7 phosphor that can be activated by room light as well as by the electron beam, therefore pictures have to be viewed under low-level room lighting conditions. With this new type of phosphor assembly, we may have a **first** as far as s.s.t.v. is concerned—i.e. **s.s.t.v. viewed in a fully lighted room.**

Using a normal t.v. gun assembly means that boost voltage will have to be supplied for the electrostatic focus. Normal 6.3 volt heaters are used and even though the e.h.t. voltage will be high (10-13 kv.) it allows the tube to give excellent brightness characteristics. Further information and a report on the above type tubes will be given on request.

POWER SUPPLIES

Low Tension Supply

The general power supply (see Figs. 4 and 5) may take any form to suit the individual and also the components on hand.

The first requirement is a +10, —10 volt supply, regulated to handle a maximum of 1.5 to 2 amps. As an alternative to the original, there is a practical circuit using fewer components than the original article suggested. This circuit is a reprint from "Radio Communications", Feb. 1971. Some monitors require +10 volts only—a saving in power supply requirements.

High Tension Supply

The required plus and minus 300 volts (Fig. 6) can be obtained using a t.v. power transformer with a bridge rectifier and pi-type filters. The value of "R" and "R" bleed can be installed to suit the type of transformer selected.

E.H.T. Supply

Probably the easiest way to generate e.h.t. (Fig. 7) is to use an old t.v. line output transformer with a 15 kHz. multivibrator oscillator as the generator. The e.h.t. requirement will be governed by the type of c.r.o. tube used for the display. The multivibrator speed of the oscillator is not critical and therefore does not have to be

ALTERNATE METHOD of VERTICAL & OR HORIZONTAL SCANNING ADJUSTMENT.

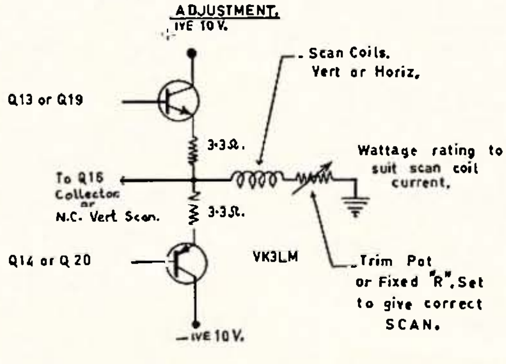


FIG- 1a.

POSITIVE L.T. REGULATED SUPPLY.

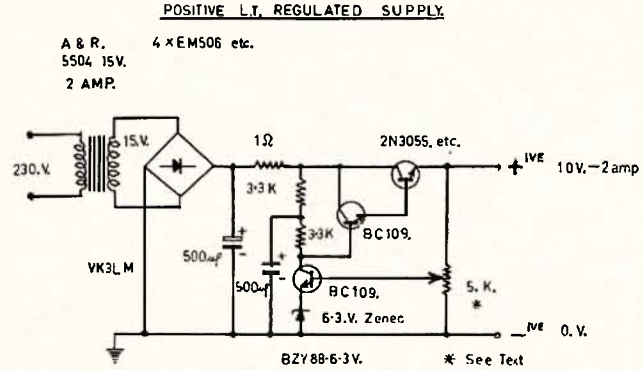


FIG- 4.

exactly 15.625 kHz. as in television where line sync. is required.

Any speed plus or minus a few kilohertz will generate sufficient drive to excite the driver tube. The oscillator coil used was an old Astor type, but any television type will suffice. A little load may have to be applied to the line output transformer and this has been achieved by using a width coil across that part of the l.o.t. winding normally used for yoke connections.

Final filtering of the e.h.t. supply is achieved by using a 1000 pF. 25 kv. door knob capacitor. Any ripple in the supply will be evident on the raster and is intolerable with this small size picture. **Door knob** capacitors are available from Radio Parts, Spencer Street, Melbourne. The output voltage (final e.h.t.) may be increased or decreased by varying the conduction rate of the driver tube. This is achieved by varying the size of the screen resistor to the 6CM5.

The drive from the multivibrator oscillator to the grid of the 6CM5 should be about 40 to 45 volts negative. The actual e.h.t. required will depend on the type of picture tube or c.r.o. tube used.

Although a valve type e.h.t. supply is shown, a solid state type can be developed along similar lines. Ideas can be obtained by using parts of the line output stage circuitry of any **solid state** type t.v. using the values given in the diagram of the receiver circuit selected.

The only reason a solid state unit (e.h.t. power supply) was not published was because insufficient time was available prior to publication of this article to build and evaluate same.

SPECIAL COMPONENTS

L1 and L3 are shown as 88 mH. toroids as these are plentiful in the States. A.W.A. width coils type 40047 were successfully used, each one tuned with a fixed value C. For the 2.3 kHz. trap C was 0.1 μF. and for the sync. detector trap C was 0.2 μF. Merely feed an audio oscillator into these traps at the required frequency and tune the coils to give maximum output as viewed on an oscilloscope at either (a) 2.3 kHz., or (b) for the sync. trap at 1200 Hz. Note that any similar coil and C suitably adjusted as above will do the job.

L2 is suggested as a 0.7 henry choke. The secondary (15-ohm winding) of a small speaker transformer was used and this gave excellent filtering.

T6—here a transformer originally used as a driver for push-pull audio stages in cheap transistor portables was used.

As stated earlier, component values are not critical, hence the wide latitude with some components.

All the transistors and ICs stated on the circuit diagrams are available from supply houses in Australia, with the exception of the "N" channel FET type 2N5462. A Fairchild type 2N3460 was used, but almost any "N" type should suffice.

An alternate monostable multivibrator to the Motorola MC851P is Texas Instrument type SN15851N.

FINAL ADJUSTMENTS

The design is such that if the components for the tuned circuits are selected with reasonably close tolerances and tuned up as stated earlier, very few adjustments should be required.

Note.—This type of monitor requires an s.s.t.v. signal to be fed into the input circuit before the scanning raster will be seen on the screen, then a tape of a good picture with correct sync. level signals present should be fed into the monitor.

The vertical and horizontal centering controls, together with the height and width controls, are adjusted for an aspect ratio of 1:1. If over-scanning results, potentiometers or resistors are added in series with the deflection yoke vertical and horizontal scan coils. These will trim the picture to give full use of the c.r. tube's surface area.

While the signal is being fed into the monitor, the sync. level control is adjusted so that the horizontal scan develops and also that clear horizontal and vertical sync. pulses are obtained at the outputs of Q9 and Q15. These pulses should be free of sub-carrier.

The pulse at Q9 will of course appear only every eight seconds. Clean positive-going pulses should also appear at terminal 6 of each of the integrated circuits.

This slow-scan monitor should provide a stable and cool-operating, reliable monitor. Any Amateur requiring further information related to this monitor can contact VK3LM at the address given.

LIST OF ALTERNATE COMPONENTS

Coils

1. L1, L3, A—Any t.v. line oscillator coil, e.g. A.W.A. 40047, etc.
2. L2—Any winding, speaker transformer secondaries, etc.
3. "B"—Parasitic chokes, t.v. types.

Transformers

1. T6—A & R TD3 driver transformer or any driver transformer of approximate ratio.
2. T1—T.v. line output transformer, any type, any deflection, e.g. Astor, Philips, A.W.A., either 70, 90 or 110° deflection. Type used, Telecomponents TV4722 as this was the one on hand.

Semiconductors

1. Q11, Q17.—Fairchild 2N3460 or any "N" type FET. Note.—**Do not** fall for the trap and use "P" types that may be on hand.
2. ICs—Texas Instrument's single shot monostable vibrator type SN15851N or similar.

   All other types are available in Australia or cheaper alternate types may be used.

Deflection Yokes

Any 70° or 90° **iron** core type for 5FP7, 3BP7 or 7BP7 or similar tubes. These can be easily deflected with low drive currents. Obtained from Bush Simpson or Classic Televisions. Other types will require high currents to drive them.

Note.—Electrostatic type tubes require no deflection units.

Video-Amp. Transistor

1. Any 300 volt type, e.g. MJE340.
2. All resistors are ¼ or ½ watt types.
3. Potentiometers are ½ watt shaft or pre-set whichever you prefer.
4. Allow for three input jacks to be mounted on the monitor panel. These will be used for:—
   (a) **Scanner in** (monitor your own pictures).

(continued next page)

NEGATIVE L.T. REGULATED SUPPLY.

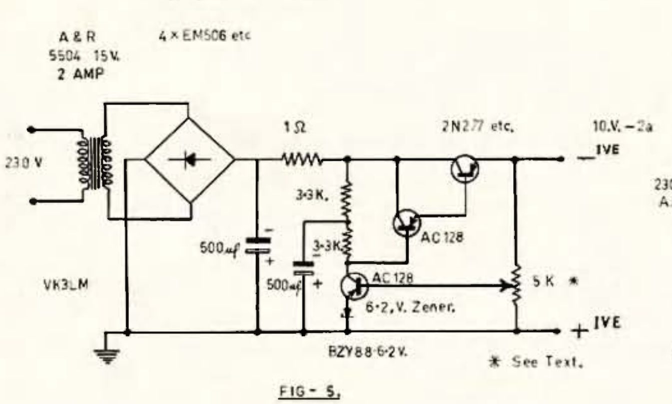


FIG- 5.

POSITIVE & NEGATIVE H.T. SUPPLY.

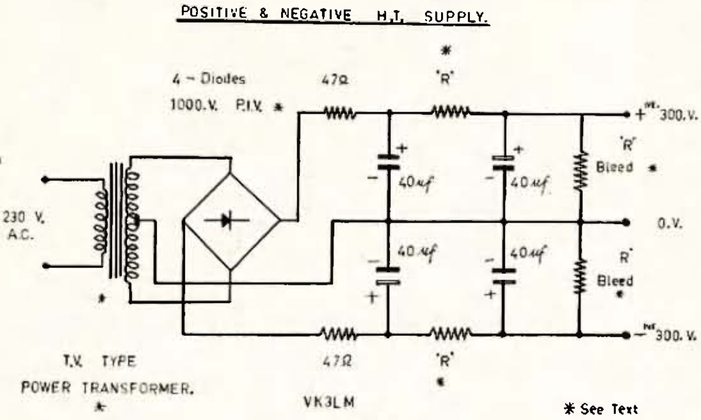


FIG- 6.

(b) **Receiver** (picture being received over the air).

(c) **Tape Recorder** (for recording pictures being sent in or out).

Note.—The limiter stages of this monitor will handle all signals from 0.2 mV. to 10 volts.

So until Part Three on S.S.T.V. Scanners, happy s.s.t.v.-ing to all.

"Wally" VK3ABM at the controls of his s.s.t.v. station. Seen are (1) left, the W6 Esky Monitor, as built to MacDonald circuit March '64 "QST"; (2) extreme right, "Videocon" type camera (valve unit); (3) centre, title display of Wally's own call and response to Ian ZL1AOY on 14230 MHz. during a recent s.s.t.v. contact.

PERSONALITIES AND S.S.T.V.

This month we would like to introduce to you Waldo Porter, VK3ABM. Known to his friends in Amateur Radio as Wally, he can be heard operating s.s.t.v. on 14.230 MHz. late at night once or twice a week.

Coming originally from North Carolina, U.S.A., Wally first obtained his licence under the call W4LD and in 1940 took up his occupation with a large aluminium company. Today he is managing director of that company in Melbourne. After the war, he obtained the call W7LK, then was later transferred to Pittsburgh where he operated under the call W3LK.

In South America during the last four years, Wally operated as PZ1DA and became interested in slow-scan t.v. He obtained an Esky monitor which is built to the McDonald circuit of "QST," March 1964. Later Wally built the slow-scan vidicon camera by McDonald, published in "QST," June, July and August 1965, followed by a control system which was published in an article in "73" as "An S.S.T.V. Patch Box" (Feb. 1971).

Using this system, Wally has a very nice set-up where titles can be displayed using magnetic movie title letters in white on a black background. Shown on the front cover is a photograph of one of Wally's call frames. Note the kangaroo featured in the centre of the frame.

Arriving in Australia just before Christmas, Wally obtained the call sign VK3ABM and has made his presence felt among the Amateur fraternity here in Australia. Whilst in South America, one of Wally's biggest thrills in s.s.t.v. was to receive a photograph of his daughter Sydney, who is licensed under the call sign W4PUB, via the slow-scan screen. In Wally's opinion, along the equator is the best location in the world for receiving the finest signals via slow-scan. "They come in from everywhere," was his comment. The worst operating area to his knowledge was Pittsburgh where signals were almost non-existent.

Today, Wally's station consists of a Collins receiver 75S-3B, transmitter Drake TX4, and a dipole on 20 metres pro tem. In Fig. 2 Wally can be seen operating in front of his very impressive station. If you would like to meet Wally, come up around 14.230 MHz. and say hello.

ACKNOWLEDGMENTS

Wally Porter, VK3ABM.
Jack Smith, of Ringwood—photography.
Articles from "QST," March 1971.
Joan, VK3LM's wife, for typing the articles.
Ian Young, ZL1AOY, for transmission of s.s.t.v. pictures.

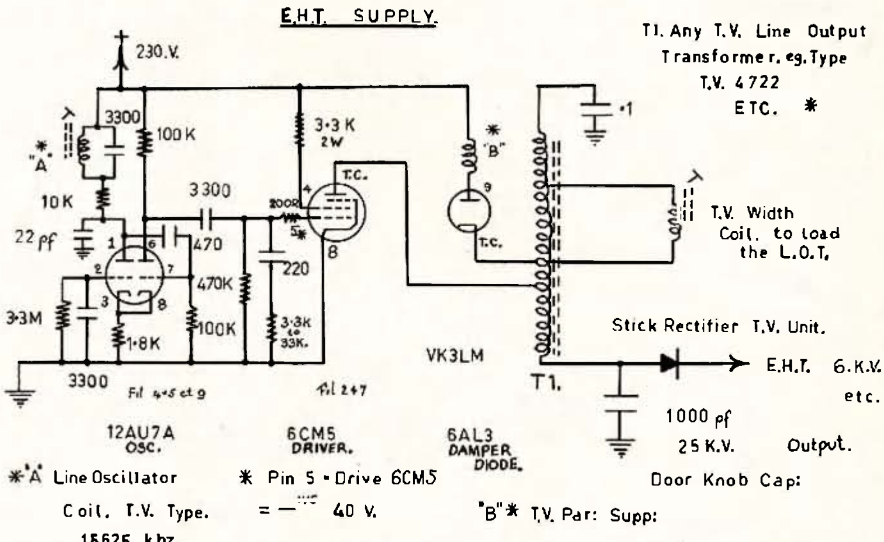


FIG-7.

BAND PLANNING

Mr. S. Voron, VK2BVS, in a letter too long to publish in full, advocates band-planning in VK-ZL be co-ordinated for v.h.f. and h.f. to stimulate usage of frequencies and to consider and formulate new ideas of benefit to the Amateur Service.

His suggestions covered—

(a) A calling frequency in the 10 mx band at, say, 28.5 MHz. (15 mx and 20 mx are our main DX bands, the latter has to cope also with local working—the other bands possess high static levels or high powered intruders); 10 mx band is wide, suitable for ground-wave working, very good for hand-held transceivers — even converted from 27 MHz. rigs quite simply—many stations already operate on 10 mx—QRM on 10 mx is less—very handy too for portable and mobile stations.

(b) When contact is made on the calling frequency QSY to any one of pre-selected xtal locked frequencies from say 28.3 to 28.5 MHz.

He invites ideas and suggestions from interested readers, particularly in the more heavily populated centres, to 60B Dutric St., Randwick, N.S.W., 2031.

The Practical Design of Mobile Aerials*

E. L. GARDINER,* B.Sc., G6GR

A great deal of scattered information has appeared from time to time both in England and in America in relation to the practical effectiveness of numerous types of aerial system when used on moving vehicles.

It is hoped that this survey will help newcomers to the mobile field to avoid some of the common pitfalls, and that others having wider experience may find at least a few pointers which will assist them in improving performance. At the same time a review of the systems in general use may suggest a few new lines for experiment which can be expected to yield worthwhile results.

MOBILE OPERATION

Consideration of true mobile operation from vehicles in motion as opposed to the related fields of portable, "static-mobile," and /A operating, suggests the following fundamental requirements which must be met:

(a) Since the vehicle is continually changing its position in relation to other stations, the aerial system should be essentially non-directional. Any directional characteristics, however slight, may be expected to increase fading and variations in received signal strength.

(b) Much mobile communication is by ground-wave at comparatively short ranges, and in this sphere as well as that of ionospheric reflection, low-angle radiation is perhaps as important as at the home station.

(c) Since the power of mobile installations is necessarily limited by considerations of power supply and battery capacity, efficiency in the aerial system and in the transfer of energy to it is of prime importance.

(d) The aerial should be so positioned on the vehicle as to pick up the minimum of electrical interference, both from the car itself and from any passing traffic. It should be clear of avoidable screening, and as remote as possible from surrounding objects which can detune the aerial and absorb valuable power.

(e) In addition to the above requirements, the mobile aerial must be mechanically safe and sound in design. It must be strong enough to withstand high cruising speeds, have low wind resistance, and either be **resilient** in itself or **resiliently** mounted to withstand accidental impacts. Preferably, it should be neat in appearance and easily removable for parking and garaging. If in addition to these factors is added the facility for remote tuning, and perhaps frequency change, from the driver's seat, it will be clear that any successful design is certain to include a strong element of compromise, and is in fact a major exercise in engineering skill.

Further consideration of the Amateur wavebands available for mobile use suggests that there is a natural line of demarcation which occurs at the frequency where a half-wave dipole becomes comparable to the length of the vehicle, namely in the region where h.f. merges into v.h.f., particularly the 10 metre band. From the earliest days of mobile working there has been a widespread, although not inevitable, choice of the vertical radiator, as this fits naturally into most of the requirements listed.

At 30 MHz. a quarter-wave whip aerial is approximately 8 ft. in length, and approaches the maximum which can be carried safely. At all higher frequencies a resonant aerial becomes small in relation to the vehicle, so that there is a wide choice from among many of the established v.h.f. designs, many of which can be carried on a car if they are thought suitable. A simple quarter-wave vertical is not out of the question for the 21 MHz. band, but from this frequency downwards it becomes characteristically necessary to load the aerial electrically in order to achieve resonance in a structure small enough to be carried safely. Thus, in mobile operation the Amateur bands fall into two classes, namely the h.f. bands upon which DX working is to be expected, and characterised by the necessity for loaded aerials; and the v.h.f. bands upon which true DX is the exception, and characterised by the use of unloaded and possibly more complex aerial systems.

The first section of this review will discuss v.h.f. mobile aerials, perhaps the simpler of the two classes, if the broader in scope. Commercial users of v.h.f. radio appear to have little doubt that the system best suited to their needs is the quarter-wave vertical rod, mounted at or near to the centre of the metal roof of the vehicle, and the author cannot recall having ever seen any important departure from this practice.

However, the commercial user has the advantage of wishing to communicate, in the vast majority of instances, with only one, or at most. a few fixed stations. These invariably employ stacked vertical systems erected at great heights in carefully chosen locations. The mobile Amateur, on the other hand, may wish to communicate with all and sundry other Amateur stations, most of whom use horizontal polarisation, in addition to other mobiles in his area; and this complication gives rise to a great deal of hard thought and discussion.

V.H.F. AERIALS

At frequencies above 70 MHz. the roof-mounted vertical can be truthfully thought of as a ground-plane, since the metal area over which it is mounted will not be smaller than a quarter-wavelength in radius, and thus simulates a radial system, or perfect ground. There can in fact be little doubt that at any frequency a central roof position is probably the best obtainable since it has maximum height above ground combined with minimum screening by the vehicle itself. It is also as remote as possible from all sources of electrical interference both internal or external, and should be as nearly omnidirectional as can be achieved.

However, the use of roof-racks, or of a "soft-top," may not always permit this ideal arrangement, but experience has shown that the aerial can be offset without serious loss of efficiency; probably the best position being towards the front of the car roof, immediately above the windscreen. This position has the advantage of remaining broadly central above the metal mass of the car as a whole, and yet it permits a short run of feeder to the most usual position of the equipment near to the dashboard.

While it is not uncommon to drill the roof of a commercial vehicle to support a whip, this procedure is unlikely to appeal to the Amateur who owns his own car! Among those who have effectively solved this problem may be mentioned G8CK/M, who makes use of one-half of the well known "ski-rack" which consists of a single bar fitted with the usual clamps to secure it across the car roof in any position. This can be fitted well forward of any obstructions, and the aerial mounting clamped to it; the method being suitable for any frequency and in no way confined to v.h.f. In practice it is not always preferable to earth the outer braid of the aerial feeder to this rack, and improved results have been noted in certain installations when the braid is left floating and earthed only at the equipment end.

It is strongly recommended that both forms of connection be tried, without regard to the type of aerial or frequency-band in use, since there have been instances where a signal increase of up to 12 dB. has been reported by distant stations when the remote end of the feeder is lifted from the car body. This effect is not universal, however, since the car body is a very individual structure, and in many instances earthing in the more usual manner is essential.

A second approach to the mounting problem places the aerial upon a small matching unit or terminating box, which in turn is secured to a square of material such as copper sheet or plywood. The latter is then attached to the car

* Reprinted from "Radio Comm.," July 1971.

roof by a suitable harness similar to that used for roof-racks, or even by a strong adhesive tape. The feeder is not taken through the roof in what may be regarded as the ideal manner, but at right angles from the aerial mounting and over the roof to enter by a convenient side window. It should, of course, be an insulated cable throughout, and the off-set or forward roof position may be preferable at lower frequencies if it makes possible a shorter feeder.

OPTIMISING THE FEED ARRANGEMENTS FOR WHIPS

It can be stressed at this point that it is a widely held view that a short and direct feeder run to the mobile aerial is of very real assistance, as it is rarely possible to arrive at and to maintain perfect impedance matching under mobile conditions and in consequence feeder losses cannot be neglected. Moreover, it is very advisable to keep the feeder as remote as possible from the electrical wiring and equipment of the car, and the effective bandwidth over which the aerial can be used without alteration tends to be wider if the feeder is short.

The author has ventured to express the opinion that in practice it is more beneficial to select a feeder cable of low loss construction and having the lowest self-capacitance per foot, and to keep this to the absolute minimum length, than to select a cable which is a correct nominal impedance match to the aerial system. In the extreme case of a low frequency transmitter which can be coupled to the aerial by a feeder of virtually zero length and capacitance, it is possible by means of a conventional pi-network to feed at useful efficiency over a considerable bandwidth; whereas in the case of the conventional mobile installation employing a relatively long feeder-run this width is very restricted, seldom exceeding 25 KHz. on top band.

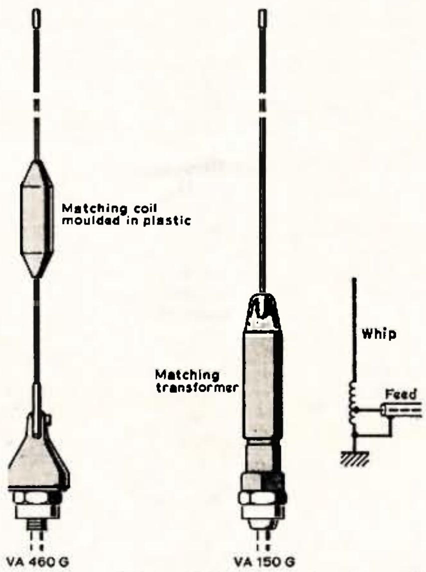
It is usual to feed the quarter-wave ground plane directly by a short 50 ohm feeder, which will not be a very good match into the estimated aerial impedance in the region of 20 ohms. Two feeders in parallel have been used, but there seems no evidence that any worthwhile improvement in matching can be claimed. However, it has been pointed out in an admirable article by G4LU and G3BA that improved matching can be obtained if the aerial is lengthened to about one-third of a wavelength, which can exhibit a resistive component of 75 ohms, while the added inductive reactance introduced by the increased length is tuned out by a series capacitor incorporated in a matching unit at the base of the lengthened whip.

These Amateurs have used an offset mounting at the side of the car roof with success, and it is a further advantage of the lengthened radiator that its impedance is less dependent upon strictly ground plane conditions, and that the use of a suitable matching unit at the base enables the effects of differing aerial position to be compensated. They have further expressed the view that a correctly matched vertical system is not materially inferior to others when working home stations using horizontal polarisation, while being better for communication from car to car.

STACKED AERIALS

At the higher v.h.f. bands it becomes practicable to stack vertical radiators, and this construction will prove very helpful at 432 MHz. W2ALR has described an aerial where the usual quarter-wave vertical rod is continued into a "quarter-wave stub", which on 144 MHz. can take the form of a half-wave section bent into circular form, and above this the whip continues vertically for a further half-wavelength section. Such a colinear stack would be some 10 feet in overall height for the 2 metre band, and although this might be regarded as excessive for safety when roof mounted, it would be quite suitable for a rear bumper position, when the upper half-wave would be in the clear.

On 432 MHz. the structure would be more nearly 40 inches in length, and thus safe at roof level, while an additional half-wave stacked element could be added without exceeding a reasonable height. These possibilities make the band potentially attractive for mobile experiment. A construction which appeals to the author for open-car use is based upon the rear bumper mounting of a short insulating section of wood or bakelite tubing, perhaps 4 ft. in length, above which can be carried a centre-fed vertical dipole for 2 metres, or a stacked array for higher frequencies. The "J" match construction described in most Handbooks also lends itself well to mobile mounting, being fed from the bottom at low impedance. A rear-mounted aerial of this form would be 10 ft. in overall height for the 4 mx band, and therefore has much to recommend it as a departure from the simpler varieties.



Two Pye aerials in which attention has been paid to ease of fitting to any vehicle. The mountings supplied are weather-proof and maintain a low resistance bond to the vehicle metalwork.

The type VA 460G u.h.f. three-quarter-wave aerial is intended for operation in the band 450-470 MHz. Inherent gain combines with height to give a high performance aerial. The radiating element consists of stainless steel rod with a sealed phasing coil placed in it quarter-wave from the base. The complete assembly is carried by a hinged clamp on an insulated base.

The type VA 150G v.h.f. half-wave aerial is for operation in the band 146-175 MHz. The greater height of this aerial is an advantage where a partially-screened mounting point must be used. The aerial consists of a tapered stainless steel rod mounted on a sealed matching transformer. A 12 ft. length of co-axial cable is provided with the aerial and this can be supplied full length or cut for a specified frequency; a cutting chart is also supplied.

HORIZONTAL POLARISATION ON V.H.F.

For the Amateur who feels that horizontal polarisation at v.h.f. must be retained, there are several well known designs which aim to overcome the too-directional pattern of the horizontal dipole. Of these the halo aerial, which consists essentially of a dipole centre-fed with the aid of a gamma matching section to overcome the altered impedance, and having the two ends bent round, without contact, into a circular form, is very well established.

The construction is not entirely effective in overcoming directional pattern, and has maximum radiation in the direction of the feed point; there is some doubt if it is as effective in this respect as the vertical whip.

The halo is mounted above the car, preferably not less than a half-wavelength above roof level, as at lower heights there will be a tendency for the roof or body of the car to reflect radiation upwards. It has the advantage of small size and weight.

The "minihalo" has recently appeared in which the diameter can be halved by joining a capacitive sleeve between the two previously open ends, resulting in a still greater reduction in these factors. It is, however, axiomatic that the field radiated by an aerial is a function of size, and any reduction will normally have some detrimental effect upon efficiency.

An interesting possibility becomes evident at this stage. Although the author has not yet seen this development in use, it should clearly be possible to so dimension the minihalo that with the capacity-sleeve in place it resonates in the 70 MHz. band, while with this removed or replaced by an insulator it will resonate in the 144 MHz. band, thus providing a useful two-band assembly.

The search for still higher effectiveness from horizontal polarisation has led to the development of the clover-leaf aerial, described in current Handbooks, which is equivalent to three half-wave halos fed in phase. The aerial has more uniform directional characteristics, and an appreciable power gain over a dipole or halo, but at the expense of a rather conspicuous appearance and relatively high wind resistance. While of undoubted excellence, it may be regarded by many Amateurs as better suited to portable or "static-mobile" working.

Aerials of this nature are unlikely to be chosen for frequencies lower than 144 MHz. owing to their size and weight, and for the under-used 70 MHz. band, vertical structures, or the halo, would appear to be a wiser choice. The 10 metre band has the distinction that a full-sized quarter-wave vertical aerial approximately 8 ft. in length without inductive loading can be carried on the average car. It is possible to roof-mount such an aerial in the "ground-plane" position, giving perhaps the highest radiating efficiency obtainable on any of the Amateur bands, but more often considerations of overall height and of accessibility for band changing lead to the choice of a lower mounting position. At this frequency, where the car body approximates in dimensions the "other half" of a dipole, it is easy to see that much of it may be expected to be "hot" at r.f., and it is not always fully appreciated that this is the normal state of affairs on all bands with the possible exception of the higher v.h.f. bands, as at lower frequencies the vehicle body is far too small to represent an earthed mass, or to simulate a true ground plane.

H.F. AERIALS

POSITIONING THE LOADING COIL

On bands lower in frequency than 28 MHz., a vertical aerial structure is the only type widely used, as it conforms relatively well to the requirements listed in our opening paragraphs. As loading is introduced, however, technique divides into two well defined streams, namely "base-loading" in which the necessary added inductance to provide resonance is added at the base of the vertical whip where it enters the vehicle, and "centre-loading" in which the loading coil appears at some point higher up the radiator, generally at from 4 to 5 ft. below the highest point. These two streams can be further sub-divided according to whether the loading coil is interchanged for each band used, or whether some form of continuously variable tuning is incorporated into the design.

Structurally these two systems differ considerably, in that base-loading places the coil conveniently for access, reduces the weight and wind resistance of the whip, and tends towards neatness and mechanical strength; whereas a higher position for the coil adds to these problems. It can be shown, however, that in the case of large aerial structures in which base, centre or even top loading really have significance, there is a marked increase in efficiency from placing the loading coil at the maximum height above ground. This provides a long section of aerial below the coil in which r.f. current is a maximum, and which contributes greatly to the radiated field.

The mobile aerial, however, becomes very small in terms of wavelength at the lower Amateur frequencies and is more heavily loaded with inductance than are most home-station verticals. The distance between the coil and car body is seldom more than two or three feet, so that the change in current distribution as between the two systems cannot be very profound. It is pointed out by advocates of base loading that as a result of the greater top-capacitance of the longer whip, the coil inductance can be materially lower than is necessary for centre loading, thereby reducing r.f. resistance. But this factor will, in addition, tend to reduce the r.f. potential across the coil, and it is suggested later that it can be of much greater importance to maintain a large potential.

The argument is strongest on top band, where the mobile aerial system is perhaps less than two per cent. of a wavelength overall, and experiences on this widely used band may be expected to apply in a decreasing degree to the DX bands as frequency is increased. The author once carried out a series of tests on top band in conjunction with a remote field strength meter, in which the coil position was progressively moved up a mobile aerial while keeping the feed current and all other factors as constant as could be devised. These tests showed quite conclusively that the radiated field at some 40 yards from the car was most nearly proportional to the height of the midpoint of the loading coil above ground, and **not** to that above either the feed point, or the point of attachment to the car body. In these tests, of course, the ground level means nothing electrically, as the true "ground" may be some distance below the surface of a dry road. It must be taken as equivalent to the lowest point of the car body, namely that where the wheels meet the road.

From tests such as these, even if the agreement is only approximate, it becomes clear that the whole vehicle is effectively part of the aerial system, and that there is no fundamental distinction between base and centre loading, for the one merges continuously into the other from a performance point of view. If this were not so, and the car body played no part in radiation, it would be hard to understand the effectiveness of such popular mobile aerials as the G3FIF, which is normally used with the coil immediately above the mounting point, and thus has no bottom section at all to carry maximum r.f. current. It is clear that the important factor is loading-coil height, and the mobile installation should be designed to improve this as much as practical considerations allow.

It is interesting to note that some users, for example G3KNB/M, have, after installing the popular aerial mentioned with good results, raised it a few feet further by the introduction of a bottom section, and have then experienced a further marked increase in signal strength reports. This improvement may in part be due to raising the coil into an unscreened position clear of the car body, and some light may be cast here by experiences the author has had when transferring a particular installation from a saloon to a "soft-top" convertable. Although in the latter case the coil height above a rear-bumper mounting was less than previously, and the measured current at the base of the whip also some 20 per cent. lower, due no doubt to less capacitance to ground, signal reports averaged an increase of two S points.

It is difficult to find any explanation of this advance other than the removal of the loading coil to greater distances from the metal body of the car. Other Amateurs have confirmed corresponding results, and there seems evidence that it would be necessary to move the aerial to a position well above a saloon car roof in order to gain equivalent performance.

A golden rule there emerges, and this is to place the coil high and clear for outstanding results. This step will tend to help in other directions also, as it will keep the coil clear of radiation from the car itself, from passing vehicles, and from other surrounding disturbances. The reaction of these experiences upon the general belief that most radiation comes from the lower portion of the mobile system where current is greatest, and that both the coil and top section of the whip do not contribute a great deal, has long worried the author, as conflicting facts constantly seem to crop up. G5IC has pointed out that resonant-circuit theory demands that the current into the base of any loading coil and that out of the top must be equal. This current will taper off along the top section as it is dispersed through the capacitance of this section to ground, or more properly to the car body, but radiation must be important from at least the lower part of it. This component of radiation will tend to be a constant factor, but it is understandable that its contribution will increase with height above ground.

Light is also thrown upon the claim often seen in American publications that a capacity hat at the **top** of an aerial, which will tend to increase r.f. current throughout the whole top section, is a desirable factor, whereas the experience often reported in this country that a hat located immediately above the loading coil does not seem a good proposition is also logical, since at this point it will tend to remove most of the current from the whip above it. It is thus unfortunate that a hat near to the top of a mobile system is so unsatisfactory from the view point of wind resistance and mechanical stability, as electrically it is a favourable design feature at the lower frequencies.

When operating "fixed mobile" or portable with the mobile equipment, and with sufficient time to make such modifications, both the author and many others have found it most effective to add bottom sections to the aerial so as to raise the loading coil to a considerable height. When this is done, there will be an increase in the resonant frequency, resulting from the lowered capacitance to earth, and this can be corrected by the addition of a light capacity hat at the extreme top of the system. When lengthened in this way the mobile aerial becomes flimsy, and light nylon guys may be added. These should be attached at a point immediately below the coil, where the r.f. potential is relatively low, and losses will not be introduced. When operating on the h.f. bands the problem becomes different, for the added length becomes significant in terms of wavelength, and may predominate to the extent that coil inductance will require reduction. The required tuning effect can be achieved by reducing the length of the top section, although this is far from convenient!

Under portable conditions there are two interesting additional modes in which the mobile aerial can usefully be employed. In the first place, a quarter-wave aerial will resonate as a half-wave aerial adjacent to the next higher-frequency band, and can be used in this way if a high impedance a.t.u. is available at the base. Thus a 1.9 MHz. loaded whip will resonate in the region

of 3.8 MHz., and will require a small amount of base loading to trim it into the 80 metre band.

The author has used this arrangement effectively, adding a small rotary coil at the base of the system and coupling into the equipment from a link winding slipped over this coil, thus retaining a low impedance feed out of the transmitter. The arrangement is convenient as an 80 metre receiving aerial, when another aerial is used for transmission, and can be coupled into most receivers having a medium impedance input by means of a small capacitor from the top of the rotary coil. If the base loading coil is earthed, the whole system can be resonated as a three-quarter-wave system, and a 75 ohm feeder at the bottom may be retained. This technique is applicable in the case of the 7 and 21 MHz. bands, having a frequency ratio of three to one, because an aerial adjusted for current feed in the usual mobile manner for the former will also function on the latter.

The second mode which is useful both under mobile and field conditions arises from an appreciation that the lower section of such a system up to the base of the coil can be current-fed as a quarter-wave vertical radiator without changing the feeder connection, the coil acting as an isolating choke. Thus if the lower section be made 8 or 12 ft. in length when portable, it can be loaded for the 10 or 15 metre bands. A more interesting possibility when mobile would be a bottom section of some 40 inches which will permit operation on 4 mx from a top band or 80 mx whip without alteration. No doubt the coil design will play a part in getting the best from such an unorthodox arrangement, and should have minimum losses and self-capacitance, but these requirements are essential for a good loading coil in any case.

DESIGN CRITERIA FOR LOADING COILS

The design of loading coils for the lower frequency bands has been a cause of concern to the author for many years, since in no part of the mobile system is so much variety seen, and some of the most successful designs appear to run contrary to published theoretical treatments which invariably stress the need for high Q as the principal requirement. In fact, the general view seems to be that if the coil is of the correct inductance, and has maximum Q, there is little more which can be done.

That the coil should be of low loss construction and minimum h.f. resistance is undoubtedly true, as pointed out under heading (c) initially, and this is implied in a high Q factor. It is also well established that the coil should have the minimum possible self-capacitance, and can with advantage be of sectionalised design, as r.f. current flowing through the self-capacitance plays no part in producing radiation but tends to promote power wastage.

When consideration is given to coil dimensions, however, an anomaly appears. Most experienced mobile operators agree that a high r.f. potential across the ends of the coil is one criterion of good performance, and proudly demonstrates the distance away from the whip at which a neon lamp can be struck by the electrostatic field. They also agree that comparatively long coils, having a ratio of length to diameter of perhaps six to one, are much the best, particularly on the lowest frequency bands; winners of many past rallies and competitions are emphatic on this point. But it is common knowledge from any text book that to arrive at the maximum Q a coil must have a good "form-factor", namely a ratio of length to diameter in the region of 0.4, because this short, wide shape results in the shortest length of wire and the lowest r.f. resistance for a given inductance. But those who have tried coils of this form agree that the results are far from impressive, so it would appear that some of the factors which go to provide a high Q are desirable, but not all.

The author is prepared to hazard the view that Q is, in fact, not the most appropriate factor by which to assess a mobile loading coil, and would support this by pointing out that all the leading commercial aerials from the G3FIF to the Webster Band-spanner have comparatively long thin coils, which cannot have the best Q obtainable, and which in some cases do not appear to have particularly low-loss construction. Most of the leading American products for the h.f. bands do appear to pay full attention to this aspect. Accepting therefore that low r.f. losses are of the usual recognised importance, it is perhaps important to remember that the coil forms one part only of an aerial system having several other sources of resistance, the most important of which at the lower frequencies is certainly the series-earth loss.

★

The Labgear h.f. mobile aerial type LTA10 is a continuously tunable aerial designed to have a nominal frequency coverage of approximately 2-15 MHz. However, the height above ground, the ground plane effect of the vehicle, the position of mounting, etc., all contribute to small changes in the end limits of frequency to which the aerial will tune with a given transmitter.

Allowing for these environmental factors, experience has shown that under typical working conditions the available tuning range should be regarded as 2.25 MHz. to 12.5 MHz. and every aerial is checked at these limits.

The motor section, not shown, is made to fit in the boot of a car, and the mounting bracket and suspension assembly consist of a number of castings and a pair of springs and hydraulic dampers. The control unit should be fitted as close to the equipment control panel as possible.

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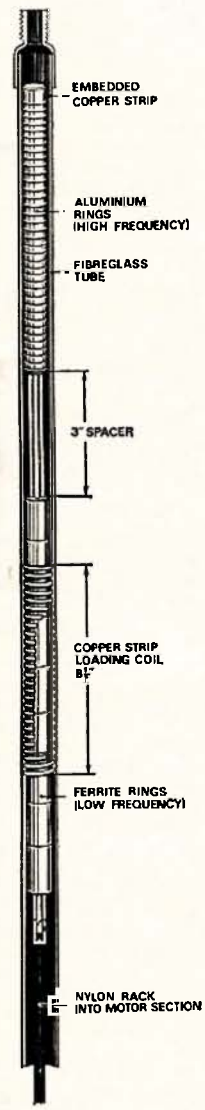

If it be accepted that the mobile system is completed by the capacitance of the vehicle to true ground, in which the electrical image of the aerial can be thought of as existing in high resistance earth below the car, this will be a very "lossy" capacitance representing a series resistance much higher than that of the coil. This view is borne out by the well established fact that the h.f. mobile performs at its best when over wet or highly conductive ground, as for example when near to the seashore. As part of such a high-loss system the difference in coil resistance due to the form-factor may well be negligible, and the optimum shape may be determined by other considerations.

After much discussion on this subject a valid explanation on fundamental grounds seems to have been arrived at from a reversion to first principles. From the original equations of Clerk-Maxwell it is well known that any radiated field in space has both an electrostatic and an electromagnetic component, and that these must be correctly related. It is common experience that neither field component alone will produce radiation. For example, the intense electrostatic field between the electrodes of an r.f. dielectric heater dissipating many kilowatts fortunately produces comparatively little radiation. Similarly, the electromagnetic field of a tank coil carrying equally heavy r.f. current is not an effective radiator—no one expects to transmit far on a loop aerial. In both instances the available power is mainly dissipated as heat. Both field components must be present in the correct proportion for radiation to occur.

In the typical mobile whip it is accepted that current flowing mainly in the lower section generates a magnetic field. This will not be radiated, however, unless an adequate electrostatic component is also present in the form of an r.f. potential difference between the ends of the conductor carrying this current, namely the base and tip of the whip. Since the aerial is a resonant circuit, these components will be in the required phase relationship. However, there is very little potential gradient along the open portions of the whip, which are small in terms of wavelength, and the major part of this essential p.d. will appear across the ends of the coil, as is normal in any parallel-tuned circuit.

The electrostatic field strength set up will be proportional to the distance apart of these two high potential points, namely to the length of the coil, since 100 volts (for example, across one metre represents an electrostatic field of 100 volts-per-metre, while if it were across one centimetre, the same p.d. represents only one per cent. of this field. The conclusion therefore seems inescapable that however strong an electromagnetic field component there may be, it can only be fully transformed into radiation rather than heat if an adequate electrostatic field is present, and vice-versa.

In practical terms, there must be a minimum length of coil before full radiation becomes possible, and in fact there will be an optimum length for any particular system above or below which efficiency falls. No doubt this could be shown mathematically to correspond to a maximum radiation resistance. For an average top band aerial this length appears to be in the region of from 12 to 18 inches, and is a much more important factor in a good overall design than high Q if the latter be obtained at the expense of this dimension. No claims of exceptional performance from considerably longer or shorter coils can be traced, although the latter may be recommended on grounds of convenience.

DESIGN CONCLUSIONS

It now seems possible to summarise the design requirements for a good h.f. mobile aerial. The loading coil must be relatively long, and of good low-loss construction, but can be of small diameter with an overall advantage if the resulting reduction in wind resistance and weight permit a higher mounting position. The top whip section is not of prime importance, but as an overall height of 12 to 13 ft. above the road is perhaps the maximum for safety, it is better to make this not more than 4 ft. of ½ in. or ⅝ in. diameter tubing rather than long and thin, so that the coil can be proportionally higher. The use of a telescopic whip for tuning purposes is most unwise in the author's view, for after a very short life it will become noisy and unreliable through weathering. A large diameter whip will exhibit a greater capacitance to earth per unit length. Less length is thus needed to resonate any particular loading coil, permitting the coil to be mounted higher without excessive overall height; alternatively, a coil of lower inductance having less r.f. resistance could be used. In either case efficiency is improved.

The lower section of the aerial should be of low resistance, 1 in. diameter tubing being a good compromise between weight, strength and other considerations. The coil is sometimes stated to need no protection against rain, if it is well varnished and of waterproof construction. This may be reasonably true for top band systems, as the leakage path along the coil is considerable, but in the author's experience rain lying between the turns can greatly increase losses at higher frequencies, and the coils should be protected. A layer of p.v.c. tape over the dry coil appears to be perfectly satisfactory. Many forms of coil cover can be devised, but unless the coils are sealed in a dry, inert gas, as are some of the best commercial products, the cover must not be sealed, for condensation will eventually occur. A good practice is to leave the cover open at the bottom.

POSITIONING AN H.F. AERIAL

Position of the aerial on the vehicle is important, perhaps the overriding factor at h.f. being a clear position for the coil. The advantages of the central roof position have been stressed, particularly at v.h.f. In the U.S.A., where convertibles are widely used, a rear bumper mounting is favoured. It can be excellent on suitable cars, but as applied to all-metal saloons there is a probability of the coil coming too close to the bodywork. Furthermore, while the aerial is well clear of the car's own ignition and electrical system, it is liable to pick up maximum interference in traffic from following vehicles. In general, aerials in this country should be mounted on the off-side of the car, as this places them furthest away from overhanging trees and road-side interference.

The conventional position on the off-front wing, favoured for broadcast aerials, has been shown to be quite effective, but work carried out in America by K5CFW has shown this position to be surprisingly directional. Of course there are few positions at which an aerial can be mounted on a saloon car and be free from quite pronounced directional effects. There is a tendency for signals to be concentrated forward with a wing-mounted aerial, and to the rear when rear bumper mounting is used. In all cases the radiation is lowest towards the sides of the vehicle, confirming the idea that the length of the chassis is frequently part of the resonant system, and nulls can in fact occur in the broadside directions. The directional pattern of an installation is not greatly dependent upon frequency in the h.f. bands, and maximum radiation is to be expected in the direction of travel, a little towards the near side **away** from that on which the whip is mounted. On the 10, 15 and 20 metre bands the effect of turning the car was comparable to many beam aerials, variations of up to 20 dB. being common.

CONSTRUCTION— PRACTICAL CONSIDERATIONS

Ideas on aerial construction naturally vary widely, but tend to follow three main trends. A light, rigid construction is often possible at v.h.f. or for roof-mounted aerials of limited height. In general, however, it is necessary in order to cater for high road speeds either to introduce flexibility into the system, or alternatively to mount a rigid system upon a flexible base. In this case the aerial may be expected to lean backwards at quite large angles during motorway cruising, and this has been criticised on grounds of detuning. American practice favours a stiff spring mounting for the rear bumper, where leaning is unlikely to be dangerous, but it has been advised that the usual spring should be covered with thick rubber tubing such as hosepipe, in order to damp out mechanical oscillations. The spring should be bypassed with copper braid in order to eliminate possible variations in inductance and h.f. resistance.

W4QS is emphatic in condemning the use of springs of any type in any part of the mobile aerial system, although most popular commercial whips incorporate them. The author has used a spring mount for many years without detecting any adverse consequences, and mechanical failures have not occurred. However, the aerial feed is taken to a point **above** the spring mount which is also insulated at the lower end, and thus the spring does not form part of the lower whip section. This would seem to get round any electrical objections.

Detuning as a result of the whip leaning does not appear serious at the lower frequencies, but may be expected to increase towards h.f. as lower portions of the aerial become relatively "hot". The DX operator should therefore be particularly alive to this risk, and it is always most unwise to employ a very flexible or "whippy" top section, as this will cause an unpleasant wobble in tuning and signal strength. A slightly flexible construction throughout such as is obtainable from the use of fibreglass, has much to recommend it, and it is unfortunate that so little has been published regarding the effectiveness of helically-wound fibreglass whips, although a design claimed to perform well on 7 and 21 MHz. has been published by G3FPK, and the American commercial "Heliwhip" for 10, 15 and 20 metres has been well reviewed.

It seems probable that this construction, which combines lightness, strength, low wind resistance and a degree of flexibility, can be excellent for those bands on which limited inductive loading is needed. At lower frequencies, however, it is difficult to obtain sufficient inductance on such a small diameter without the use of fine wire having relatively high resistance, and losses tend to rise. A construction has been proposed in which the lower few feet of such a whip is wound with an open helix of heavy wire, followed by a close-wound section corresponding to the usual centre-loading coil, continuing with an open helix of fine wire to the tip. The G3FPK design employs a winding-pitch which is progressively reduced towards the tip, so that the greater part of the r.f. resistance will be in the upper part of the whip where current is lowest. This construction is also claimed to raise the feed point impedance.

TUNING H.F. WHIPS

Mobile whip aerials are normally regarded as equivalent to quarter-wave verticals, having maximum current and minimum impedance at the feed point. There is evidence, however, that many successful designs are in fact slightly longer than a quarter-wavelength electrically, thus raising the resistive component of the feed point reactance towards 75 ohms, and the current maximum is partway up the aerial where it will be more effective. This is almost certainly the case when bottom-loading or trimming is employed, or when the feeder is tapped up along a base loading coil or Z-match. The author has made no reference to this form of coupling, because in his experience, with which not all experimenters agree, no advantage has ever been noted from any kind of impedance-matching device in relation to an aerial which is correctly matched in its initial design. Such arrangements are convenient in maintaining loading when tuning over a band, but they cannot be without their own inherent r.f. losses, and the gain may be more apparent than real.

It is worth bearing in mind, however, that whips can be designed for half-wave resonance, which will place the maximum current well up in the clear, and fed from a high impedance coupling unit. The helical construction, for example, can be wound with close-spacing at both ends, and a heavier gauge open section in the centre; the construction is quite practicable for the higher frequencies and might be expected to give very interesting results.

It has been stressed by many authors that really low-loss construction is vital for the mobile loading coil, and while pointing out the importance of correct proportion, the author fully endorses this viewpoint. It is claimed with good reason that only individual, interchangeable coils for each band can provide this peak efficiency, and W4QS, for example, states that up to 3 dB. gain, representing double the effective radiated power, is obtainable over any form of tunable construction. However, there is little doubt that many mobiles feel the need for a multi-band system, particularly when DX operation is required, and will accept some penalty for this convenience.

At v.h.f., as has been suggested, interchangeable whips are satisfactory or it is possible to introduce a telescopic feature if the greatest care is taken to keep all sliding joints clean and firmly clamped. On h.f., however, it is not possible to change bands by length adjustment or capacitance loading alone, and the coil inductance must be varied. The problem becomes the familiar one of doing this without the introduction of excessive r.f. losses. Tuning within the band can be carried out by: (i) sliding a capacity hat along the upper section, (ii) by hinged rods, or (iii) by a small telescopic extension fitted at an angle to the whip just above the loading coil.

The best known solution is undoubtedly that used in the Webster Bandspanner in which movement of the top section adjusts a sliding contact along the **inside** of a well protected loading coil. This is not an easy form of construction for an Amateur to attempt himself, and other approaches such as tapped coils or the variometer principle have been used with varied success. All such systems have the disadvantage, however, that the car must be stopped and the aerial manhandled, perhaps in pouring rain, in order to change bands or even to change frequency within the limits of one of the wider bands. It should not prove beyond the reach of Amateur ingenuity to find a solution whereby band tuning or even band changing can be carried out from the driver's seat, and it seems that the modern ferrite materials should offer a promising approach.

G2BCX has described the use of a small piece of grade B2 ferroxcube rod slid within the lower portion of a top band loading coil as a satisfactory means of tuning over the band, stressing the importance of avoiding saturation by the r.f. field, but has not referred to the remote actuation of this rod. The author has made considerable use of the latest ferrite materials in the construction of r.f. coils, including tank-coils handling the range of power levels in general mobile use, and while there are, of course, losses and the core material may become warm, he is of the opinion that these losses are not necessarily serious in relation to others which are always present. The experiment of moving a relatively large ferrite core longitudinally by means of a Bowden-wire control has been tried, and it has proved feasible to tune a mobile aerial remotely from 3.8 to 1.8 MHz. by this method with tolerable performance. Losses are, of course, a minimum at the h.f. end, where the effect of the core upon inductance is small. This makes possible efficient working in the 80 metre band, and an instant change to top band without leaving the car. It is possible to visualise the movement of a combined copper-ferrite slug within a helically-wound hollow fibreglass tube, having suitably graded windings whereby the effect of the ferrite will become greater as it is moved into regions having closely-spaced turns.

A still more flexible solution may lie in an application of the transductor principle, in which the inductance of a coil is varied by the saturating effect of d.c. passed through a control winding. If this could be developed at radio frequencies through the skilful use of modern materials, without the introduction of too large losses as a result of core saturation, aerial tuning could be altered by the adjustment of a simple potentiometer on the dashboard. The varactor diode clearly offers another similar approach, but here there is a problem in that any form of parallel tuning capacitance has been shown to ruin the performance of mobile aerials. However, little or nothing appears to have been done with the idea of varying the tuning or current distribution by means of series capacitance, and there seems no reason, on basic grounds, why this method should not be feasible.

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The Bantex h.f. aerial type MI was developed in the U.S.A. for s.s.b. transceivers and is made in the U.K. exclusively by Bantex Ltd. It is a helical aerial covering the range 3-15 MHz. It is made in 15 different models covering this band and has found widespread acceptance in application where only a few frequencies are used, eliminating the necessity of an expensive aerial tuning unit.

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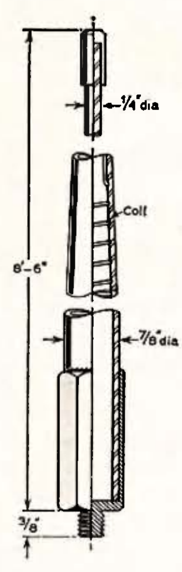

"HOW MANY Hz. IN FREQUENCY?"

DAVID RANKIN, VK3QV*

How many Hz. in frequency? Orthographically speaking of course there are none but read on to learn how many there can be in some electronic circumstances. By the way, if you do not know what "orthographically" means, this article will not tell you. Try your dictionary.

THE BEGINNING

Recently a friend of mine purchased some crystals for his new solid state f.m. carphone. But when he received them and started out on the installation his troubles began—he could not get the crystals to come up on frequency. The receiving side was not too bad, but the transmitted signals were quite a few kHz. off channel and no amount of fiddling with the trimmers would bring the crystals within cooee of the wanted frequencies.

What had gone wrong and why?

There are a number of reasons why a crystal does not oscillate precisely on its marked frequency and most of these were covered recently by an article in "Amateur Radio".[1] However, from the friend's experience cited above, one more reason comes to light. This involves the way of specifying the crystal frequency and a few words on this subject may save others from expensive mistakes and omissions.

THE PROBLEM

Many of the popular carphones in the 146 MHz. f.m. band use Tx crystals around 4 MHz., so let us concentrate on this frequency initially and expand our discussion to other frequencies later. A 4 MHz. crystal unit for the Tx implies a multiplication factor of 36 times.

Thus: 146,000.0 kHz. ÷ 36 = 4055.555 kHz. (the five in other words is recurring).

We could thus say we need a crystal on 4055 kHz., or on 4055.5 or on 4055.6 or 4055.55 kHz., etc. Just how should we specify the frequency or "How many Hz. in frequency?" (Get it?) If we say the frequency is to be 4055 kHz., then we are actually 555.55 Hz. off the calculated frequency, and that multiplied 36 times puts us just about 20 kHz. away from 146 MHz.—too far away to be of any use to anyone.

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On the other hand, if we say the frequency of the crystal should be 4055.55555 kHz. then we would be too academic because who among the Amateur ranks (and the professionals for that matter) can precisely measure carphone frequencies to 0.01 (one hundredth) of a Hz.? What purpose would such accuracy serve? No doubt the crystal manufacturer would smile at such a request and ignore the last few digits in your frequency spec., anyway. Obviously then, there is some middle course, but what is this happy medium and how do we determine it?

Referring again to the recent "Amateur Radio" article,[1] we saw how the frequency adjustment tolerance affected the final outcome and before we can answer the question about the happy medium we must look at this tolerance because it plays an important part in the number of figures we should quote in a frequency.

ADJUSTMENT TOLERANCE

Let us consider two points in reference to this tolerance.

(a) In scientific circles, a concept of "order of magnitude" is used. Simply, if a measurable event is said to be affected by a condition of "one order of magnitude" less than the event, then, initially at least, the effect of the condition is regarded as being negligible and may be disregarded. On the other hand, if the condition is of an "order of magnitude" greater than the event, then the effect of the condition is significant and it cannot be disregarded. For most practical cases, the "order of magnitude" is considered as being a factor of ten times and we will use this concept here. We will, in effect, consider a variation of 1/10th in our tolerance figures to be of negligible importance with respect to the nominal frequency.

(b) What is the tolerance in terms of Hz. for varying percentage tolerances typically offered by crystal manufacturers? At 4 MHz., the following would apply:—

a tolerance of ±0.01% is ±400 Hz.
and ±0.005% is ±200 Hz.
and ±0.003% is ±120 Hz.
and ±0.0015% is ±60 Hz.
and ±0.001% is ±40 Hz.

Let us now apply our "order of magnitude" concept to these tolerance figures.

±400 Hz. → ±40 Hz.
±200 Hz. → ±20 Hz.
±120 Hz. → ±12 Hz.
±60 Hz. → ±6 Hz.
±40 Hz. → ±4 Hz.
} may be considered as a negligible variation.

Thus, if we have an allowable tolerance of ±400 Hz. and if we quote our actual frequency to within ±40 Hz., then we can say that we are specifying this frequency to a sufficient degree of accuracy consistent with the adjustment tolerance desired. Obviously, if we want a tighter tolerance we must be more precise about our frequency specification and this follows from our example viz.: for an allowable tolerance of ±40 Hz. we should quote our frequency to the nearest ±4 Hz.

FREQUENCY SPECIFICATION

The recommended method of specifying the digits of 4 MHz. crystals now becomes:—

For a ±0.01% tolerance—quote the frequency to within ±40 Hz. of nominal frequency.

For a ±0.005% tolerance—quote the frequency to within ±20 Hz. of nominal frequency.

Frequency kHz.	Adjustment Tolerance (as stated) in terms of Hz. with recommended method of Frequency Quotation		
	For ±0.005% (±50 p.p.m.)	For ±0.003% (±30 p.p.m.)	For ±0.001% (±10 p.p.m.)
2,000	±100 Hz. → Quote to nearest 10 Hz.	±60 Hz. → Quote to nearest Hz.	±20 Hz. → Quote to nearest Hz.
4,000	±200 Hz. → " " " 10 Hz.	±120 Hz. → " " " 10 Hz.	±40 Hz. → " " " Hz.
8,000	±400 Hz. → " " " 10 Hz.	±240 Hz. → " " " 10 Hz.	±80 Hz. → " " " Hz.
10,000	±500 Hz. → " " " 10 Hz.	±300 Hz. → " " " 10 Hz.	±100 Hz. → " " " 10 Hz.
20,000	±1 kHz. → " " " 100 Hz.	±600 Hz. → " " " 10 Hz.	±200 Hz. → " " " 10 Hz.
30,000	±1.5 kHz. → " " " 100 Hz.	±900 Hz. → " " " 10 Hz.	±30 Hz. → " " " 10 Hz.
40,000	±2.0 kHz. → " " " 100 Hz.	±1.2 kHz. → " " " 100 Hz.	±40 Hz. → " " " 10 Hz.
50,000	±2.5 kHz. → " " " 100 Hz.	±1.5 kHz. → " " " 100 Hz.	±50 Hz. → " " " 10 Hz.
60,000	±3.0 kHz. → " " " 100 Hz.	±1.8 kHz. → " " " 100 Hz.	±60 Hz. → " " " 10 Hz.

Table 1.—Recommended method of frequency specification in range 2.0 to 60.0 MHz. and for tolerances of ±0.005%, ±0.003% and ±0.001%.

For a ±0.003% tolerance—quote the frequency to within ±12 Hz. of nominal frequency.

For a ±0.0015% tolerance—quote the frequency to within ±6 Hz. of nominal frequency.

For a ±0.001% tolerance—quote the frequency to within ±4 Hz. of nominal frequency.

However, we can take this idea a little further, and in doing so, make its practical application a little simpler. It is not particularly convenient to quote a frequency within ±40 Hz., but because of our decimal system of arithmetic, quotation to the nearest ±10 Hz. is quite simple—just leave the digits following the 10 Hz. digit out although we should observe the normal arithmetical laws concerning "rounding off".

e.g. rounding off ...65.432 to two decimal places becomes ...65.43, whilst ...34.567 becomes 34.57 to two decimal places.

Thus, the recommendation above simplifies to:—

For

±0.01%	types specify	within	±10 Hz.
±0.005%	"	"	"	±10 Hz.
±0.003%	"	"	"	±10 Hz.
±0.0015%	"	"	"	±1 Hz.
±0.001%	"	"	"	±1 Hz.

In other words, we should specify our 4 MHz. crystal as—

4055.56 kHz. if we require it to be manufactured within ±0.01%, ±0.005% or ±0.003%,

and as 4055.556 kHz. if we desire ±0.0015% or ±0.001% adjustment tolerance.

Two observations—

In the case of recurring decimals, round off to the nearest figure for the last digit quoted.

The compromise suggested is on the conservative side and will mean that the frequencies specified will be a little more precise than need be.

It becomes a relatively simple matter to extend the idea to other frequencies and Table 1 shows the results for adjustment tolerances of ±0.005%, ±0.003% and ±0.001% and for frequencies between 2.0 and 60.0 MHz. Readers should do their own calculations for tolerances and frequencies not covered.

Table 2 summarises the actual frequencies used in the most popular carphone configuration for the three simplex f.m. channels currently used in Australia. An adjustment tolerance of ±0.003% has been used as this is considered a suitable compromise between convenience and cost. A tighter tolerance crystal may cost more money, but it should be easier to net to frequency because the actual manufacturing tolerance is less and the crystal will be manufactured closer to nominal frequency within the terms of the actual specification.

CONCLUSION

We have set up a technique for specifying, with the appropriate number of digits, the frequency of a quartz crystal. Although our discussion centered around Tx crystals, the technique is equally applicable to Rx crystals and in addition can be used for specifying crystals for any purpose—not just f.m.

TRANSMITTER CRYSTALS			
Formula (f_c = Carrier Frequency)	145.854 MHz. Simplex	146.000 MHz. Simplex	146.146 MHz. Simplex
$\frac{f_c}{36}$	4,051.50 kHz.	4,055.56 kHz.	4,059.61 kHz.
$\frac{f_c}{24}$	6,077.25 kHz.	6,083.33 kHz.	6,089.42 kHz.
$\frac{f_o}{12}$	12,154.50 kHz.	12,166.67 kHz.	12,178.84 kHz.
RECEIVER CRYSTALS			
Formula (f_c = Carrier Frequency)	145.854 MHz. Simplex	146.000 MHz. Simplex	146.146 MHz. Simplex
$\frac{f_c - 2.0^*}{14}$	10,275.29 kHz.	10,285.71 kHz.	10,296.14 kHz.
$\frac{f_c - 10.7}{3}$	45,051.3 kHz.	45,100.0 kHz.	45,148.7 kHz.
$\frac{f_c + 10.7}{3}$	52,184.7 kHz.	52,233.3 kHz.	52,282.0 kHz.

* Simplified version of actual formula used by manufacturer.

Table 2.—Recommended method for quotation of crystal frequencies for Australian FM channels based on a crystal adjustment tolerance of ±0.003%.

N.B.—Only some of the more popular formulae are included in this table. Interested readers should be able to calculate frequencies correctly for other cases.

equipment. The decisions you must make concern the actual frequency required plus the permissible adjustment tolerance—the numbers of digits in the frequency sepecification will then follow from the idea presented here.

By the way, the friend mentioned in "The Beginning" got into trouble because he had only specified his crystal frequencies to the nearest kHz.—and in this case "near enough" was not "good enough".

Finally, the author makes no claim to fame as an orthographer—just as the Editor.

BIBLIOGRAPHY

1. D. Rankin, VK3QV, "Crystals for Carphones—and Other Things," "Amateur Radio," May 1970, page 6.

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SKEDS AT SEA

Cyclone "Althea" certainly created havoc on land at the end of Dec. What would it have been like on the high sea? At about that time Ralph Martin, VR4BM was yachting in his trimaran "Seeker" from Honiara in the Solomons bound for Rabaul. He didn't make it and was forced to return. Read his account. "The first part, from Honiara to Gizo, was routine, Morova Lagoon on New Georgia was delightful but then the wx began to deteriorate. We had a nasty passage with a heavy rain squall at the end just as we were going through the pass in the reef. It was down sail and start the motor. I shudder to think what would have happened if the motor had been in the condition it was a few days later. Visibility was down to 100 yards until we anchored off Munda."

Talking to an aircraft pilot next day, he heard about a cyclone some 200m. S.E. No wx reports could be obtained and as conditions did not get worse he decided to carry on after keeping sked with Stan VK2BSG. Three restful days were spent in Gizo and he then left for the Shortlands but whilst clearing the reefs the motor began to fail. They reached the Shortlands vicinity but never made it due to strong winds followed by a flat calm with a current taking them onto the outlying reefs. The motor then failed completely, so they used the dingy and oars as tow until the wind came in again. Hard sailing put a safe distance between them and the reefs, but to carry on to Kieta whilst bucking the N-W monsoon, with no motor and unfamiliar reefs ahead, made them decide to return.

"The voyage back to Honiara was when we really appreciated Amateur Radio. Our nightly skeds (with Stan) were the high point of the day. The moral support of knowing that there was someone at the other end waiting to hear was what we needed most."

The night they obtained a relay of the wx report from Stan in Sydney was their worst. As they finished the sked a severe squall hit them, followed by calm. "There was a lot of lightning about and in one of the flashes the islands (the Russells) showed so clearly that it looked like a zoom lens bringing them closer. We were in a dead spot at the time and I had everything up trying to work with whatever small breezes were around.

"There was a dark patch in the sky off to the west. It seemed a long time coming. On a hunch sails were shortened, but when it hit us it was a grand-daddy. The working jib was too much but I did not dare try to get it off. The squall held for hours and still blew at dawn with gusts about 50 knots. Whoever has to do this (near a lee shore) should try to get the wx man to give latitude and longitude of the centre."

Others drawn into the drama included Lloyd VK2BLK, Jack VR4EE, Selwyn VR4BS, YJ8DS and VK4UG for relays. The wx improved, the cyclone turned off to the south, and they finally returned safely to Honiara.

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TRADE NEWS

R. H. Cunningham Pty. Ltd. announce the release by their principals, Kilovac Corp., of a new rugged high voltage, high current, vacuum relay listed as the KC-10. Capable of withstanding 15 kv. d.c. to 60 Hz. peak up to 75 amperes, this s.p.d.t. ceramic relay is the latest in metal-ceramic technology.

Commercial Kinks

This month sees the start of a brand new feature series in our journal. For some time it seems as if we have been in need of a column that caters for the interests of the much-maligned—the appliance operator. To be realistic most of us come under this heading, perhaps some of us only to a small extent, but commercially-made Amateur gear is of vital interest to us all. Even to those of us gifted enough—and of course with the time available—to construct our own gear, a knowledge of current commercial practice is quite invaluable.

It is hoped in future this column will give a monthly rundown on useful hints, modifications and other advice on transceivers, receivers, transmitters and any other items of gear that may be of general interest. The writer is also looking into the possibly of publishing a series of technical reviews on new equipment as it becomes available. Perhaps, too, readers might like to participate by letting me know about problems they might be having with their own station gear, or of any modifications they have made or would like to make.

Not to be all one sided, I would like to start off by making an offer to the reader. Over the years I have built up a fair collection of information, circuits, etc., on all types of Amateur equipment including some of the more popular disposals items. If you are in need of a circuit or perhaps some modification data, drop me a line c/o. "A.R." and I will be happy to help—if I can. At the time of writing, it looks as if the cost of copying an average circuit will be about 20 cents plus postage, however I suggest you write to me first and I will let you know if I have the information you need. **Do not forget a s.a.e.**

THE DRAKE 2B RECEIVER

No doubt all Drake 2B owners read with interest the 160 metre conversion article in Nov. 1971 "A.R." Believe me, it works like a charm. I got to work and converted my 2B in just about no time at all with first-class results. If you have not already done yours, here are a few hints that I am sure will help.

The 750 pF. trimmers mentioned in the article are not available in this country. The biggest I could find was 220 pF. Now if you parallel one of these with a 1200 pF. Styroseal capacitor, the circuits will tune up with about half the capacity of the trimmer. The author's estimate of 1500 pF. required seemed to be on the high side.

For the crystal I used one on 5.5 MHz. which gives an overall tuning range of 1.4 to 2.0 MHz., however the preselector tuning will peak only over the 1.8 to 2.0 MHz. range. The 5.5 MHz. crystals incidentally are commonly available from stock, as these are used as markers in t.v. sweep generators.

The whole job of converting the 2B only takes about 10 minutes, so go to it and enjoy some 160 metre listening for a change.

OLD RECEIVERS AND S.S.B.

S.w.l. friends and Amateurs often ask what they can do to improve s.s.b. reception on older receivers such as the BC348, AR7 and some of the earlier post-war models.

There are of course many answers to this question, probably ranging from a complete re-build down to many simple changes. Many of the factors required by an Amateur or even considered normal by him may not really be necessary for an s.w.l. Stability and selectivity cannot usually be improved beyond points that would fall well behind modern s.s.b. gear.

Probably the one thing that is most annoying in old receivers is the lack of an effective a.g.c. system. I have found that in most cases an audio-derived a.g.c. comprising one valve or a couple of transistors plus a couple of diodes built on a small sub-chassis will really make an old set perform on s.s.b. A product detector is not needed.

Next month we will continue this with a few suitable circuits for audio derived a.g.c. plus a few hints and modifications on some of the more popular s.s.b. transceivers.

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OVERSEAS MAGAZINE INDEX

Accessories: (1) "An Audio Tape-Controlled C.W. Keyer". (2) "Zero-Beat—Visually". (3) "Wide Range R.F. Millivoltmeter using Hot Carrier Diodes"; "An Instant F.M. Repeater for Emergency Use"; "'It'—It's the Real Thing", economy power supply (very handy for the average transceiver; some diodes could probably do with a better safety factor though); "A Simple Reverse Current Battery Charger" (VK3ASC is still not convinced of its effectiveness on dry cells. Any comments from readers will be appreciated!). (6) "Crystal Tester—Calibrator"; "Class A Audio Amp." (15-20w. output). (8) "A Relay Driver for use with Solid State Keyers"; "The W7YGN Contest Keyer".

General: (1) "CQ" Reviews: "The 'Standard' SR-C826M 2M Transceiver", "Heathkit HM-102 R.F. Power Meter" and Dycomm Model PSU-13 V.H.F. Scaler"; "Amateur Radio and the 1971 I.T.U. Space Conference"; "The Second Coming of the Argonaut" (a story about the development of a portable s.s.b. rig by Messrs. 'Ten-Tec'." (2) "Satellites in the Amateur Radio Service"; "CQ" reviews "Heath IM-105 V.O.M.". (3) "Signalling Through Space Without Wires"; "How to be an Amateur"; "Converting the A.C./D.C. for WWV"; "Fail Safe Switching". (6) "Measurement of P.E.P." (7) "Frequency Multipliers"—old (valve) and new (solid state) designs. (8) "Voltage Multipliers"—half and full wave types with up to eight times voltage multiplication; "High Frequency Atmospheric Noise".

Other: (3) "Meteor Showers on Prediction Accuracy"; "Simple Digital Remote Control Circuits". (5) "Adjustable H.T. Power Supply"; "Vehicle Noise Suppression for Mobile Operation"—very complete and applicable particularly to the Morris Minor 1000; "Beam Direction Indicator". (7) "V.H.F. F.M. Channel Scanner"; "V.H.F. Co-axial Filter"; "Easy to Build IC Function Generator"; "Low Cost 'Instant' Printed Circuit Boards"; "A.C. Power Line Monitor". (8) "Transverter for 1.8, 21 or 28 MHz."—driving transceiver is on 3.5 MHz.; "Fabrication of Printed Circuit Boards"; "How to Make a Jewish Movie"—the experiences of a Hollywood Ham in Israel; "Radio Robert"—a 1925 story of radio in a logging camp.

Receiving: (1) "A Simple IC F.M. Detector"; "The Motorola 80D on 225 MHz. Part 2 Rx"; "An IC Pre-Amp. for 6 Metres". (2) "A Different Approach to Front-End Design"—double conversion with a single local osc. (4) "Using the SL630"—a Plessey IC for a.f. stages. (8) "Two New ICs for the Receiver Builder"—these are R.C.A. types.

Transmitting: (1) "Build a 50w. 1934 Style Transmitter for Fun"; "F.M.—Building a Phase Modulator for A.M. Gear". (2) "Sideband with the Ranger"—modifications to the popular Johnson Viking Ranger a.m. tx to d.s.b.. (4) "A Transmitter for 28 MHz. with Class D Modulator"—solid state; "A Stable V.F.O. for 2M with F.M." (5) "813s in Linear"; "Transmitting Antennae for Small Gardens—the helical whip on top band. (5/6) "Personal Portable for Two Metres"—Pt. 1 in (5), Pt. 2 in (6). (6) "VXO for 2 Metres"; "Build up of a Transmitting Layout," Pt. 2; (Pt. 1 Sept. issue). (7) "R.F. Clipper for the Collins S Line"; "High Performance 144 MHz. Power Amplifier"—1000w. c.w. to a 8877. (8) "A C.W. Man's Kilowatt," Pt. 1—240w. into parallel 6146Bs.

KEY

(1) "CQ" Nov. (2) "CQ" Dec. (3) "73" Oct. (4) "Radio Comm." Oct. (5) "Short Wave Magazine" Oct. (6) Ditto Nov. (7) "Ham Radio Aug. (8) "QST" Oct. All 1971.—VK3ASC.

Antennas: 1, "A New Slant to a Tilt-Over Tower", "Notes on the Cubical Quad Antenna"; 4, "Convert your 7 MHz. Cubical Quad to All-Bands", "The Indoor Quad"; 5, "A Low-Cost Tilt-Over Tower", "Radiated Power Patterns for Multiband Dipoles"; 6, "A 5 over 5 Stacked Yagi Array for 50 MHz", "A Forty Metre DDRR Antenna"; 12, "How to fit a Rotating Mast in a Tower".

General: 3, "The N.Z. Time Service"; 4, "The Squared Ell" (discusses RTL and TTL circuits), "SCR Mobile Theft Alarm"; 5, "AC Operated Regulated DC Power Supplies for Transistorised Rigs", "SWR—What does it mean?", "Amateur Radio—Serving and being served"; 7, "Using the SL640 ad SL641 Double Balanced Modulators"; 8, "The G3TVU/G8BDO 20 MHz. Digital Freq. Meter—Random Comments"; 9, "Freq. Dividers for SSB Generators", "Evaluating Semiconductor Diodes"; 11, "Let's use those Junk Box Capacitors"; 12, "Humidity and Ham Radio", "Printed Circuits the Easy Way".

Receiving: 5, "A WWVL Receiver", recent equipment—"The Randall Scrubber"; 6, "Threshold Detectors in a CW Audio Filter"; 8, "Adding a switchable gain control to a KW201 Receiver", "Ideas for Noise Limiters for AM Receivers"; 9, "Diversity Receiving System", "General Coverage Receiver Freq. Calibrator"; 11, "Another Approach to the Receiving Problem"; 12, "A Miniature SSB/AM/CW Receiver for Monitoring Purposes".

RTTY: 9, "Electronic Speed Converter for RTTY Teleprinters (60, 67, 75, 100 w.p.m.)"; 10, "An Audio Freq. RTTY Converter".

Slow Scan Television: 3, "Slow Scan Television—A New Frontier in Amateur Communications"; 5, recent equipment, "Robot Research Model 70 SSTV Monitor and Model 80 Camera".

Transmitting: 4, "More Power from 6146s" (stiffening the bias and screen voltages permit safe achievement), "Morse Memory"; 5, "Interpreting SSB Linear Amplifier Peak and Average Power", "How to tame a Solid State Transmitter"; 6, "15w. Output Solid State Linear Amplifier for 3.5-30 MHz.", "A CW Man's Kilowatt", S9er, Part 2" (Part 1 Oct. '71 issue), "Pi and Pi-L Network Design for Amplifiers", "Tone Generator for Netting of SSB Stations", 8, "The Yaesu Musen FF50DX Low Pass Filter"—review; 9, "Miniature Solid State VFO", "Integrated Circuit SSB Speech Processor" (18 dB. compression, 4 dB. intelligibility threshold improvement with no distortion).

Transceivers: 2, "The Southland Companion" 80-40 mx s.s.b., a.m., c.w., 10w. input all solid state; 5, "The HW-100 and ½"—installs c.w. filter; 9, "AM Two Metre Transmitter-Receiver".

VHF/UHF/Microwaves: 2, "VHF Co-ordination Committee Report, including ZL 144 MHz. Band Plan"; 4, "73" tests the "Gladding 25 FM Transceiver"; 6, "Some Thoughts about 220 MHz. Operation", "Using the ATS-1 Weather Satellite for Communications"; 7, "Just Look at the Weather" Part 1, the reception of automatic picture transmissions from satellites; 8, Part 2 of above, "So you can't afford a Receiver" (straight forward Rx using old FM tuner); 8, "The G3EEZ 9 cm. Converter", "Microwaves, 1000 MHz. and up"; 9, "Push to Talk for a Styleline Telephone" (touchtone on translators), "High Power Line Amplifier for 220 MHz."; 10, "Digital Calibration-Spectrum Generator", "Improvements to the DC9MD Mini Walky-Talky", "Stripline for VHF and UHF", "Simple 70 cm. Transverter for Portable Equipment", "Stripline Bandpass Filter for 70 cm.", "A Simple Modulator for FM Transmitters", "A Transistorised Power Amplifier for two metres using the 2N3632", "Frequency Multiplication with High Spurious Signal Rejection".

KEY: 1, 2, 3: "Break-In"—Oct., Nov., Dec.
4: "73"—Dec.
5, 6: "QST"—Nov. Dec.
7, 8: "Radio Comm'cation"—Nov., Dec.
9: "Ham Radio"—Dec.
10: "VHF Communications"—Nov.
11, 12: "Radio ZS"—Oct., Nov.

All are 1971 issues.—VK3ASC.

DX

Contributing Editor: DON GRANTLEY,
P.O. Box 222, Penrith, N.S.W., 2750.
Times: G.M.T.

When compiling a page of this nature, one is often undecided as to just what is necessary and what can be omitted. I tend to omit news of future operations unless I have the information well in advance of the scheduled date, usually advance news comes with only a few weeks notice, and by the time it would reach the reader, the operation is over. QSL information, however, is of vital interest, particularly in view of the increased interest in the various award programmes now in operation by various clubs, societies and individuals. Most of these require the cards to be in possession of the applicant, and this is one reason why concentration on this phase of DX is given.

On the subject of QSLs, the poor return is often a subject of concern to the award hunter. I have a list of VK stations from whom OK-3CGP is awaiting calls. Knowing many of the people listed, I would say that they have sent their cards and these have been held up in the Bureau, but in case any reader has worked this chap and can assist him with a card, then he would be pleased to receive one via the Bureau. And whilst on the subject, I note in October "QST" that 9G1WW, whose policy it is to answer QSLs upon receipt, finds it difficult to do so through lack of information on the cards he has received. G-lander points out the fact that it is advisable to write the name of the month in full instead of using the numeral because of the different system used in various countries. For instance, 1/6/71 to us indicates the first of June, but to many countries including the U.S.A. it indicates the sixth of January. To a busy DX station or manager this takes time to sort out, and they just return them to the sender. Finally, on the subject of QSL returns, my highest percentage of incoming cards are from the JA and UA Bureaus.

One of our best known and most capable s.w.l's, Chas Thorpe of Rockhampton, who has been a member of the VK4 Division for many years, has just returned home after a spell in hospital where he underwent surgery. I am sure his many friends wish him a speedy return to health, and look forward to his return to full activity.

A very welcome note to hand from Lee VK-2AXK who has been around the DX bands for quite a while. He reports good conditions into Europe on 20 metres in the early morning, and worked ZS6GP/M, EQ2WB, VQ9R and 7Z3AB at around 1500z. Amongst stations he has worked around 1100z were VQ9WES whose manager is WA3OTV, HS0UDN, YB9UA/0 (Box 2761, Djakarta) and ZP5TT. Lee also lists VQ9R as Box 193, Mahe, Seychelles Is., and 7Z3AB as Box 2486, Dhahran, Saudi Arabia.

Jack VK3AXQ lists a number of stations worked, together with their QSL arrangements where possible. They are EQ2BQ who is normally EP2BQ, several VR2s using the new 3D prefix, YN1RSJ, VE1KG (Box 663, Halifax), C20ED (Box 32, Nauru), VP7DL who says QSL via R.S.G.B. or direct to call book address with 2 IRCs. Also VP2VAG (QSL to VE3GMT). Jack also advises me of the proposed TI9IJ operation by TI2IZ on 14th Feb.

George VK3ASV/T down in Morwell reports a very good opening on 10 metres when he worked several JAs, RA0ABE, RA5EDY, 9K2KI, DL6RK and HA5EG. Good going for 10 mx at this time of the cycle.

Special prefixes in use recently include C20 used by Nauru operators on national holidays (but see addendum.—Ed.) PJ0AT (manager W3RNQ), PJ8AA (manager W2BBK), and PJ9AD (manager W2VIA). WY3MCA was the special call used over the period Jan. 23-30 from Severna Park, Maryland, during Y.M.C.A. week. QSL details not available at this time. JD6EA will be the new call of KR8EA from Jan. 1, while JH6 prefixes are now on the air. 9H3B now active, QSL to VE3MR. 9H3WPD was a special station operating for World Peace Day on Jan. 1. Not a well publicised one was WB4TON, Hollywood Radio Club operations day Jan. 8, gave W4OZF as QSL handler with a special QSL for working the station on c.w. and s.s.b., and a special certificate for five-band operation of the station.

Two other special stations in the States were WM1NSA, QSLs for which go to Box 310, Boston, Mass., and WO8HIO from the Ohio State Fair, QSLs to WB8CWD. PE2EVO, Eindhoven permanent exhibition station at Eindhoven is of interest to some. For five-band operation of this station, your QSL will be affixed to the honour roll at the exhibition provided you send them your QSLs, and receipt of their QSL entitles the holder to free admission to said exhibition.

Finally, VB1MSA is a new prefix of which I have no information. YB3AAY, YB9AAT and YB0AAH are all lined up for the prefix hunters, their managers being W3BRB, W4YUU and W5MVP. ZL1JAM early this month at the National Scout Jamboree, Sth. Auckland, cards go to ZL1BBH who will QSL 100% with a special card. I might add that this station was in great demand and these operations catering for such events should be aided and encouraged by all of us as a possible way to assist the youth of today in following a hobby which will be not only interesting, but more than beneficial in guiding them away from the more unsavoury pastimes which are being presented to them by unscrupulous sponsors.

Tanzania recently celebrated her 10th anniversary of Independence, the 5H5 prefix was used by Amateurs for this occasion and the QSLs for all using this prefix go to 5H3LV, Box 23169, Dar-es-Salaam, Tanzania.

There has been an increase in operations from YK. YK1AS is the training station for YK operators and is QRV on 14 c.w. YK1AA Rasheed, and YK1OK Jenda are most active; the latter, originally licensed for 80, 40 and 20 operation only, can be identified by a slightly chirpy signal, however she was due to go QRT at the beginning of March. QSL to YK Bureau.

Operation from Majuro Is., which counts only as KX6 Marshall Is. but as OC29 for IOTA chasers, is currently active by KX6NB, KX6NP and KC6CD/KX6 Rudolf Aliven, Box 285, Majuro Is., Marshall Is., 96960. Other K prefixes of possible interest which are at present active are KB6DA, active until end of Feb., manager is W6CUF; KZ5EK, QSL to DL1HH; KC6JC from the East Carolines, managers for Cav are W2GC and W2RDD, and last but not least, Swan Island is operational again, this time by W6MTE/KS4 who has been using 14035 c.w. and 14325 s.s.b., also 7001 c.w. He will have a KS4 call by the time this issue of "A.R." is released, and QSL data is not yet available.

SK7BK is the call of the Freebooters Radio Club who hold their QSO parties on the third Sunday in Jan. and Sept. on 3670 s.s.b., and the third Sunday in March on 14215 s.s.b. SK7BK uses the frequencies listed above, but the other club stations use 3700-3800, and 14230-300. The Freebooters statuette is given to all who work four members of the club plus the club station, during the party QSOs with up to two statuette holders (who are classed as honorary members) may be counted toward the award, but at other times it is necessary to work the club station first, and only SM7 members may be counted. March 19 is the date of the next party which is on 20.

Results of the 1971 "CQ" WPX s.s.b. Contest have been announced, no VK calls appear in the short list which I have here.

WA1ARF/KS4, through his QSL manager WA6MWG, wishes to make it known that the logs covering the period June 22 to July 21 were packed in Bob's trunk when he left the island and the QSLs for that period will be delayed until Bob mails them on from PJ land where he is at present.

This one has not appeared in the newssheets to my knowledge, but JT1AM has been booming in here regularly on Saturday evenings just inside the 20 metre band with a 599 signal. He has been swamping the band at times, and not getting too many takers other than an odd JA. This chap is a good operator and his transmitter does not have the poor T7 note which characterised the earlier JT stations. He gave the normal QSL address, Box 639, Ulan Bator.

YN0HSM is the call sign to be used by YN1HSM over the contest week-end of March 4-5, then during the WPX Contest on March 25-26 he will use HT0HSM. Freq. will be 7261 s.s.b. 0001-1300, 14276 s.s.b. 1300-2359. He asks for all QSLs via WA8TDY. Also on the air for the event will be YN0YN which is the official club station for the C.R.E.N. club which QSLs via Box 925, Managua.

Recent operation by ZD3Q now completed after over 6,500 QSOs, 579 on 80, 1266 on 40, 1643 on 20, 1862 on 15, and 1192 on 10, many stations being worked on all five bands. QSL mauager OZ3PO asks that contact do not get too impatient for their QSLs as there has been a delay with the printer, and they should be available by the end of Feb. or early March.

Some news from 5Z4. 5Z4MX QRV daily, and at week-ends on 14300 s.s.b. 1800, 21300 s.s.b. Sundays 2100 and on 28600 s.s.b. Saturdays and Sundays at 1500. His manager is DK3IR. 5Z4NM will have completed his operation by the end of Feb., he is DJ3YU and asks that cards be sent to his home QTH. 5Z4MO is currently active, having been noted on 3799 s.s.b. at 2014.

VE3GNM wishes to make it known that he is no longer manager for CR6CA due to the long delay in logs reaching him, cards should now be sent direct or via the CT Bureau.

If you worked 7Q7PAX during the 1968-69 period and have not yet had your contact confirmed, W3YEK/2 who was the operator for the period has the logs and will be pleased to confirm from his home address.

W3HNK has terminated his QSL handling for UD6, UF6, UG6, UL7 and UO5 regions, but can still assist with cards from UC2, UH8, UI8, UJ8, UK8 and UM8, also he handle all QSLs for Crete operation of SV0WEE for last Sept. I do not know just what his arrangement is in regards to the U.S.S.R. call areas listed above, but I suggest that an air letter to him before sending cards may be a good idea. QTH is J. Arcure, Jr., Box 14, Norwood, P.A., 19074.

Finally as far as DX is concerned, I will briefly give a rundown of other interesting DX currently active. BV2AB usually on with XW8AX, manager is K4ASI. CE9AR on from Deception Is. in the Sth. Shetland group, Julio CR4BC still causing an odd pileup when on, QSL to Box 36, Sao Vicente. CT2AO, manager WB4KVN. EA8GK will arrange skeds through manager K6GAK. XT2AE QRV 21210 s.s.b. Sundays 1000 and 14170 Fridays at 1700, breakers to wait until after sked, manager is DJ9KR. 4W1AF skeds manager DJ9KR on Sundays at 0900, also QRV 14265 Fridays at 1530z.

A.R.R.L. QSL BUREAUS

There have been several important changes in the locations of several A.R.R.L. Area QSL Bureaus, namely the W4/K4, W8, W0, the latter now being split into three sections covering W0, WA0, K0, WB0, WN0. Minor address changes in W3, WA4, W9 and KZ5. I do not have room to list them all here, but they are in the Nov. issue of "QST".

My thanks this month to Amateurs and S.w.l's listed in the text of this page, and I acknowledge copy from the Geoff Watts DX News Sheet, and "QST," "73," and good hunting, de Don L2022.

ADDENDUM de H. R. Evertick: Visitor to Melbourne recently was David Costello, C2IDC, now returned to Nauru. David lists only four calls in use on Nauru at present as himself (s.s.b.), Bob Lear C21AA (VK2ASZ) on 20 s.s.b. and 6 mx, and VK3TL using calls C20ED as a school club call, and C29TL (on s.s.b.) as his own call.

NEW CALL SIGNS

NOVEMBER 1971

The Publications Committee have decided to print only new call signs henceforth. The following is the first list, November, 1971. Note that VK1 and VK2 cover the period from September to November, 1971.

VK1GM—G. M. Percival, 18 Weld St., Yarralumla, 2600.
VK1GT—W. E. Tiller, 23 Carrington St., Deakin, 2600.
VK1MS—M. S. Stark, 17 Clisby Close, Cook, 2614.
VK1RA—R. A. Angrave, 10 Nicholas St., Higgins, 2615.
VK1VN—V. H. Norrish, 21 Carruthers St., Curtin, 2605.

VK2II—J. L. Martin, 37 Elimatta Rd., Mona Vale, 2103.
VK2JN—J. F. Barker, 51 Beale St., Georges Hall, 2198.
VK2RR—D. E. Krull, 2/43A Grand Ave., Westmead, 2145.
VK2WN—A. S. G. Fenton, 26 Muttama Rd., Artarmon, 2064.
VK2ZI—F. Bridgewater, 31 William St., Broken Hill, 2880.
VK2AJF—J. B. Dennis, 246 Wollongong Rd., Arncliffe, 2205.
VK2ALH—A. L. H. Bennett, 21 Monterey Rd., Bilgola Heights, 2107.
VK2AOZ—L. H. Ferris, 12 Toomevara St., Kogarah, 2217.
VK2ARM—R. S. McEvoy, 61 Tuffy Ave., Sans Souci, 2219.
VK2AUP—R. J. McHardie, 21 Oldfield St., Warilla, 2528.
VK2BBE—N. E. V. Quinn, 639 Hodge St., Albury, 2604.
VK2BBX—L. R. Carter, 31 Fairfowl St., Dulwich Hill, 2203.
VK2BDT—D. S. Thompson, "Glenelg," Golspie, 2580.
VK2BFI—J. H. Ginsberg, 1/282 Belmore Rd., Riverwood, 2210.
VK2BII—E. W. Cleburne, "Cuttagee House," Bega Rd., Bermagui South, 2547.
VK2BLZ—L. L. G. Meek, 47 Turner Rd., Berowra, 2081.
VK2BNJ—C. B. Murphy, 21 Nicholson St., Kempsey South, 2440.
VK2BOE—S. R. Hutchinson, Y.M.C.A., 325 Pitt St., Sydney, 2000.
VK2BQQ—K. Nad, 1/21 Lavender St., North Sydney, 2060.
VK2BRX—P. W. McNabb, 1 Bellevue Cres., Cardiff, 2285.
VK2BRZ—S. J. Rigney, 152 McKay St., Nowra, 2540.
VK2BWJ—G. Wood, 11 Clarice St., Lithgow, 2790.
VK2ZAY—B. J. Harwood, 38 Dalton St., Boggabri, 2382.
VK2ZCF—T. R. Harris, A.E.M.S. Radio, 2AD R.A.A.F., Richmond, 2755.
VK2ZFF—S. J. Blair, 17 Deborah Pl., Eastwood, 2122.
VK2ZKK—G. Rosam, 33 Cheshire St., Berkeley, 2506.
VK2ZOF—G. D. J. Barrett, 45 The Causeway, Maroubra, 2035.
VK2ZOG—W. J. Arnott, 176 Michael St., Jesmond, 2299.
VK2ZOI/T—J. C. Bishop, 153A Galston Rd., Hornsby Heights, 2077.
VK2ZOJ—G. N. Brown, 141 Rae Cres., Kotara, 2288.
VK2ZOM—G. J. Gillam, 20 Mt. Keira Rd., West Wollongong, 2500.
VK2ZOP—E. C. Brockbank, 4 Lynette Pl., Kotara, 2288.
VK2ZOQ—I. G. Repin, 24 Bennelong Cres., Bellevue Hill, 2023.
VK2ZOS—K. J. Scully, 179 Denison St., Hamilton, 2303.
VK2ZPU—G. J. Gray, 42 Gould Ave., Petersham, 2049.
VK2ZQK—R. A. Evans, 17 Burbar Ave., Kirrawee, 2232.
VK2ZQO—W. G. Kennedy, 7 Bass St., Kingsford, 2032.
VK2ZQP—C. J. Humby, 851 Squadron R.A.N. A.S., Nowra, 2540.
VK2ZTB—R. L. Harrison, 1 Huntleys Pt. Rd., Huntleys Pt., 2111.
VK2ZTE—G. D. Tickner, 34 Lowry St., Cardiff, 2285.
VK2ZTZ—R. J. Rodrick, 8/23 Orpington St., Ashfield, 2131.
VK2ZUS—G. W. Francis, 53 Falconner St., West Ryde, 2114.
VK2ZUV—P. J. Mason, 11 Villowra St., Auburn, 2144.
VK2ZUZ—C. J. Minahan, 5/23 Bridge St., Waratah, 2298.
VK2ZWA—R. W. Wood, 17 Kennedy St., Rutherford, 2320.
VK2ZWP—R. R. Black, 62 Auburn St., Sutherland, 2232.
VK2ZXX—D. G. Swan, 38 Finlayson St., Lane Cove, 2066.
VK2ZYG—W. J. Collison, 20 Fotheringham St., Wingham, 2429.
VK2ZYH—H. Ruessel, 38 Engadine Ave., Engadine, 2233.
VK2ZYI—K. E. Curle, 24 Beach Dr., Woonona, 2517.
VK2ZYJ—L. J. Grant, 19 Reif St., Parkes, 2870.
VK2ZZA—M. E. Johnson, 11 The Lee, Castlecrag, 2068.
VK2ZZC—D. A. Griffiths, 130 Stewart Ave., Hamilton South, 2303.
VK2ZZE—D. N. Kinny, 4 Scenic Cres., Kyle Bay, 2221.
VK2ZZF—N. A. Jays, 27 Grover Ave., Cromer, 2099.
VK2ZZG—G. T. Urquhart, 338 Mowbray Rd., Chatswood, 2067.
VK2ZZH—H. E. Wiltshire, 30 The Expressway, Albion Park, 2527.
VK2ZZK—N. Lean, 3 Eight St., Boolaroo, 2284.
VK2ZZL—G. L. Thorpe, 185 Park Ave., Kotara, 2288.
VK2ZZT—R. J. Swallow, 1 Chauvel St., North Ryde, 2113.
VK2ZYE—D. J. Longmore, 28 Spring St., Wagga Wagga, 2650.

VK3XS—K. V. Brayshaw, 89 Roslyn St., Burwood, 3125.
VK3ZB—I. W. Jay, 80 Grandview Gr., Rosanna, 3084.
VK3AEM—M. C. Elias, 20 Thoresby Gr., Ivanhoe, 3079.
VK3AJL—J. L. Wright, 72 Ramsden St., Clifton Hill, 3068.
VK3WIA/R4—Wireless Institute of Australia, Residence of G. L. Long, Eyre Rd., Mt. Dandenong, 3767.
VK3YGE—R. A. Morrison, 7 North Gateway, Werribee, 3030.
VK3YGF—P. N. George, Lot 1, Middle Rd., Pearcedale, 3912.
VK3YGI—E. G. Allchin, 26 Ashby St., Trafalgar, 3824.
VK3YGJ—H. R. Hardy, 1 White Pde., Churchill, 3842.
VK3ZEM—J. K. Ralph, 2/24 George St., Reservoir, 3073.
VK3ZHD—D. R. Hurley, 6 Abercrombie St., Balwyn, 3103.
VK3ZHL—B. R. Bathols, 3 Connewarra Ave., Aspendale, 3195.
VK3ZNQ—M. T. Joiner, 6 Pohlman St., Romsey, 3434.
VK3ZRD—D. S. Fisher, 9 Birdwood St., Box Hill, 3128.
VK3ZUN—R. E. Sherlock, 429 Princes Highway, Morwell, 3840.

VK4CY—C. W. McCamley, Main Rd., Maroochydore, 4558.
VK4JZ—L. F. Schmidt, Station: 28 Major St., Roma, 4455; Postal: P.O. Box 403, Roma, 4455.
VK4VU—R. M. Luther, 74 Mornington St., Alderley, 4051.
VK4VV—L. L. Luther, 74 Mornington St., Alderley, 4051.
VK4CAW—K. P. Warchot, Station: 1 Chester St., Thursday Island, 4875; Postal: P.O. Box 132, Thursday Island, 4875.
VK4ZAD—R. A. Elliott, 306 Bennetts Rd., Norman Park, 4170.
VK4ZBM—R. G. Blackmur, 35 Palm Ave., Holland Park, 4121.
VK4ZGK—G. C. King, 149 Park Ave., Eagle Junction, 4011.
VK4ZJZ—J. B. Grimes, Wirra, Banana, 4715.
VK4ZNW—N. J. Walden, 8 Kruger St., Booval, 4304.
VK4ZWO—T. W. Mitchell, 4 Thurso St., North Booval, 4304.
VK4ZWT—T. P. Walters, 11 Violet St., Toowoomba, 4350.

VK5IR—O. A. Isaachsen, 24 Seafield Ave., Kingswood, 5062.
VK5TH—T. R. Hutchesson, 45 Swallow Dr., Mt. Gambier, 5290.
VK5XQ—M. L. Parnell, C/o. Superintendent, Radio Branch, 30 Flinders St., Adelaide, 5000.
VK5ZAC—A. C. Gordon, 56 Euston Tce., West Croydon, 5008.
VK5ZGZ—R. W. Pitcher, 65 McKenzie Ave., Seaton, 5023.
VK5ZHT—H. G. Tremethick, 162 Winston Ave., Edwardstown, 5039.
VK5ZKT—I. H. Laughton, 8 Methuen St., Prospect, 5082.
VK5ZMB—M. J. Bloodworth, 16 Pamela Dr., Para Hills, 5096.

VK6EJ—E. J. R. Cowles, 10 Harrison St., Bluff Point, 6530.
VK6EN—J. Wippo, 1 Yalberee St., Newman, 6753.
VK6CIL—P. H. Long, Station: Portable; Postal: 337 Stirling Hwy., Claremont, 6010.

VK7ZPH—P. N. Heckscher, 4 Huntley St., Montrose, 7010.

VK8FB—F. D. Baarda, 18 Phillip St., Fanny Bay, Darwin, 5790.
VK8ZZ—G. Heming, 82 Hartley St., Alice Springs, 5750.

VK9ZDT—D. Tangey, C/o. B.C.P. Power House, Loloho, Bougainville, N.G.

VK0KA—K. B. T. Andrews, Macquarie Island, Antarctica.
VK0ZVS—A. G. Le Grip, Macquarie Island, Antarctica.

PREDICTION CHARTS: READY-READER

Based on I.P.S.D. Series P for March 1972. Times are local for first-named place. For further explanation please see DX Notes Nov. "A.R.," p. 21. Where no plus or minus hours are shown there is either a sharp peak or the ALF intrudes. VK4(T) represents Townsville, VK0 is Mawson.

28 MHz.:

VK5	KH6	(1230)
VK2	W6	1100
VK4(T)	KH6	—6 1300 +3

21 MHz.:

VK5	KH6	—6 1230 +7
VK2	G (S.P.)	—2 1900 +1
	(L.P.)	1900
	PY	—1 1000 +1
	ZS6	—1 1600 +4
	9G1 (S.P.)	1600–2100
		—2 1100 +1
	(L.P.)	—2 0800 +5
		1800 +1
	W6	—5 1100 +3
	8P	—4 1230 +5
	VE1	—2 0800 +3
VK3	W1	—2 0800 +2
VK6	G (S.P.)	—4 1800 +2
	W1	—1 0700 +1
	VK0	1700

14 MHz.:

VK5	KH6	—1 0330 +2
VK2	G (S.P.)	1700–0600
	(L.P.)	—2 0700 +3
	W6	0100–0600
		1300–2200
	9G1 (S.P.)	0700–1200
	(L.P.)	1700–2000
	PY	0600–2300
	VK6 (2F)	0700–2000
	ZS6	—3 1600 +7
	8P (S.P.)	1200–1800
		2100–2400
VK3	W1	2200–0300
	VK8 (2F)	—6 1400 +6
VK6	G (S.P.)	1900–0400
	W1	2000–0800
	VK0	—8 1700 +4

7 MHz.:

VK5	KH6	1730–0230
VK3	W1	—3 2200 +2
VK2	G (S.P.)	—3 0400 +3
	W6	1700–0100
	9G1	—2 0500 +2
	ZS6	—3 0400 +3
	8P	—2 1900 +2
	VK8	1900–0600
VK6	G (S.P.)	—4 0400 +3
	W1	—1 1900 +2
	VK0	2000–0700

VHF

Contributing Editor: ERIC JAMIESON, VK5LP,
Forreston, South Australia, 5233.
Closing date for copy 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	52.525	VK0MX, Mawson.
	52.100	VK0ZVS, Macquarie Island.
	53.839	VK0PF, Casey.
VK3	144.700	VK3VE, Vermont.
	144.925	VK3ZQC, Moe South.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4VV, near Towoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VE, Bickley.
VK7	144.900	VK7VF, Devonport.
VK9	144.600	VK9XI, Christmas Islan.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
W	50.091	WB6KAP, U.S.A.
KH6	50.101	KH6EQI, Hawaii.
	50.015	KH6ERU, Hawaii.
HL	50.100	HL9WI, South Korea.
ZK	50.100	ZK1AA, Cook Island.

A few changes to the beacon list this month. Firstly, the VK0 beacons should be treated with caution. It is unlikely any of these are operating on a permanent basis, and with Phil VK0PF returned to Australia at the end of January, nothing is known of the future of his station. Further interest in the Antarctic area will come with the next DX season at the end of this year, and renewed activity will no doubt see some contacts between VK and VK0.

A new beacon has appeared in Victoria, this time in the Eastern Zone, being VK3ZQC on 144.925 at Moe South. The new call sign will be advised when received. It is understood the VK4VV beacon is still off the air during alterations to the keyer to accommodate a new call sign. While still dealing with those beacons, perhaps of doubtful operation for various reasons, if someone reads these notes in Carnarvon, W.A., and on Christmas Island, could a letter be sent to me advising if VK9XI and VK6TS are still operational please.

As these notes are being written the DX openings on 6 metres are becoming fewer, but at least they will give some operators a chance to relax. I mentioned last month what a great season it had been this year, and with the increasing use of s.s.b. and transceive techniques contacts will become more readily available under marginal conditions. It really does make a difference if you know the other fellow is on your frequency, and as such operation extends in greater numbers to 2 metres we will see more long haul DX on that band.

There has been quite an upsurge in the number of contacts made across the Southern Ocean to Albany on 2 metres. The 16th Jan. appears to have been one such occasion, when Trevor VK5ZTN in Mt. Gambier worked Aub VK6XY and Bob VK6BE with signals 5 x 5, later peaking to S9. Trevor also heard Stan VK6SS in Perth on c.w. at 519 and Leigh VK6WA heard at 5 x 6. These two latter stations did not hear anything from the East. Chris VK5MC at Millicent in the S.E. of S.A. also worked VK6XY and VK6BE and heard VK6WA. Subsequently Colin VK5DK in Mt. Gambier worked VK6BE on c.w. later. All this cannot be left to pass without mentioning Garry VK5ZK, who every now and again sneaks in a contact on 2 metres to the boys in Albany. Garry's intuition seems to tell him just when to come on the air, he takes a sample of what is offering, then wanders off to his pot plants!

All 2 metre activity certainly has not been confined to the Southern States. On 2nd Jan. 2 metres opened via Es to ZL2. Peter VK2TK and Doug VK2ZZI were portable in the Central West of N.S.W. for a VK2 V.h.f. Field Day. At about 1920 Peter heard N.b.f.m. signals from ZL2TGT. Both Peter and Doug worked him at good strength, also worked ZL3AR/2 and ZL4PF/2. Strangely, no Sydney stations worked ZL, although some of them, principally ZL3AR/2, were audible. Unsuccessful stations in Sydney at the time were VKs 2HO, 2ZRH, 211, 2ZAC. Roger VK2ZRH was heard in ZL but apparently the ZL in question could not resolve s.s.b.! Roger also reports that during the ZL opening he heard a VK4 Z calling on two. While all this was going on, Rod VK2ZQJ was inside sipping lemonade and watching t.v., tch! tch! Thanks to Mike VK2II for the last two paragraphs.

No notes would be complete without a mention of 6 metre activity, and there has certainly been some. Further to my mention last month of the hearing of VK0ZVS by Ross VK4RO, Bob VK3AOT advises others who have subsequently heard signals from the South to be Bill VK3ZWF and Ken VK3ZNJ. On 6th Jan. what is believed to be the first ever 6 metre contact within Antarctica occurred when Phil VK0PF at Casey Base worked WB5DYJ/KC4 at McMurdo Sound, due south of New Zealand. The distance was 1,200 miles, and signal reports 559 both ways. Phil was also copied at S5 by UA1KAE/1 at a Russian base in Antarctica. The Russians are not authorised to transmit on 6 metres and a 2-way contact was not possible.

A letter is to hand from Stan ZL4MB indicating his interest in propagation, particularly on 52 MHz. The matter has been discussed with Geoff VK3AMK with a view to trying to get enough Amateurs on both sides of the Tasman to keep skeds on Saturdays and Sundays. Stan mentions times being considered at present are between 0930 and 1030 E.S.T., with ZLs transmitting on even multiples of five minutes and listening for VK transmissions on the odd multiples. Anyone interested in following up these thoughts could either write to Stan whose address is: S. E. Andrews, 14 Como St., Maori Hill, Dunedin, N.Z., or Geoff VK3AMK, or you can mention the matter to me. Stan further advises having found a very good hill, 1200 feet a.s.l. for future portable operations. Such operations, particularly during the DX season, represent probably one of our best chances to work ZL4 (and that includes me, I have been waiting for years for that call area!).

During a 6 metre contact recently with Ross VK4RO, I learnt the boys in Townsville are gradually getting back to normal following cyclone Althea. Bob VK4ZRG lost both antennas and received water damage. Ron VK-4ZTK took his antenna down. Peter VK4QD, half way up Castle Hill, took a large share of the brunt of the cyclone and lost half his roof. Ross himself suffered virtually no damage, being 50 miles to the south at Ayr, although being without power for a period did not help the contents of his freezer and refrigerator, crammed full of Christmas goodies! Ross did remark on the excellence of the DX season and indicated he had had 380 plus contacts and his best seven days' score in the Ross Hull Contest came in excess of 3,000 points, that's pretty good scoring. He also mentioned JAs have been heard already on 28 MHz. at good strength and advises all to keep an ear on 52 MHz. during March and April at least for TE contacts.

EARLY WARNING FOR T.E.P.

The Ionospheric Prediction Service will be setting up an early warning system for trans-equatorial-propagation (T.E.P.) during the March-April equinox of 1972. From mid-March to mid-April warnings of increasing maximum observable frequencies, range spreading, etc., via F2 on various Australia-Japan circuits will be relayed on the I.P.S. h.f. net on 6815 kHz. upper s.s.b. I.P.S. expect to be able to give approx. half an hour's notice of evening type T.E.P. for Eastern States and approx. ¾ hour's notice for Central and Western States. Warnings will also be given of any likely extensions of T.E.P. further south via Es. (Thanks, Mike VK2II). So all you chaps with Amateur band receivers only had better get cracking and make yourself a converter to listen on 6815 kHz.

144 MHz. METEOR SCATTER

Rod VK2ZQJ and John VK5QZ for eight days from 27/12/71 to 3/1/72 conducted meteor scatter experiments on 144 MHz., distance 720 miles, commencing 0700 with the usual five-minute call and listen sequences. Roger VK2ZRH also took part. Apart from the usual pings, grunts, etc., some c.w. characters were heard, some with a definite ring about them, others of a "rattlly" sound. It was also believed definite evidence of some s.s.b. "grunts". Some of Rod's comments after the test period are worthy of passing on for your interest.

He believed the "rattlly" c.w. could have been f.s.k. He also believes continuous carrier transmissions should have been used at both ends initially to establish the circuit. Random pings are so short and as s.s.b. is about 80% silence anyway, ping recovery with s.s.b. would only be about 20% of the continuous carrier transmission recovery. Adelaide may be marginally too close for optimum M/S. 800 miles is suggested by a reference as a minimum. More r.f. power is needed in the circuit on 144 MHz. Requires a couple of sessions to get the ear organised!

Rod believes the experiments have been useful and rewarding in terms of appreciation of the problems involved, getting the feet wet, etc. Probably these would be the first organised skeds in VK for 144 MHz. M/S. Possibly as 1972 progresses others may become interested and thereby more substantial results obtained.

Rod's final paragraph is worth repeating: "After several months of 52 MHz. M/S and eight days of 144 MHz. M/S, seeing more and more s.s.b. on 52 MHz., and listening to DX s.s.b. ident. tapes, then as the man said—'v.h.f. bands never close, it is just that the operators go QRT'."

That's all for this month. Here is the closing thought: "It is easier to bear some abuse if I reflect, 'I do not deserve this reproach, but I do deserve others that have not been made'." 73, Eric VK5LP, the Voice in the Hills.

STOP PRESS.—At approx. 9 p.m., Monday, 7th Feb., during an opening on 144 MHz. between VK3 and VK7, a contact was made between Mac VK3YEO using a.m. and John VK7JV using s.s.b. John, being interested in s.s.t.v., mentioned that he had on tape various s.s.t.v. images to be used in setting up his monitor when finished. Very little effort was needed to persuade him to transmit a few frames which resulted in some of the best pictures ever received by VK3YEO who previously had done all his viewing on the h.f. net frequencies. This more or less confirms the opinion that v.h.f. bands without the problems of QRN and QRM are ideally suited to s.s.t.v. operation. Furthermore, is this a first on v.h.f.?

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

S.S.T.V. STANDARDS

Editor "A.R.," Dear Sir,

We strongly endorse the proposal of J. A. Wilson and A. H. McKibbin ("A.R.," Jan. '72) that temporary standards for s.s.t.v. be established in Australia immediately. However, we consider that it would be most inadvisable for Australia to adopt a 16.66 Hz. horizontal sweep rate in view of the fact that 15 Hz. is well established as the standard in North America. A horizontal sweep rate of 15 Hz., phase locked to the Australian mains, can be obtained by tripling from 50 Hz. to 150 Hz., followed by division by ten in an IC. Component-wise, this is no more complex than the divide by three used to derive 16.66 Hz. That is, the simplicity and timing stability proposed by Wilson and McKibbin can be equally well obtained at 15 Hz. from the Australian 50 Hz. mains. Since 98% of all countries employ either 50 or 60 Hz. power, the Amateur Service can easily achieve a world-wide standard for a mains-locked s.s.t.v. system by appropriate action now.

A single standard will have its most obvious technical benefit in simplifying the introduction of a long time constant, phase locked horizontal sweep in the receiver (i.e. a long persistence "fly wheel"). Since a mains-locked horizontal sweep at the transmitter is highly phase stable (better than 0.01% over an hour), the receiver can gain a considerable improvement in resolution and immunity to noise, QRM and drop-outs by being likewise phase stable. Thus having obtained sync. once, the receiver henceforth ignores the sync. information in the video signal. This immediately eliminates the sync. jitter (about 2-3% of the horizontal sweep) which is evident on even a good s.s.t.v. signal, or the completely spurious sync. pulse due to noise.

Since in such a system both the transmitter and receiver at the one station have equally stringent phase stability requirements, it is natural that they share the same time base generator. This obviously requires that both ends of a QSO use the same horizontal frequency. The advantages of locally phase locked reception will show up most clearly on DX s.s.t.v., and it is for this reason that it is important that regional differences of standard be avoided assiduously.

In view of the ease with which Australia could adopt the 15 Hz. standard, and in view of the future benefits that will accrue from a truely international standard, we strongly recommend that the 15 Hz. horizontal sweep rate, 120 line standard, be adopted throughout Australia.

—K. G. McCracken, VK3AXE.
J. G. Ables.

S.S.T.V.

Editor "A.R.," Dear Sir,

Please find enclosed list of 2-way s.s.t.v. stations worked at VK5MF using a K7YZZ flying spot scanner, just about as described by Louis Hutton and using one of three monitors built to date. One a tube job as described by Copthorne MacDonald in "QST," one as described by SM0BUO in "Radio Communication" (R.S.G.B.) modified in details, and another developed around a transistor version of Cop. MacDonald's tube monitor. The latter monitor contains about 34 transistors, 2 FETs, 2 unijunctions, and ten or so diodes, continuous raster.

Also there is under design a fairly neat solid state monitor showing promise, using noise immunity gates V and H. continuous raster, electromagnetic scanning, etc., by one of our local technicians.

At the moment here the continuous raster is favoured, but a perfected circuit has not been found for monitors.

I have not tried Mike Tallent's Mark I. or II. monitors here.

I enjoyed your "A.R." story of course and have had some starters to help in Adelaide.

—Alan C. Smythe, VK5MF.

[The list of 2-way s.s.t.v. contacts on 14 MHz. is not printed in full, but contains numerous Ws, ZLs, VEs, and several out of the ordinary s.s.t.v. QSOs as SM5RQ, 9Q5BG, 6Y5PB, XW8AW and HR2HH.—Ed.]

INTRUDERS

Editor "A.R.," Dear Sir,

Intruders are a continuing and increasing nuisance on Amateur frequencies.

The accepted procedure for their elimination involves, first, a positive and meaningful identification (often impossible). This is followed by a lengthy bureaucratic process of uncertain outcome involving both the P.M.G. authorities here then their counterpart in the country concerned—even assuming that the country is a signatory to the I.T.U. which frequently is not the case.

Therefore the suggestion of Alf VK3LC ("A.R.," Jan. '72) to form a "QRM Brigade" to call CQ on the intruder's frequency deserves close attention. Many may be sceptical of the effectiveness of the procedure. But we are assured by those who have tried it, even solo, that the method often works and the offending station moves off frequency to avoid QRM. An added attraction is that it affords emotional relief to the anger many feel against intruders on our bands. If effective, a vast bureaucratic obstacle may be neatly by-passed.

Here in VK7, Alf's suggestion has been widely discussed and we have Federal approval for our suggestion that the letters (or words) "IW" be included between each CQ. This has three advantages: (1) It clarifies the special meaning of the CQ; (2) It is an invitation for others to net on frequency and add their voices; (3) If widely adopted could be a deterrent to stations planning to operate on Amateur frequencies.

No objection will be made by the authorities to the employment of this procedure.

—Ian Pearson (VK7 Intruder Watch).

JUSTIFYING AN EXISTENCE

Editor "A.R.," Dear Sir,

Mr. Peter Williams, VK3IZ, in a letter to "A.R.," Jan. '72, points out that the most vital issue confronting Amateur Radio, is that of justifying our place in the spectrum. This should be our present concern and not Novice licensing. It is pointless, he says, pursuing the latter, until we have proven our case for retaining the bands we now possess.

No one would argue that our survival is of prime importance, but I disagree with the deduction re N.L.; in fact, I regard this part of his letter as unfortunate, as it is likely to create the type of thinking that would encourage those who desire to oust us from our present frequency slots. The reasoning of VK3IZ could be likened to a young married couple saying, "we will produce no children until their security can be assured." There is no such happy state as a guaranteed security, just as no sound case can be made out, to justify the existence of A.R., ad infinitum, on the bands.

History shows that numerically fragile groups, particularly if they have little or no bargaining power, are usually the more easily disposed of, by larger antagonistic pressure groups. The R.S.L., Auto Associations, Trade Unions, etc., etc., all endeavour to increase membership, for obvious reasons. The permitted scope of our activity in Australia is restricted and it allows little or no lobbying power but there is strength in numbers. It must be remembered that we are in no way, a specialist group.

Numbers are also needed to deter the free-wheeling intruders, who illegally use our bands. A 10w. Novice won't have much impact but those who graduate to a full ticket, will. It is noticeable, that during contests, or other periods of high-level activity, these intruders mostly vanish.

There is yet another case for numbers. The societies of most countries have promotion programmes in order to increase their fraternity. To cite one example, figures for the U.S.S.R. are hard to come by, but it appears the Amateur population there is increasing rapidly, particularly clubs; so, why should we fall behind.

However, let's keep the subject in perspective. Survival in our A.R. global village is the constant concern for all societies in I.A.R.U. nations. N.L. is but a small fragmentary extension of conditions of licensing, in a relatively minor country.

It seems to me, that at future I.T.U's the A.R. case will be listened to more readily by the reps. of those countries whose governments tacitly approve of A.R. (U.S.A., Cent. and Latin America, etc.) and who consequently allow the Amateur to provide some community service, and third party traffic, phone patch, etc., etc.

In Australia, we enjoy no such status and the term "Amateur Radio Service" here is virtually a euphemism. We are, as the Minister for the P.M.G's Dept. described us, when announcing our last licence fee increase from the floor of the House of Representatives—**Hobbyists**.

Mr. Williams observes that A.R. needs a new set of values. I would agree that the opportunity to participate in community affairs, as is done U.S.A. style, would give us a new image here in Australia, but how can we demonstrate our value and service within the restricted framework of Hobbyists? I don't want to accuse VK3IZ of romanticism, because I share his idealism but would like to be told just what new values we might, in a practical sense, hope to attain.

A.R's activities are mainly to experiment and socialise. Our contribution in the latter is to spread international goodwill. To the cynics, I.G.W. is simply an empty cliche, that means little; DXing, they say, is the obsession. We are in reality, only a bunch of prefix-gatherers and any I.G.W. is incidental.

So we might ask the question, "Do our activities really promote I.G.W. and extend past the barriers of race, creed and class?" One way to answer or evaluate this would be to ask another question, "Would the world suddenly be poorer if international A.R. ceased overnight?" i.e. an end to all our on-air intercourse, all participation in community affairs, traffic, phone patch, etc. (where this is allowed) and a QRT to the daily exchange of a thousand technical and electronic ideas.

In a humble way the answer to both questions is a positive YES. (One can see this amply demonstrated by reading any copy of "World Radio".)

It is often said, "Why do we have to justify what is rightly ours? Are not the bounties of nature the rightful heritage of Mr. Private Citizen, for use, in part, for personal pleasure?" This means we should be able to enjoy part of the r.f. spectrum without having to establish a case. Be this as it may, the sad truth is that no justice is obtained unless it is fought for. It must be remembered, we live in a hostile world, where space for every human activity is at a premium.

Some of our activities are open to question. How does one answer this comment, "You blokes spend hours, even days, on this DX fun-kick, chasing a fragment of sand or rock somewhere, called a new country (sic), all for a 10 second QSO. That's as virtuous as collecting bottle tops. Can't you fellows put your time to better use?" It is true, that for some, this type of DX is a psychosomatic activity and only gives the critics a chance to be vocal. In my view, the whole framework of the DXCC "rat race" needs restructuring, with different incentives (too detailed to be outlined here).

At this present moment, the A.R.R.L. DX Advisory Committee is preparing a submission to hdq. which may result in the deletion, amendment or modification of DXCC status of non-administered rocks, reefs, islands. This overdue move has been the result of long and continued criticism of the value of this kind of activity.

The experimenters: The technical sophistication A.R. enjoys today is due to these purists and the sad truth is that as a group, they seldom get the merit and recognition they deserve. True, they experiment simply for the satisfaction it brings but as an incentive for thir talents, I feel the W.I.A. should make an award of generous proportions, to an individual or group, who yearly comes up with the best contribution. There is a rightful place for commercial gear: like other means of communication, it's here to stay but let's not forget the "back room" boys who will always have something of benefit to offer.

The v.h.f. scene: Reading U.S.A. magazines, I am impressed with the tremendous participation in community services by this group in the States; particularly in outdoor, beyond the line-of-sight, sporting events such as Air, Aero Club Races, Adventurers Club, Auto Road Racing, Marathon Foot Running, Bushwalkers, Yachting, Birdwatching, Swimathons, to name a few. Similar participation here in VK would do a lot for the image of the A.R.S.

It is easy but unwise to fall into pessimism when contemplating A.R's future. There will be change, this is certain, but no one can make firm predictions at this point of time. Even within the restricted confines of our conditions of licence in VK, we can and must do a lot better. This is the important thing.

—Alan Shawsmith, VK4SS.

DIVISIONAL NOTES

NEW SOUTH WALES

The January general meeting heard a very interesting lecture on the A.C.I. Electronics Acitron s.s.b. line of equipment. John VK3JE and Ken VK3AKK made the trip from Melbourne for this lecture.

Don Miller, VK2GN was re-elected as the VK2 Federal Councillor.

V.H.F. & T.V. GROUP MANAGEMENT COMMITTEE ELECTIONS, 1972

Charter: Para. 9 and 17. Nomination of a candidate for election to the Management Committee must be received by the Secretary in writing not less than 21 days before the Annual General Meeting of the Group with an intimation in writing that such candidate is willing to act. Each nomination shall be signed by two members proposing the candidate.

Notice is hereby given that the Annual General Meeting of the V.h.f. and T.v. Group shall be held on Friday, 7th April, 1972, at Wireless Institute Centre, 14 Atchison St., Crows Nest, commencing at 8 p.m. The business to be transacted shall be the Retirement of the Management Committee and the election of the Management Committee 1972-73. Notices of motion for the A.G.M. must be received by the Secretary not less than 21 days prior to the meeting and must be signed by at least three members.

—M. J. Farrell, Secretary.

ILLAWARRA BRANCH

Monthly Branch meetings of the Illawarra Branch recommenced on Monday, 14th Feb., 1972, at the Wollongong Town Hall. Future meetings should retain the interest of members as well as visitors by the monthly attendance of a guest speaker or a suitable film. Brian VK2ZGB, who arranges these segments of the meetings, has assured us of some interesting guests for 1972. Guest speaker for the March meeting will be Mr. Bob Milton, VK2ZMM, who has a vast experience in transmission feed systems and antenna design.

Wollongong's Ch. 1 repeater committee are still searching for a suitable permanent site for their repeater and are negotiating at the moment for a site between Heathcote and Wollongong. In the meantime activity through the repeater has been steady but consistent. The antenna system was scheduled to be changed to a four element beam on transmit and a 10 element beam on receive with the direction favouring the Sydney general area.

Barry VK2ZYL corrected the fault which had developed in the I.D. and has also lengthened the "trail" of noise which comes back when triggered. (VK2FE)

REPEATER AT TAMWORTH

The VK2 North-West V.h.f. Group (Tamworth) is in the process of preparing a repeater application for their area. It is a Channel 1 system to be located on Mt. Kopator.

VICTORIA

This month the Eastern Zone will be holding their Convention at Moondarra Dam, near Moe, on 18th and 19th March. Accommodation and meals will be provided by a hostel at the Dam. This area is excellent for a convention and an interesting week-end is promised.

DX operators in this State will be pleased to hear that they can send overseas QSL cards via the Bureau free from the 1st of July. This was agreed upon at a recent Divisional Council meeting as an added service to members.

Due to the large number of enrolments for the A.O.C.P. classes, it has become necessary to provide an additional class each week.

The V.h.f. Group will be holding a Convention at Wandin East on 1st and 2nd April, during the Easter holidays. The convention will have an interesting programme including a 2 mx antenna gain contest along with scrambles on all v.h.f. bands and 2 mx hidden tx hunts. For the benefit of h.f. operators, an 80 mx fox hunt will also be conducted. The builders of carphones will be able to see who has the most efficient rig in the mobile efficiency contest. The venue at Wandin East is in a very pretty area just behind the Dandenongs and is approx. 32 miles from Melbourne. 73, Gil VK3AUI.

SOUTH AUSTRALIA

The Dec. Christmas Social meeting had its share of Interstate visitors and many of them remarked how much more lively were their own breakups. I wonder if this should be a hint for the 1972 Council to act upon! The V.h.f. Section meeting was a display of members' equipment, old and new, and produced a varied and impressive display from Eric VK5LP's first home-built receiver used as s.w.l. to tune the world, to his latest sophistication. Four v.h.f. s.s.b. transverters showed the trend in this line too.

The V.h.f. Section field day on Dec. 5 resulted in impressive scores based on mileage, because of good 2 mx conditions to VK3 and a 6 mx band opening to VK6. Results (co-op. in brackets): VK5ZDX/5 (VK5LP), 33,848 pts.; VK5BW/5 (VK5WV), 25,745; VK5QZ/5 (VK-5ZWW), 20,822; VK5PP/5 (VKs 5ZGJ, 5ZAG), 14,258; VK5ZCR/5 3,874; VK5ZT 3,096; and VK5QH 332.

Shifting the day to December certainly improved the scores, but more participation is needed. The John Moyle N.F.D. will have seen a massive VK5AWI club station effort on all bands.

Rick VK5ZFQ put on a good lecture at short notice about a circuit to display five transistor parameters on a c.r.t. at the January Divisional meeting. This caused a great deal of interest and should result in a journal article at least.

The January V.h.f. Section gathering was a barbecue at the home of Bart VK5GZ. A rainstorm almost drowned proceedings, but could not dampen the enthusiasm.

The building committee's report suggested a building in Thebarton could be available. If so, a permanent home for VK5WI may be accomplished at long last, after an option had lapsed, and renovations completed. This result of a second option on a building is a very fine reward for a hardworking group, and we all hope it will be successful. 73, Bart VK5GZ.

EVENTS CALENDAR

Mar. 9—VK4 General Meeting.

Mar. 18/19—VK3 Eastern Zone Convention, near Moe.

Mar. 18—VK7 A.G.M. and Dinner, Hobart.

Mar. 21—VK6 General Meeting.

Mar. 24—VK2 A.G.M. at 14 Atchison St., Crows Nest at 7.45 p.m. Election of new Council.

Mar. 25—VK2 Annual Dinner, Artarmon B.C. (Tickets $5.00 a double). Details from Sec.

Mar. 26—VK2 Field Day. Details Div. B/C.

Mar. 28—VK5 Divisional meeting.

Mar. 31-Apr 3—Federal Convention, Melbourne.

Easter—VK2 Urunga Convention. Details B/C.

Apr. 1/2—VK3 V.h.f. Group Convention, at Wandin East.

Apr. 7—VK2 A.G.M. and election of V.h.f. Group.

COOK BI-CENTENARY AWARD

The following additional stations have qualified for the Award:—

Cert. No.	Call	Cert. No.	Call	Cert. No.	Call
1446	HL9WI	1458	AX3KS	1469	VE7BNE/W6
1447	AX3AXJ	1459	AX3XB	1470	AX7MK
1448	F8IH	1460	AX2XS	1471	AX4ZQ
1449	VE3HJ	1461	AX4LW	1472	AX5HW
1450	K2JMY	1462	AX1JL	1473	KG6JAJ
1451	K6UXV	1463	DL2RR	1474	AX3AFW
1452	IT9GAI	1464	FO8BY	1475	ON4EB
1453	AX5NT	1465	JA1MRS	1476	YU1AFQ
1454	AX7NZ	1466	AX2BRU	1477	DJ4KD
1455	AX3JI	1467	HB9UD	1478	W3UH
1456	AX3AXV	1468	AX2AHL	1479	AX2XM
1457	K9PPY			1480	AX3ARM

VHF/UHF SECTION

Cert. No.	Call	Cert. No.	Call	Cert. No.	Call
33	AX2ZUB	36	AX3BDA	38	AX2ZFX
34	AX3YDP	37	AX5ZID	39	AX4ZHW
35	AX2ASZ			40	AX4ZEL

—...—

I.P.S.D.: TRIAL WARNING SYSTEM

A letter from the I.P.S.D. advises that a V.H.F. and T.E.P. warning system will be tested for one month during the equinox for the period 14th March to 9th April inclusive.

Ionospheric summaries will be relayed over the I.P.S.D. network from Sydney every 15 minutes from 1600 to 2200 hours E.S.T. on 11.440 MHz. in the afternoon and 6.815 MHz. at night. Mondays are rest days and there will be no transmissions.

The material from I.P.S.D. unfortunately is too lengthy to reproduce in this issue but an attempt will be made to include details in future issues.

Wide publicity has been requested as well as collaboration by interested Amateurs. The tests are designed to be one more step towards a wider and more comprehensive service by I.P.S.D. to all radio wave users. Please refer to Feb. "A.R.," p. 16.

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VS5 LICENSING

There is very little trouble in obtaining a licence in Brunei. Write to Brunei Telecommunications Department (Bandar Seri Begawan), Brunei, with a copy of your current licence and Brunei $10 or U.S. $3.33. The local mains voltage is 230 volts a.c. and hotels cost $7.10 per day.

SILENT KEYS

It is with deep regret that we record the passing of:—

VK2RD—Reg Longworth
VK2AAW—Bill Richardson
VK2ATW—T. E. Whitfield
VK3UM—Major W. Mitchell
VK3ZE—Stan Beaton
VK4RB—R. J. V. Browne
VK4SA—S. J. Armstrong

PROJECT AUSTRALIS

OSCAR 6 LAUNCH IN JULY

In a letter to W.I.A.-Project Australis the Radio Amateur Satellite Corporation (Amsat) have advised that the Amsat-Oscar C (AO-C) satellite is planned for launch some time in July. Unfortunately, neither the Australis 144/435 MHz. repeater nor the DJ4ZC 435/144 MHz. repeater can be carried on this flight. Amsat's decision to fly only a 2m./10m. repeater on AO-C was taken reluctantly and was caused partly by a reduction in the weight available on the N.A.S.A. launch vehicle for the July flight and partly by technical problems which have caused delays in the completion of the Australian and German repeater packages.

George Long, VK3YDB, who is building the Australis repeater, reports that good progress is being made on the system, but a problem with low efficiency in the 435 MHz. transmitters is only now being overcome with the availability of new components from America. Extremely high efficiency is required because of the low power (about 6 watts) available to run the whole satellite from the solar cells which re-charge the batteries.

What Amsat now propose to do is to fly AO-C in July and to fly AO-B in the second half of 1973. AO-C will carry the Amsat 2m./10m. repeater which is a multiple-access linear system that receives uplink signals between 145.900 MHz. and 146.000 MHz., and re-transmits them between 29.550 and 29.450 MHz. on the downlink. Sideband inversion takes place in the translation process (i.e., upper-sideband becomes lower-sideband and vice versa). Approximately 100 watts p.e.p. will be required on 2m. to work through the repeater. For best results, s.s.b. or c.w. should be used. A description of equipment which should be used to work the repeater is printed in "A.R." of December 1971, page 14.

Listed below are the basic characteristics of the 2m./10m. Amsat linear repeater breadboard:

Input frequency: centered at 145.95 MHz.

Output frequency: centered at 29.5 MHz. (Note.—This represents a change from the previously announced frequency of 29.6 MHz. which turns out to be the national ten metre f.m. frequency in the U.S.A.)

Beacon frequency: 29.45 MHz. (same as Australis-Oscar 5).

Repeater bandwidth: measures 120 kHz. at 3 dB. down points, 150 kHz. at 6 dB. down, and 240 kHz. at 10 dB. down. This means that stations capable of operating with higher power than that normally required to operate through the repeater can operate further from the repeater centre frequency thereby avoiding QRM from other stations using the repeater. In other words, the usable bandwidth for high power stations is approx. 240 kHz.

Repeater output power: presently measures approximately 1.3w.; final goal is 2w. p.e.p.

Input sensitivity: approx. —100 dBm. (2 microvolts/meter) for full repeater output.

Ground station power required to operate through the repeater: 80w. of effective radiated power develops full output from the repeater, assuming a maximum distance to the satellite of 2,000 miles. An 8w. transmitter and 10 dB. gain antenna should be sufficient, or an 80w. transmitter and an omnidirectional antenna.

Antenna gain required for reception: 0 to 8 dB. A 10m. dipole or beam should give good results at a maximum distance to the satellite of 2,000 miles.

AO-C will also carry a Morse Code telemetry system, but the Australis r.t.t.y. telemetry unit will not be flown until AO-B, because of the reduced power and weight available on AO-C. A description of the Morse telemetry and how to decode it will appear in a later issue of "A.R." The satellite command system being built by Peter Hammer, VK3ZPI, to enable the various satellite systems to be turned on and off, will be flown on AO-C.

The AO-C satellite, to be called Oscar 6 after launch, is expected to be put into an orbit very similar to that achieved by Australis-Oscar 5. That is, a near-polar orbit at a height of about 930 miles. The orbit will be sun-synchronous so that the satellite will pass over Australia at about the same local time every day of the expected one-year operating life. This would mean that the orbits would travel south to north over Australia at about 3 p.m., north to south at about 3 a.m. It is planned to publish tables to allow easy tracking of AO-C in coming issues of "A.R." Assuming a satellite height of about 930 miles, contact through the satellite with Amateurs more than 2,500 miles away should be possible.

Present plans are that the AO-B satellite, to be launched next year, will carry the Australis 144/435 MHz. repeater in the 4-channel configuration, the DJ4ZC 435/144 MHz. repeater, the Amsat 2m/10m. repeater, the Morse and r.t.t.y. telemetry systems, and the Australis command systems. As both AO-C and AO-B should operate for at least 12 months each, the next two years look like being an exciting time for Amateur Radio satellite enthusiasts, and, with only 100w. e.r.p. needed to work the AO-C repeater, it will not be difficult to become an Amateur Radio satellite enthusiast, if you are not one already.

Technical data on Amsat satellite systems was derived from editions of the Amsat Newsletter. Readers with queries on the AO-C satellite should direct these to W.I.A., P.O. Box 67, East Melbourne, Vic., 3002, attention Project Australis.

HAMADS

Four lines FREE for members only.

See Jan. 1972 "A.R." page 23 for complete details.

FOR SALE

Box Hill, Vic.: Yaesu FL-100B SSB Transmitter, covers 80-10 mx, USB-LSB, VOX Pwr. Supply inbuilt. $150. VK3AOY QTHR. Ph. (03) 89-3715.

Ashfield, N.S.W.: 2 MHz. Block Filters, Type 3Q57975, ex A.W.A. Carphones, $3.60 each. VK2AXJ, QTHR. Ph. (02) 798-9021.

Melbourne, Vic.: Panoramic Adaptor 455 kHz. input. Singer Metrics Model SB200. Brand new condx. $250. VK3IZ, Ph. (03) 848-5790, or B.H. 45-2615.

Bankstown, N.S.W.: One AR7A Receiver complete with Coil Boxes and Power Supply. $75 or nearest offer. Ring I. Ward, 149 The Avenue, Condell Park, Ph. (02) 70-1991 **after 5 p.m.**

Melbourne, Vic.: Yaesu FT200 Transceiver and P.S. complete, $300. FTV650 6 mx Transverter, wired for above, $110, or both $400. VK3AUN, QTHR, Ph. (03) 46-4200.

Sydney, N.S.W.: Heath SB300 Receiver, SB400 Transmitter, table top microphone, matching SWR meter, electronic keyer, and 24-hour digital clock. Receiver fitted with CW and SSB filters and new tubes. Receiver and Transmitter each have a linear master oscillator and full quartz crystal set. Frequency setting accuracy on both units better than 500 cycles on any band. The above cost over $1000 new. Will sell complete station $550. VK2BFE, QTHR, Ph. (02) 451-2923.

Greenacre, N.S.W.: MR20B, complete/working, R1, 146, R4, $80. MR6, complete/working, 52.525, $60. Transistorised STC MTR125-131, complete/working, 52.525, $100. Transistor P.S.U., suit FT200, $65. Pye 25w. AM Base, $30. S.T.C. Base FM, 50w, low band, $50. John Bennett, VK2AAL, QTHR, Ph. 709-6281.

WANTED

Brisbane, Qld.: Pre-1940 Morse Keys, home-brew or commercial. Any condition, shape or size, hand or "bug". Price, partics. to A. Shawsmith, VK4SS, QTHR.

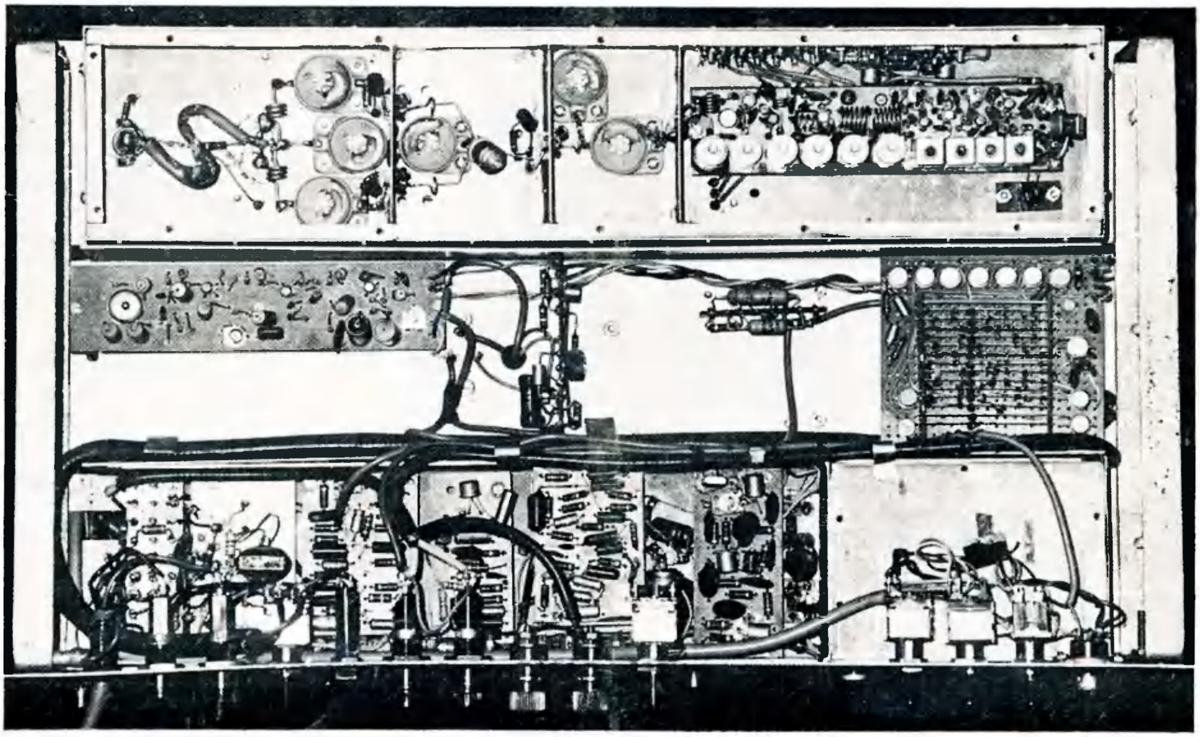
Melbourne, Vic.: FTDX100. Price and condx to VK3LS, 5 Hillsyde Pde., Strathmore, Vic., 3041. Ph. (03) 379-3619.

Pt. Macquarie, N.S.W.: SSB Receiver, good order reputable manufacturer, full details to VK2AEB, QTHR.

Melbourne, Vic.: Cossor Model 1049 Double Beam CRO manual. Will buy, borrow or hire. VK3ZZG, QTHR, Ph. 795-2506 or bus. 541-3559.

amateur radio

APRIL, 1972



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6AM6 (EF91)	2.28	6SQ7	3.18
6AN7A (ECH80)	1.90	6U7G	0.75
6AN8	3.06	6V4	1.10
6AR7GT	2.28	6V6	3.64
6AU4GT/A	1.84	6X2 (EY51)	2.40
6AU6	1.61	6X9 (ECF200)	2.09
6AU7	2.87	6Y6G	3.18
6AU8	3.06	6Y9 (EFL200)	2.30
6AV6	1.35	12AT7 (ECC81)	0.75
6AW8A	1.93	12AU6	1.78
6AX4GT	1.84	12AU7A (ECC82)	1.72
6B8	3.88	12AX7 (ECC83)	1.95
6BD7 (EBC80)	1.30	12BE6	2.02
6BE6 (EK90)	1.68	12SN7GT	3.18
6BH5	1.61	16A5	2.15
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Price $11.95, postage 30c

MODEL CT330 MULTIMETER

20,000 ohms per volt. DC volts: 0-6, 6, 30, 120, 600, 1.2K, 3K, 6K. AC volts: 0-6, 30, 120, 000, 1.2K (10K o.p.v.). DC current: 0-0.06 mA., 60 mA., 600 mA. Resistance: 0-6K, 600K, 6M, 600 megohms (30, 3K, 30K, 300K ohm centre scale). Capacitance: 50 pF. to 0.001 uF., 0.001 uF. to 0.2 uF. Decibels: —20 to plus 63 dB. Size approx. 4½ x 3⅝ x 1¾ in.

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MODEL OL-64D MULTIMETER

20,000 ohms per volt. DC volts: 0.025, 1, 10, 50, 250, 500, 1000 (at 20K o.p.v.), 5000 (at 10K o.p.v.). AC volts: 0-10, 50, 250, 1000 (at 8K o.p.v.). DC current: 50 uA., 1 mA., 50 mA., 500 mA., 10 amps. Resistance: 0-4K, 400K, 4M, 40 megohms. DB. scale —20 to plus 36 dB. Capacitance: 250 pF. to 0.02 uF. Inductance: 0-5000 H. Size: 5¾ x 4⅛ x 1¾ in.

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CONTENTS

COVER STORY

A view underneath the chassis of the VK5 FM Repeater. Top (left to right): SWR protect, final, driver and exciter. Centre: Transmitter audio, 10-minute timer switch, call sign generator. Bottom: Receiver and front panel controls. See page 7 for the first part of this article.

QSP

THE COMPLEAT AMATEUR?

Leonardo da Vinci is a silent key.

And according to the history books he has been for quite some time. Yet one could be led to believe that he is still alive—at least in the minds of some of the delegates to the recent I.T.U. Space Conference — and that Leonardo is a Radio Amateur.

A brief recapitulation — Leonardo da Vinci was the complete genius — a man who lived in the latter part of the fifteenth and the early years of the sixteenth century. He excelled as a painter, sculptor, musician, engineer, architect, natural philosopher (physicist) and mechanician. He crowded into the sixty-seven years of his life a creative output which has so far remained unequalled by any other man. So great was his mastery of all these fields that many scholars concede that he is the only man in recorded history who possessed deep and intimate understanding of all knowledge current in his time and that he probably will remain in this unique position because of the rapid growth of knowledge possessed by mankind. No man today could hope to master all the facets of even one of the branches of science—he would be overwhelmed by sheer volume of detail.

Why then should those engaged in Amateur Radio activities be regarded as exceptional men?

There are numerous areas of particular interest within the Amateur Service—the art of good c.w., propagation studies, radio teletype, mobile operation, equipment construction, conventional black and white or colour t.v., slow scan t.v. (s.s.t.v.), moonbounce propagation, f.m. repeaters, and so on. These interests, whilst not mutually exclusive, are becoming so complex in themselves that, as in the professional fields of communications and electronics, one individual cannot be expected to excell, or even participate deeply in all areas. Probably even the genius himself, da Vinci, if he were alive today, would not excel in all these fields plus painting, music, etc. It should be noted though that these diverse interests have at least one common denominator—self education. The individual participating is learning something perhaps unconsciously so, but, if he enjoys it then no doubt painlessly so.

Experimentation can be involved in all these areas of particular interest so why is the radio Amateur as an experimenter always looked upon as an equipment builder? Historically, of course, it was a question of having to build most pieces of one's station out of sheer necessity—there was no alternative. But even in the history of Amateur Radio one cannot find evidence of many individuals making the more complex components in their home workshops. Such items as meters and valves were usually purchased—certainly they may have been modified by the Amateurs to vary performance. Thus, in days gone by, the term experimenter was synonomous with equipment constructor, but like everything else wireless has become more complex and it is no longer true to say that "Radio Amateur" equates "Constructor" only.

It is suggested that now the emphasis in Amateur Radio is based on a **systems engineering concept**, i.e. the idea of taking a number of standard modules, perhaps modifying some of them and then welding the lot into a functional whole—for moonbounce or s.s.t.v. The person doing this is surely no less an experimenter than the one who builds his own transmitter or receiver—the use of the commercially built transceiver or receiver allows the experimenter to concentrate on his area of particular interest whether it be propagation studies, s.s.t.v. or aerial design.

(Continued on Page 10)

Is this your last issue of "Amateur Radio"? – it could be if you are unfinancial

A Solid State Amateur S.S.B. Receiver

PART FIVE

B. G. CLIFT and A. E. TOBIN

● This article outlines the design concepts, circuit operation and construction of the r.f. amplifier and first mixer, described in previous issues of "Amateur Radio."

Several approaches to the r.f. amplifier design were considered, the main aim being to obtain good signal-to-noise ratio and cross modulation performance. Whilst the cascode approach would fulfil both these requirements, it would, however, complicate switching of the input and output tuned circuits.

In previous articles it had been suggested that the front end circuitry would be built around an old type 12-channel Philips t.v. turret tuner. Whilst this approach is quite sound, ultimately with the final front end circuitry chosen, the use of a turret tuner for coil switching is not really essential. This simplification is made possible by employing a v.h.f. type N-channel junction FET in both r.f. amplifier and first mixer functions. The device used in the prototype is the FT5245, but the metal equivalent 2N4416 may be used if desired.

Reference to the circuit diagram (Fig. 1) shows the relatively simple approach required for band switching. The aerial coil is identical to the r.f. coil with the addition of the aerial coupling link. Although coil data is provided for only the 80 metre coils, approximately the same L/C ratio should be used for the other bands.

Construction of suitable sets of coils as required should present no difficulties with the aid of a g.d.o. The coils should be peaked at the high frequency end of each band with due allowance being made for stray shunt capacitance. Tuning of the aerial/r.f. coils is effected by varicap diodes, those used in the prototype being the AN965 zener diode which provides approximately 30 pF. capacitance range. If a smaller range is considered desirable on the high frequency bands, this may be achieved by switching appropriate values of resistors in series with the 4.7K pot to limit the voltage range applied to the varicap diodes.

A.g.c. control is applied to the r.f. amplifier by using an 2N4248 transistor to reduce the drain current of the r.f. amplifier. The AN753 zener diode connected in the a.g.c. line provides the appropriate a.g.c. delay. The delay is selected to enable the r.f. amplifier to operate at maximum gain provided the i.f. amplifier is still operating within its a.g.c. range.

CONSTRUCTION

The 80 metre coils are constructed on 5/16" diameter polystyrene formers fitted with suitable tuning slugs. The finished coils are then fixed to tuner biscuits using "Araldite" epoxy resin. The value of inductance is approximately 18 μH., which then requires 100 pF. to resonate at 3.7 MHz. Using 26 B. & S. enamelled wire, about 65 turns with a 7-turn link spaced 1/16" from the cold end of the main coil should be satisfactory. The 100 pF. ceramic capacitor is also mounted on the biscuit.

Care should be taken to ensure that coupling between input and output circuits of the r.f. amplifier is minimised otherwise instability will result. It is good practice to incorporate a small grounded shield between the FET leads to prevent stray coupling.

The 9 MHz. drain coil for the mixer is wound on a Neosid former mounted in a standard can but no cup or ring is used. Primary consists of 30 turns, 30 B. & S. enamelled wire with a 3-turn secondary wound over the cold end.

A circuit for the crystal calibrator is shown in Fig. 2. A 3.5 MHz. or 1 MHz. crystal may be used as required.

CONCLUSION

Whilst in this and previous articles a considerable amount of construction detail has been provided, this information has been included for the purpose of indicating some of the practical techniques which were used in construction of the prototype.

The prime purpose of the series of articles has been to provide a source of ideas to assist those desirous of engaging in such a project. The approach is by no means the only one likely to be successful; and the Amateur with experience in this area is to be encouraged to expand his own ideas. Consequently no provision has been made to have kits of parts including printed circuit boards made available. With the vast array of transistor types currently available today it is perhaps difficult to make a suitable selection. If the foregoing articles help to sort out this problem to the satisfaction of the Amateur, then they may be considered to have achieved their basic purpose.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the help provided by the management of Fairchild Australia Pty. Ltd., in making equipment and material available to complete this project. Special thanks go to Messrs. B. T. O'Shannassy and R. Chapman for their many helpful suggestions and criticisms, and to "Amateur Radio" for reproducing the articles. Complete set of the articles can be obtained by writing to A. E. Tobin, C/o. Fairchild Australia Pty. Ltd., P.O. Box 151, Croydon, Vic., 3136.

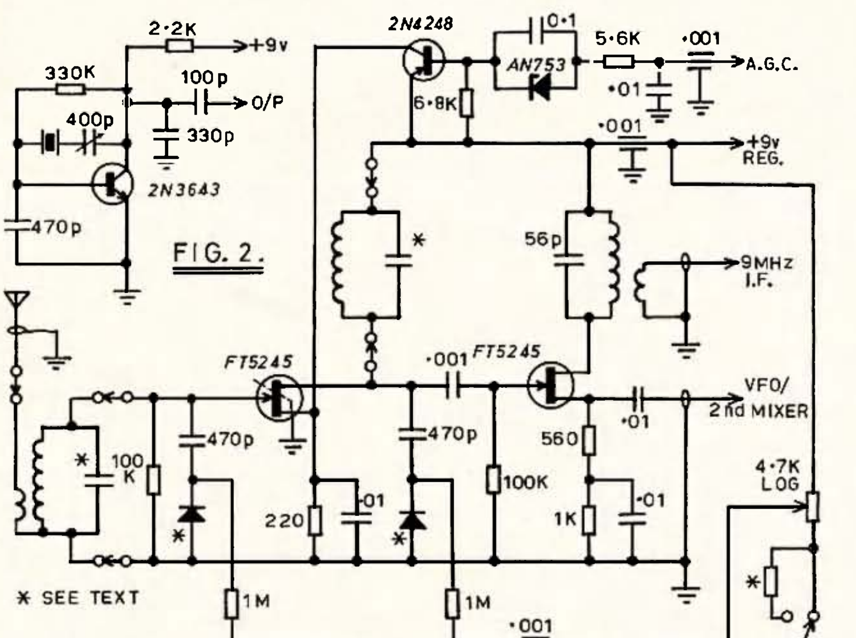


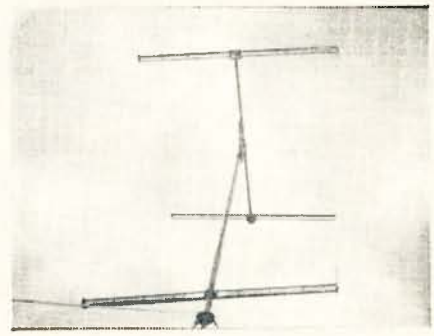
FIG.1. R.F. AMPLIFIER & FIRST MIXER

"THE RAKE" ANTENNA

A Rotatable Dipole for 40 Metres and a Mini-Mini Beam for 20 Metres

L. T. E. SCOWN, VK5YS*

Like to try something different and smaller for DX on 20 and 40 metres? Here is something for the small garden and not difficult to construct.



A worm's eye view of both antennas. The 40 mx Single Rake is below the 20 mx Double Rake. Note the angles the hats are bent.

The antennas to be described are a rotatable dipole for 40 metres and a 2 element driven array for 20 metres. Each element in each antenna consists of two helicals wound over a triangular cross-sectional former 6 feet long.

The end triangular spacers are made from ⅜" thick insulating material (perspex was used), whilst the other spacers are ⅛" thick (see Fig. 1).

The coils are commenced from the element ends (capacitive hat end) and wound towards the feed point. More turns were wound on than necessary (each length of wire used was approximately five-eighths wavelength long) for each coil initially and then tapped out from the feed point to resonate each element.

Capacitive hats of various diameters were tried, using the spoke wheel variety, but the method shown in Fig. 2 was finally adopted as being the easiest to adjust to bring the s.w.r. to a satisfactory minimum.

The first investigations were carried out with the 40 metre single "Rake". The element former is of the same construction as the double "Rakes" for 20 metres. The former consists of three six-ft. lengths of wooden dowelling coated with "Estapol" for weather proofing. The length of six feet was chosen simply because dowelling is readily available in that size. The end triangular spacers were then fitted on to the ends of the three dowel rods. The other spacers were clipped into place and then all spacers were "Araldited" to the dowels. A piece of insulating board was fitted to the centre of each element to facilitate installation. Four holes were then bored, one in the centre of each end spacer and two spaced 2" apart in the centre board. In each hole was fitted a ¾" x 2 BA bolt and one nut.

The coils were wound in the normal manner by tying one end of a length of 14/.007 p.v.c. covered wire to the back fence and fitting the other end to the 2 BA bolt on one of the end spacers. The wire was kept taut as it was wound whilst walking towards the back fence. Before winding commenced, marks were placed one inch apart on one of the wooden dowels to assist in keeping the correct spacing during the winding procedure (see Figs. 3 and 4 for the coil data).

Note.—The two coils on each element are wound in the same direction.

40 METRE SINGLE RAKE

Tuning up of the 40 metre single rake was relatively simple. The hats are bent until the best s.w.r. is obtained. At a height of 6 feet, the angle of bend was approximately 70° and the s.w.r. 1.4:1. At 10 feet, the angle was 80° for minimum s.w.r. and 90° for 20 feet above ground. It was left at this height for a fortnight for comparisons against an "inverted vee" dipole which is 38 feet high. The results were comparable on transmitting, but the real advantage was noticeable on receiving. During night time operation the QRM

(continued next page)

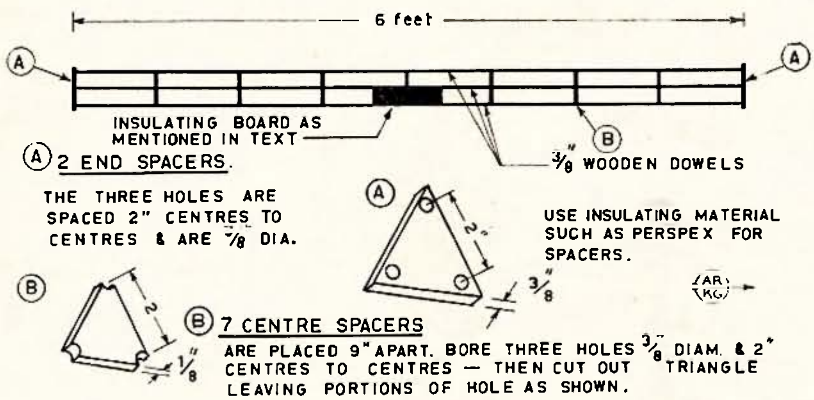


FIG. 1 CONSTRUCTION OF ELEMENT FORMERS

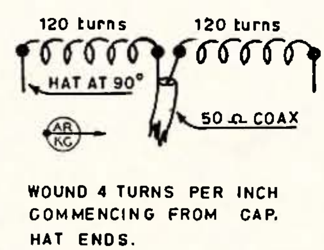


FIG. 3 40 METRE SINGLE RAKE

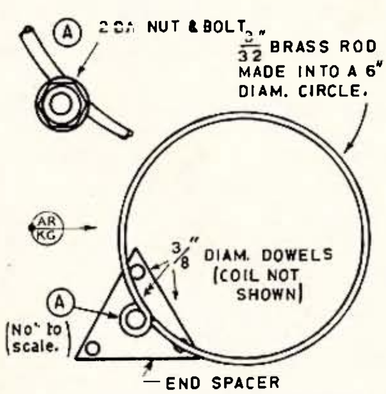


FIG. 2 FITTING OF CAPACITIVE HAT TO END SPACER

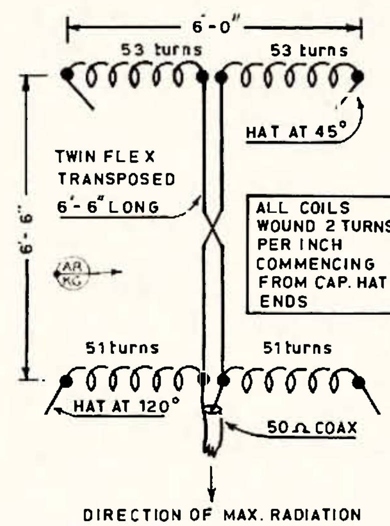
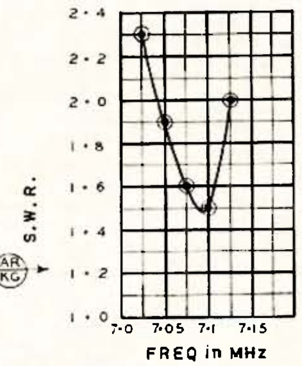


FIG. 4 20 METRE DOUBLE RAKE

* 59 Oxford Street, Brahma Lodge, S.A., 5109.

from the north could be almost eliminated by pointing the ends north. 50 ohm co-ax. was used, and the s.w.r. obtained was as Fig. 5, but no doubt the s.w.r. could be improved by using 70 ohm co-ax.

FIG.5



40 METRE SINGLE RAKE ANTENNA

THE 20 METRE DOUBLE RAKE

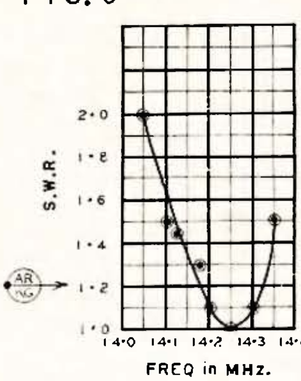
This antenna comprises two "Rakes" spaced 6 ft. 6 in. apart on a 2" x 1" wooden boom and fed out of phase with ordinary twin flex light wire.

Whilst one "rake" was being tuned, the other was removed. Tuning procedure was the same as for 40 with all hats finally bent at 90°. The antenna was then assembled, and the phasing line connected. The complete unit was set about 8 ft. above ground, and tuning was commenced for best s.w.r. One pair of hats was bent until the s.w.r. was at a minimum, then the other pair was attended to so as to bring the s.w.r. further down. Then back to the first pair and the process continued until the s.w.r. was approximately 1.2:1. This figure was achieved when the bending angles of the hats were as shown. See Fig. 6 for s.w.r. figures.

The 20 metre double "Rake" appears to have a back-to-front ratio of the order of 11 dB. This figure was obtained by averaging out prolonged tests on receive. On transmit, it was confirmed by local and Interstate stations.

Both the antennas are installed at the present time as the photographs show

FIG. 6



20 METRE DOUBLE RAKE ANTENNA

and they have given very good results, an 80 metre one will shortly be installed. They should adapt quite readily to caravans when a rotatable is desired and space is limited. Mine was found to be very robust and providing the finished product is well coated with "Estapol" or the like, they could remain aloft indefinitely.

They are extremely cheap to build and they give surprisingly good results. One last remark, the reader may be wondering why I have referred to the antennas as "Rakes". If you build the 40 metre one and erect it in your yard, I am sure the reason will become obvious, especially if the reader has a yen for gardening.

A general view of the Rake Antennas among others of the standard variety.

THE VANILLA WATTMETER

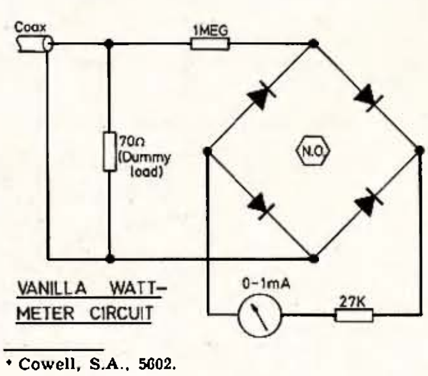
A Dummy Load incorporating a Direct Reading Power Meter

BRIAN J. WARMAN, VK5BI*

It is very convenient, especially when operating s.s.b. equipment, to be able to measure the output power. As it seems that the supply of cheap r.f. ammeters has dried up, the only way out these days is to make or buy. The writer preferred to make one.

The licence states that 400 watts p.e.p. **output** can be run. In the above sentence **output** is the operative word. Many of our appliance operators would turn to Oragami crane making if they could measure the power output of their 400 watt **input**-rated transceivers. Since 400 watts p.e.p. output corresponds to a mean r.f. output of 200 watts when using a two-tone test signal, it follows a power meter indicating at that level or perhaps just a fraction more is all that is needed. The circuit shows how it is done.

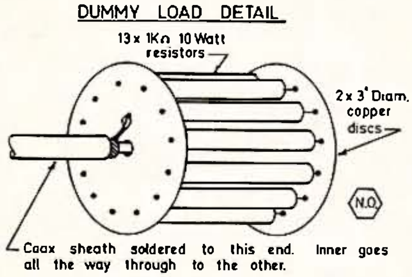
The dummy load is used as the actual shunt for the indicating circuit. The 1 megohm resistance serves to isolate the diode bridge and improve the s.w.r. (there is ample sensitivity). The diodes are normal germanium small-signal types in a full wave configuration; this was found the best arrangement for continued accuracy, probably because of low impedance. The 27K resistor serves to calibrate the meter. It could be replaced with a variable element.



* Cowell, S.A., 5602.

The load consists of 13 carbon resistors. This gave 70 ohms to suit the author's set-up. The resistors came from a disposal source. They would be approx. ½" diameter and probably rated about 10 watts. They are more than adequate for 400 watts s.s.b. and 150 watts a.m. The sketch shows an arrangement suggested by VK5VB for mounting these resistances and the one subsequently employed.

DUMMY LOAD DETAIL



The device was calibrated with the aid of an electronic voltmeter using the P = E² ÷ R formula. If you cannot get access to such an instrument you could use an r.f. ammeter provided the calibration is reliable, or even a calibrated oscilloscope again using the above formula. An idea in a magazine years ago employing a photographic light meter and a series of lamps of differing wattages as a comparative measuring set-up has even been seen, but this does not appeal.

Using a 0-1 mA. meter in the wattmeter it was found:—

200 watts	reads	0.8
100 watts	,,	0.64
50 watts	,,	0.5
and 25 watts	,,	0.4.

Why the title? The author lives in the bush and likes to improvise. The dummy load/wattmeter was mounted in a metal ½-gallon ice cream can of about 5⅓ cubic inches.

AN F.M. REPEATER

PART ONE

IAN CHAMPION, VK5ZIP*

Many operators tend to take for granted the enormous amount of work which goes into the provision of a repeater. Here is a glance at the experiences of one group in establishing an operation repeater which, of course, services the needs of many operators.

By now, many thousands of words have been written about repeaters, how to build them, how to use them, and what features can be fitted to them. All the well documented articles seen are of American origin and although embracing good ideas, comply with different rules to those we experience here in VK-land. The P.M.G. Department in Australia has laid down certain requirements for the operation of Amateur repeaters in this country. Here in Adelaide, a small group has built a unit that complies with P.M.G. requirements and has provided a reliable service since January 1971.

To start the ball rolling in an information exchange that may assist other groups interested in establishing a repeater, details of efforts and experiences are submitted.

In early 1970 six interested Amateurs formed a group to discuss getting the project under way. It was resolved that the device was to be fully solid state and as much "state of the art" as our limited resources would allow. At this point Brian VK5ZNK stepped forward and donated a T.C.A. 1675 base station receiver. We baulked at the idea of our first step being to commercial equipment, then realised that nobody could produce anything better for the price, so this became our basic building block.

Further discussion resolved that the transmitter would be power compatible with current mobile equipment and would initially run 10-20 watts r.f. output. Garry VK5ZK was nominated to head the group and he immediately began farming out projects. Bart VK5GZ was to build the power supply, Frank VK5ZHF the transmitter, Rick VK5ZFQ went off to play aerials, whilst Garry and Ian VK5ZIP retired to plan the merging of all the bits.

It is not intended to go into detail regarding the transmitter and receiver construction as they are basic to any repeater and need not necessarily follow the configuration we employed. Briefly, however, for those familiar with the 1675, the front end was converted from bipolar transistors to FETs and a FET pre-amplifier added. A two-stage d.c. amplifier was added to the mute circuit to interface into the control circuitry and the whole receiver re-wired for negative earth operation.

The transmitter was built into an identical chassis to the receiver except that it was completely sealed, with d.c. and metering being fed via feedthrough capacitors at one end and an aerial socket at the other. The output transistors are a pair of 40282 and although capable of higher output, are only driven to 15 watts at this stage. Although the transmitter is homebrew, it finally finished up with a T.C.A. 1680 audio and exciter card due to time-consuming problems with temperature stability in the original oscillator.

The power supply built on a third identical chassis, employs an electric blanket transformer and an IC to supply and control a 5 amp. current-limited +14v. rail. As this supply could be of general interest, a circuit is included in Fig. 1.

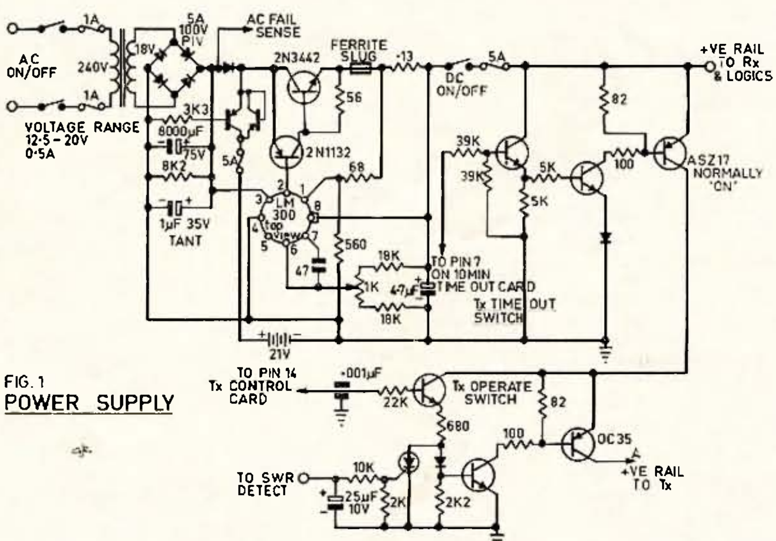


FIG. 1
POWER SUPPLY

CONTROL CIRCUIT OBJECTIVES

It took many months before transmitter, receiver and power supply were mated together in a small box; in that time Garry and Ian came to grips with the problems of the control circuitry. Rather than technical, the problem was to provide an aesthetically pleasing "modus operandi" that still complied with Departmental requirements. To satisfy the transmission time limit requirement we decided two solid state switches were to be fitted in series in the positive rail to the transmitter and coupled to two uni-junction transistor (UJT) timer circuits. The first switch would be normally "on" and coupled to a 10-minute timer. The second, effectively the transmitter "on-off" switch, would be normally "off" and coupled to a 5-minute timer. With an incoming signal the second switch was to be turned "on" and operate the transmitter, at the same time both timers would begin counting.

If the incoming signal (or noise say in the case of a mute failure) continued for five minutes, the 5-minute timer would turn off the second switch and cut the transmission. Once the incoming signal ceased, this circuit would automatically reset and allow normal operation again. During normal operation both timers would be reset at the end of each over.

In the event of a failure in the 5-minute timer the transmission could continue as long as 10 minutes then the 10-minute timer would turn off the normally "on" switch and isolate the positive rail. This circuit would have a manual reset only and would require somebody to attend the site.

It was also considered essential that the transmitter remain on during weak signal flutter to eliminate excessive chopping of the re-transmitted signal. Rather than delay the mute recovery time and transmit noise, a third timer would be used—operate time one second—to delay the switch off of the transmitter after the incoming signal disappeared. This would result in one second of blank carrier at the end of each over.

After considerable thought it was decided that the transmitter would be controlled by the receiver mute. The other possibility was to sense receiver limiter current, but false triggering of the transmitter due to changes in noise level ruled this system unsatisfactory.

* 16 Tarranna Avenue, Parkholme, S.A., 5043.

On the matter of identification, m.c.w. seemed the obvious answer, but how and when? How was solved by the guideline "all solid state"—so, a handful of ICs and lo presto, call signs at the speed of light—but we settled for 25 w.p.m. When was guided largely by P.M.G. requirements, exactly when involved quite considerable discussion. The approaches to this are many and varied, each has its own advantages and drawbacks. Our reasoning ran something along these lines:

An ident each and every five minutes, 24 hours a day, a good beacon sure, but this State has had a two metre beacon for years. A call sign every five minutes of 'on air' time? This means that Joe Bloggs can come up and say to Bill Smith: "See you in the local in two minutes." No ident! A call sign at the start of each over? VK5ZdiddelyK diddely VK5diddelyZIP diddely diddely calling . . . yuk! How about at the **end** of each over? Okay, but still too many call signs, the average mobile 'over' on a busy net is 1-2 minutes and many of only a few seconds. How about a call sign at the end of the first over, inhibit call signs for the next few overs then towards the end of the five-minute period, enable the call sign to tack onto the end of the over in progress. Great, but I like that beacon idea, good for the DX station!

Right, let us say a call sign at the end of the first over, then inhibit call sign but if after say seven seconds there is no reply, cancel call sign inhibit and the next transmission has a call sign on the end, i.e. any seven-second break in the incoming signal allows the call sign to be generated when the next incoming signal ceases. As the call sign takes 3-4 seconds, it only requires a three-second wait after a call sign to be able to initiate another one. This feature allows a station to optimise his receiving equipment or check out dead spots when there is no one else around. Immediately a QSO commences the call sign is cancelled for a period of four minutes. Theoretically it is possible for no ident to occur for nearly seven minutes, but experience has shown that a call sign is initiated approximately every 4-5 minutes during long QSOs.

Having convinced ourselves of our objectives we set about lashing up some working circuits. These grew three dimensionally . . . as did the pile of dead marines around the shack. The first tests with these circuits proved quite amusing—they worked fine individually, but hooked to the repeater, back circuits and transients played havoc, circuits refused to obey instructions from the test facilities on the front panel, and the whole device just sat there and talked to itself.

One by one, the many problems were overcome and the umpteenth copy of the circuit diagram became the real thing. The problem of mounting the circuitry was solved by using reject computer cards. After a lot of tedious work we succeeded in mounting 80% of the circuitry using the existing printed tracking. This resulted in a neat card with very little jumpering on the back. All the circuitry fitted comfortably on three cards which plugged into sockets mounted on the power supply chassis. The first card contains the transmitter control circuitry, the second the ten-minute timer, and the third the ident control circuitry.

CONTROL CIRCUIT OPERATION

Fig. 2 shows details of the transmitter control circuit which operates in the following manner. A two-stage d.c. amplifier fitted to the receiver mute transistor causes +11.45v. to appear at pin 13 when the mute is open and 0v. when closed. When a signal is received the mute opens and Tr1 turns on a lamp on the front panel. The + level is also fed via a 10K pot and 2 μF. by-pass to Tr2/Tr3 which are wired as a Schmitt trigger. The 2 μF. and 10K pot smooth out weak signal "picket fence" type flutter and afford some control on the switch sensitivity.

Tr2 turns on and Tr3 snaps off, generating a sharp pulse which is a.c. coupled to Tr4/Tr5 which are wired as

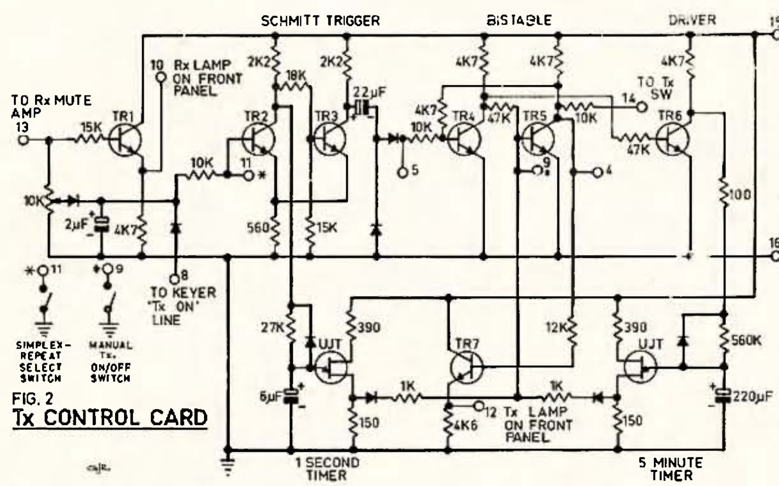
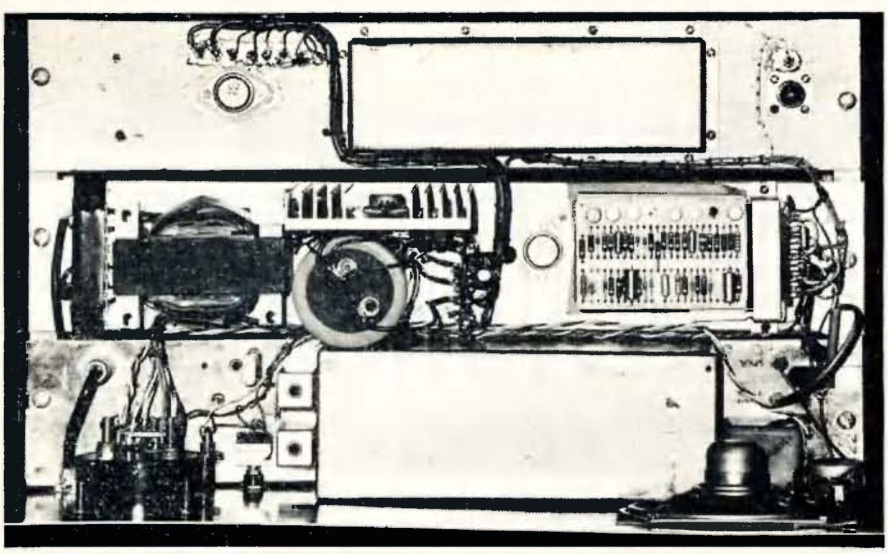


FIG. 2
Tx CONTROL CARD



Top view of repeater. Top: Transmitter. Centre: Power supply—with plug-in control cards at right. Bottom: Receiver—with metering on the left and monitor loudspeaker at right.

a bistable pair. (The Schmitt trigger is employed to guarantee a sharp pulse of the correct level each time the mute opens.) Tr4 turns on and Tr5 turns off. The + level on the collector of Tr5 is used to turn the transmitter on by operating the transmitter on-off transistor. (See power supply circuit diagram.) Tr6 also turns off and the + level at its collector allows the five-minute timer to commence working. Tr7 turns on and lights a front panel lamp.

When the incoming signal ceases and the mute closes, Tr1 turns off, extinguishing a front panel lamp and Tr2/Tr3 flip back to their former state. The + level now on collector Tr2 allows the one-second timer to operate and fire a shot into the base of Tr5 flipping the bistable pair and turning the transmitter off. Tr6 turns on and resets the five-minute timer. Tr7 turns off and extinguishes the front panel transmitter lamp. In the event of the mute being open for more than five minutes continuously, the five-minute timer fires a shot into the base of Tr5 and turns the transmitter off. As the Schmitt trigger is a.c. coupled to the bistable, to bring the transmitter on again requires the mute to close at least momentarily to allow the Schmitt trigger to reset so that Tr3 can pulse Tr4 when the mute opens again.

The 10-minute timer employs a single unijunction transistor and identical circuitry to the one-second and four-second timers save for the R/C values. The shunt diode provides the capacitor discharge path when the timers are reset.

Tantalum capacitors are used in all the timers, the 10-minute timer using 100 μF. and 3 megohms. The 10-minute accuracy is ±15% over a temperature range of 50-100°F. The circuit could obviously be made more accurate, but this was considered unnecessary in this application. (The five-minute timer is always within a second or two.)

The 10-minute timer operates into one side of a bistable pair which controls the normally "on" series switch to the transmitter. Once this bistable has been flipped, the positive rail to the transmitter is broken and can only be restored by resetting the bistable by means of a press button on the front panel. A switch on the front panel shunts the 3M charge resistor with approximately 120K to allow the timer to run at 30 seconds for test purposes.

The ident control circuit (Fig. 3) is very similar to the transmitter control card in that it employs two timers and a Schmitt trigger to drive a bistable pair. When the mute opens + level from card 1 turns Tr1 on, Tr2 turns off and Tr3 on—this has no effect on the bistable pair Tr4/Tr5. When the mute closes, the + level from card 1 disappears, but Tr1 remains held on for 100 ms. or so because of the charge in the 5.6 μF. capacitor. Tr1 then turns off, Tr2/Tr3 flip over and the resultant shot from the collector of Tr3 flips the bistable pair Tr4/Tr5. The + level now on the collector of Tr5 is used to initiate a call sign cycle in the solid state keyer. (The 100 ms. delay allows the receiver and mute circuits of the calling station to recover and not clip the first character of the call sign.)

A zero level within the keyer during the cycle time of the keyer is used to turn Tr6 off. The + level on the collector of Tr6 is fed to pin 8 of the transmitter control card and holds the transmitter on during the call sign cycle. At the end of the call sign cycle Tr6 turns on and one second later the transmitter turns off. With the next received signal Tr1 turns on, Tr2 off and Tr3 on. When the signal ceases, Tr3 turns off and pulses the base of Tr4. This pulse has no effect however, because Tr4 is already on, so no call sign is generated.

This situation continues for four minutes then the four-minute timer—which commenced operating when the call sign was initiated—pulses the base of Tr5 and resets the bistable pair. The end of the transmission in progress at that moment (or the next time the mute closes) will then initiate a call sign.

In practice it was found convenient to set this timer a few seconds shorter in duration than the five-minute timer in the transmitter control circuit as this allows the call sign to be enabled prior to any station being "timed out". The effect of this is apparent when a station over-runs the five-minute limit and locks the repeater off. When his transmission finally ceases the receiver mute closes, an ident will automatically announce the channel is clear.

The second timer in the ident control circuit allows a beacon effect to be achieved without having to wait five minutes for the ident. During the period when no signal is received and the mute is closed, the + level on the collector of Tr1 allows the seven-second timer to operate. If the mute remains closed for seven seconds, the timer pulses the base of Tr5 and resets the bistable pair, resulting in an ident at the end of the next incoming signal.

This configuration has proved quite effective although no claims are made that this arrangement would suit all environments. The golden rule for this system—or for any net—is to allow the incoming signal to your receiver to cease before you transmit. This allows the timers to reset before each over. The rule also applies during an ident, for although it is possible to talk over the ident, failure to allow the timers to reset means that the next transmission will be repeated **only** for the remaining portion of the five-minute period allowed for each over. For the long-winded types, a one-second break in transmission will allocate a further five-minute period.

(to be continued)

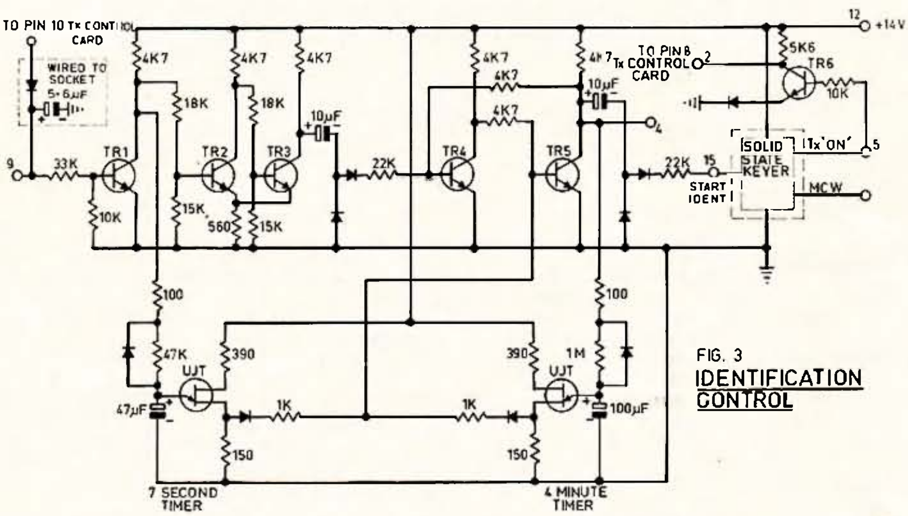


FIG. 3
IDENTIFICATION CONTROL

☆

QSP

(Continued from Page 2)

Certainly, it must be admitted that there are **some** people in the Amateur ranks today who **only** buy commercial equipment, plug it in and operate. But who can really say that it ends there—even the most obvious "appliance operator" is educating himself. He must learn to tune, adjust and operate his equipment, albeit badly initially, but he will learn by his mistakes and such knowledge could be invaluable to the community in times of need. Unwittingly, too, he may provide, for example, the signal that helps in the solution to the "Long Delay Echo" problem.

Consequently, the fact that members of the fraternity buy commercial equipment and even have it serviced commercially, may not make them any less an Amateur Experimenter than the "equipment constructors" of bygone days. But other concepts must be injected into the minds of the right people — those that attend Geneva Conferences—and so the Amateur Service has a P.R. problem—to educate such people that there is more to Amateur Radio than just building transmitters and receivers, but also that today the "Compleat Amateur" is a mythical beast as is the "Compleat Painter" or the "Compleat Philosopher".

Leonardo da Vinci is a silent key.

—D. H. RANKIN, VK3QV,
Federal Vice-President.

PIRATES: 2 METRES AND 11 METRES

At Lilydale (Victoria) Court of Petty Sessions on 25th February a case involving illegal transmissions in the 2 metre band was heard by the S.M. and proven. Defendant was ordered to enter into a good behaviour bond of $200 for three years and a surety of $200 plus $30 costs, to appear for sentence when required (within the period) and all the equipment involved was forfeited. Details of other cases (11 metre band offences) are not yet to hand. (de VK3ZDK)

SUBSCRIPTIONS

A last reminder concerning W.I.A. subscriptions. If you have not paid yours, please do so as soon as possible. If your name is removed from the mailing list it will take several months to re-instate it. Meanwhile any "A.Rs." which you will miss may not be replaceable because only a limited quantity of "overs" is printed each month.

INDONESIA

To hand are several issues of the new Indonesian bulletin "Zero" published monthly by O.R.A.R.I. Region 0, Djakarta, by R. A. J. Lumenta, YB0BY, and his XYL. Although these are in Indonesian it is obvious that concentration is on basic principles with circuits exclusively on valve gear and some local news. Splendid material resulting from immense effort.

OSCAR EXPERIMENTAL REPEATER

A licence has been granted for the operation of an experimental translator, VK3WIA/R5, on Mt. Martha to familiarise users with Oscar

(Continued on Page 12)

TACKLING T.V.I.*

● No apology is required for reprinting this TVI article from "Radio Communication" (R.S.G.B. journal of October 1971). Readers should note that there are differences, but the principles are the same.

There is a wealth of information available to anyone wishing to study the literature and work on the problem which is, of course, a two-part one as there are two sets of equipment involved.

THE TELEVISION RECEIVER

Unlike the Amateur signal, which is one modulated carrier not more than 8 kHz. wide, the television signal contains two carriers, sound and vision. The sound signal is about 50 kHz. wide, and the vision signal is some 3½ MHz. wide on 405 lines and about 5½ MHz. wide on 625 lines. To receive all this the t.v. set must be a broadband receiver, which makes it rather susceptible to any strong signal. Its r.f. stage may be overloaded by the Amateur signal and generate many spurious signals which break through in the form of sound bars, cross hatching and/or audio interference.

The fact that the interference affects all channels will suggest that the fault lies with the t.v. set, which needs assistance to sort out the signals it should be receiving from those it ought to reject. This can be given by adding a rejection filter as near to the first stage as possible.

If the Amateur owns his t.v. set the filter can be put inside the back of the cabinet, but it is more usual to fit it on the outside of the cabinet on the end of the aerial feeder. A high-pass filter will attenuate all signals below its cut-off frequency but will have a frequency of maximum attenuation. In commercial filters this is usually about the i.f. of the t.v. set (35 MHz.). Ideally the maximum attenuation should occur at the frequency giving trouble, so an Amateur who works 14 and 21 MHz. only, for instance, could make himself a more effective filter by following an Amateur design or by designing his own from the details in the "Radio Communication Handbook".[1]

With a v.h.f. transmitter the situation is more complicated because the t.v. set may need to receive signals above and below the Amateur signal, say at u.h.f. Channel 9 (190-195 MHz.), Channel 2 (48-53 MHz.), when the transmitter is at 145 MHz. In this case a notch filter for 145 MHz., as supplied by some t.v. firms, or a co-axial stub is the obvious answer. When the t.v. receiver is u.h.f. only a high-pass filter is adequate, and this can take the form of a v.h.f./u.h.f. diplexer with the v.h.f. output terminated in 75 ohms.

Some Amateurs have found that a high-pass filter does not solve all their troubles at the t.v. set, as the Amateur signal sometimes enters by the mains or on the outer braid of the co-axial lead. The former can be inhibited by a mains filter[1] at the t.v. set, and the latter by a braid filter or a quarter-wavelength stub and/or by earthing the braid.[2] The braid filter will either make a break in the aerial feeder or add impedance by coiling co-axial cable around ferrite toroids. A quarter-wavelength of insulated wire connected to the outer braid at the set end will sometimes be effective against a particular frequency. Earthing the braid without breaking it, and so providing the interfering signal with an alternative route, is another answer. The solution to any particular problem is very much a matter for experiment.

THE AMATEUR TRANSMITTER

Particular attention has to be paid to the spurious outputs generated by the transmitter which fall in the t.v. channel.[3] The basic rule here is not to generate them, but if this cannot be avoided they should be kept at home. Many Amateurs now buy commercial transmitters and so have little say in what frequencies are used, though this is something to be considered when buying a new rig. Try to find out what frequencies are produced and work out which ones might cause trouble.[4] One thing is certain—the transmitter will have harmonics, so as a matter of course a low-pass filter to reduce the level of any which fall in the local t.v. channels will be needed.

The amount of attenuation required depends on the strength of the harmonics in relation to the t.v. station's field strength at the receiver. In an area of weak field strength, radiation from the Amateur transmitter will need to be housed in an r.f.-tight box.[5] In this respect some commercial transmitters are better than others, and when buying one look out for large holes in the front or back panel and badly fitting inspection doors which may cause trouble. All the leads into and out of the box should be by-passed and all connections between boxes in the transmitting system, i.e. low-pass filter, Z match, etc., should be of co-axial cable with proper connectors at both ends of each length, however short.[6] It is not safe to assume that a commercial rig is adequately screened and filtered, almost certainly it is not. In some cases a great deal of work is required to make it harmonic proof.

In many cases though, all these precautions are not necessary and simply installing a low-pass filter will effect a cure. A low-pass filter is needed to ensure that only lower frequency signals can get out to the aerial and any accidental frequency above the cut-off frequency of the filter is attenuated. In a Channel 1 area it is obviously important to have a low-pass filter with a cut-off below 41 MHz. A v.h.f. transmitter may also have sub-harmonics when a band-pass filter is more suitable.[7]

An Amateur transmitter is also capable of producing any number of odd spurious frequencies, most of which will be at such a low level as to be completely unnoticeable, but there could be one or two odd mixer products which would be sufficiently strong to cause trouble, or even a parasitic oscillation. Again, these will be substantially attenuated by a filter, but if the specific frequency can be tracked it is better to attack it at the source.

The only way to be sure that the transmitting system is clear of t.v.i. is to test it.[8] A simple and useful gadget for detecting r.f. leakage is a search coil. Make a small coil, say a couple of turns about 1" diameter in 16 s.w.g. and solder one end to the inner and the other to the outer of a length of co-axial cable. Fix an appropriate co-axial connector on the end. Make a T junction box with a tobacco tin and three co-axial connectors, one on each end and one somewhere in the middle, inners connected inside the box. Then connect the search coil to the t.v. set and t.v. aerial lead by means of the junction box. If the t.v. picture is much weakened, prune the line to the search coil a little. After installing the transmitter and television receiver in the same room the loop can be used to search over the transmitter cabinet while it is working into the dummy load and any hot spots where r.f. is leaking out of the cabinet will be revealed on the t.v. screen. Test the leads, knobs, meter holes, filter boxes, etc., and make a note of any places that need attention.

Next test the transmitter on open aerial with transmitter and t.v. receiver in their usual places. If they are in different rooms it will be most helpful to have a fellow Amateur to assist with the observation. Repeat the tests at both ends and in the middle of each Amateur band for each channel on the t.v. set and make a note of the results. If this can be done when trade transmissions are being made, so much the better.

Sometimes at this stage the Amateur finds his transmitter is clean on, say, every band except the h.f. end of 21 MHz. on every channel except Channel 5. That is an easy one, $21 \times 3 = 63$. So it is the third harmonic of 21, and either a low-pass filter that has maximum attenuation covering the third harmonic of the 21 MHz. band, or a tighter box, or more lead filtering, or a combination of these is needed. But whatever the results, look for a pattern. See if a harmonic relationship between some frequency in the transmitter and the frequency in trouble can be traced. Oscillator and mixer frequencies are usually given in equipment manuals, so if in doubt read the book. Work on the rig as seems appropriate and then re-test. Do not be downhearted if it is not clear on a second test, there is always something else that can be done. Interference is curable, even if it takes a lot of work to do it.[5]

T.v.i. can be caused or made worse by over-driving the final amplifier, by over-modulating,[9] and by key clicks, and it may be possible to clear it simply by taking it a bit easier, by using a speech clipper or a click filter. It has also been cured by using less power, but the same effect could often be achieved by turning the microphone gain knob back slightly.

(Continued on Page 12)

* Reprinted from "Radio Communication," October 1971.

TACKLING T.V.I.

(Continued from Page 11)

When all the test results are negative the transmitter can be put on the air at any time with confidence. Neighbouring t.v. sets may need high-pass and/or braid filters, but it is usually wise to wait until neighbours raise the subject. If the Amateur can demonstrate that his own receiver is clear it will be a powerful argument in his favour, and if he has a spare filter at the ready he can soon prove to his neighbour that his trouble is easily curable. If a friendly relationship can be maintained with neighbours and problems sorted out with them, the good name of Amateur Radio will have been promoted and a case of t.v.i. kept out of the official statistics.

This will reduce the total problem and the Amateur will have reached the happy state where he will feel a justifiable pride in having used his licence to learn something, and he will be in a position to encourage and assist other Amateurs to do the same.

REFERENCES

1. "Radio Communication Handbook," chapter 18.
2. "Which Filter?", "Radio Communication," July 1969, p. 470.
3. "How Much Harmonic?", "Radio Communication," May 1969, p. 328.
4. "TVI Tips," "Radio Communication, February 1970, p. 108.
5. "Where TVI is a Problem," "Radio Communication," February 1970, p. 74.
6. "TVI Tips," "Radio Communication," June 1970, p. 383.
7. "Band Pass Filters," "Radio Communication," December 1969, p. 867.
8. "TVI Tips," Radio · Communication," April 1970, p. 245.
9. "TVI Tips," "Radio Communication," September 1970, p. 609.

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QSP

(Continued from Page 10)

satellite techniques. Frequencies are 145.85 MHz. input, 435.15 MHz. output, power 1.0 watt, mode F3 plus or minus 10 kHz.

MOBILEERING EUROPEAN STYLE

"For the man who really likes to travel and operate mobile at the same time . . . Tour even has something for him: a VW camper bus fully outfitted to accommodate three or four adults, and fully equipped with a Yaesu FT-101 and Hustler antenna for 80-10 metres." ("CQ" Mar. '72)

CUSTOMS

Work still goes on behind the scenes on this complex subject. Maico Electronics recently applied for By-Law concessions on 420-450 MHz. band mobile f.m. transceivers, but their application was blocked by an Australian manufacturer of similar equipment.

STANDARDS ASSN. OF AUSTRALIA

Recent new standards included 1099 (2nd) electronics testing procedures, 1173 recommended measurement methods on t.v. rx and 1174 radio tx measurements. Draft standards include 1878 on electrotechnological diagrams, charts and tables.

W.A.C. AWARD

This is an I.A.R.U. award. All applications received by the W.I.A. would be forwarded to I.A.R.U. Headquarters to process.

REPEATERS

Census—U.S.A.: 310 (269 on 2 mx), Canada 52 (all on 2 mx). "CQ" Mar. '72.

ARTICLES

Articles are always needed. Short articles are always welcomed, not only as "fillers", but for their own worth.

AN ATTENUATION MARKER

A. J. C. THOMPSON,* VK4AT

This unusual but efficient "Marker" has been a very essential piece of the equipment used on the author's Antenna Farm during the last couple of years.

The "Marker" possesses the ability to record exactly just one particular signal strength and on only one frequency band. This is done as the instrument is moved outwards from an r.f. power source. An identical signal strength can be recorded also in any other direction from that source.

At this QTH it has been used mainly as an indicator, in order to maintain a set output from the transmitter and the antenna.

The transmitter was rated at 120w., the antenna being a 13 element yagi. This attenuation strength (inherent in the marker) gave the following approximate readings:

33 ft. off the end of the driven element.

130 ft. off the other end, but diagonally and across a 14 MHz. yagi of 5 elements.

90 ft. inside the beam.

16 ft. (approx. half way) between the driven element and reflector.

This and similar tests will be discussed later. The merits of this marker are not deemed important in the following notes.

This is an article for the experimenter. It is written from that particular angle and it is intended to be a stepping stone into this interesting field for average minded Amateurs, a class to which the writer belongs.

Even in its present very crude state this attenuation marker has already provided a much-needed and very useful piece of equipment. It is stressed that in this marker, the "pull" from various sources, being all off-frequency ones, must be countered so that eventually they will culminate on the exact frequency of the r.f. power source. In this regard, it differs substantially from the f.s.m. or a household fluorescent tube.

In addition, being very directional, it can be used as an r.f. sniffer on either stray wires or even on different sections of a dipole or vertical.

Basically it is a fluorescent tube with components that force it to work on only one frequency band. At this QTH dud 20w. fluorescent tubes are used. These can be "struck" with a 1w. power source (a g.d.o.) at a distance of up to 5 inches. They will stay alight (hold) to up to 18 inches until it reaches the extinguishing point (drop-out). We will also disregard the power factor and give the actual linear measurements (approx.). Because the drop-out point is so obvious, sensitive and critical, it is from this viewpoint that the following experiments have been made.

The strike position has not been neglected as it is a very handy adjunct at shorter ranges.

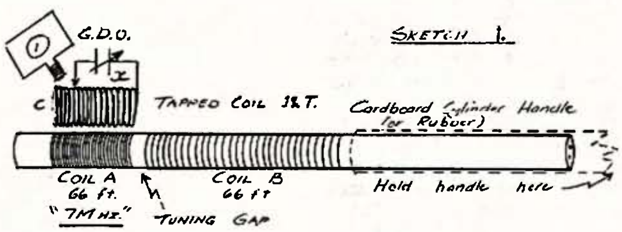
We concentrate now on two very unusual things:

(1) The behaviour of unconnected coils (this appears to have been ignored in the literature at our particular level).

(2) Wave guides on 7 MHz. (our literature mentions this, but regard it as not practicable on that band).

It now becomes necessary to differentiate between the terms wave guides and feed lines. For the purposes of this article we will take Sketch 4. Here we have a feed line E, about 18 inches long. It physically connects 2 turns round the g.d.o. coil, with 2 turns round coil A. This will strike the flourescent tube. If now we remove that gear and use several coils (like Coil A) placed end to end and thus transfer the g.d.o's energy to also strike the tube, then such coils would be termed wave guides.

This project is not foolproof, so "heed this warning". The coils in their final state have to be adjusted under field conditions. In some circumstances they are liable to radiate fiercely. The effect of such rays will not be felt for several hours after the actual burn. The burns are severe especially on already damaged skin. Keep both your unprotected eyes and your hands well clear of the coils at this time. Use an insulated rod or even a wooden ruler. It should be realised that, as with a.c., safe handling depends on a knowledge of the risks involved.



SKETCH 1.

In this project radiation gives no warning, so concentrations of the suitable energy should be either avoided altogether or the necessary precautions taken. In the chain reaction that we are using, a suspicious eye should be cast on the coils and the fluorescent material. With regard to the latter, the writer started these experiments by radiating off the fluorescent coating at the end of a 40w. tube that was just hung on the end of a dipole with 120w. on the transmitter. It will be shown that the adjustment of the coils can and should be done with about 1w. of power or its equivalent in distance from the r.f. power source.

In order to understand what is happening, we start off using low power (a g.d.o.).

Our aim is to use two unconnected coils of 66 ft. in length of wire, wound round our dud fluorescent tube. We want to fire the tube at around 7.1 MHz. but in this case they fire at 5.6 MHz.

It is necessary to have the "pull" of the two coils to each other and to the g.d.o. coil such that the combined result is actually a half wave corresponding to 66 ft. This will also be our transmitter frequency.

Because the pull of the g.d.o. with its tuned circuit has a different effect on coils A and B than a radiating wire antenna, with the transmitter as the power, it is not possible to use the same setting on both occasions.

Another problem is that the maximum distance away obtained for "firing" the tube is not the exact position to give a long distance for the "hold" that leads to the final "drop-out" or extinguishing point.

These three terms will be used here.

Two main defects in the use of a g.d.o. caused a lot of failures:

(1) The tube coils A and B pulled the g.d.o. off frequency.

(2) The maximum output of the g.d.o. coil in use (3.6-8 MHz.) peaked at about 5.6 MHz.

Dozens of coils were wound and tried. By the use of six tubes and using many combinations, the best results were listed and afterwards compared. In all cases where satisfactory results were obtained, the two coils had different electrical lengths but both were half wave (66 ft.) in actual length of wire. In the example shown here, this could be obtained through different gauge, spacing or with the assistance of a tuned circuit:—

	Coil A	Coil B	Gauge
(1)	close w'nd	dble. spac.	similar
(2)	close w'nd	close w'nd	different
(3)	dble. spac.	wide spac.	similar
(4)	close w'nd	dble. spac.	tuned circuit

The simple two-coil arrangement on a dud 20w. tube was chosen because it was neat and very handy to use on the installation at this QTH even in its present crude state. The antennas here are all on 20 ft. poles so the marker can be struck on 4 or 5 of the elements at from 15 ft. to 1 ft. The attenuation drop-out occurs at 30-140 ft. distance in varying directions, using a power of 120w. on the transmitter.

This two-coil arrangement was more difficult to adjust than the others.

No. 4 in the above was the first system worked out and this was used for the first test quoted previously. It was awkward to use, but had the additional advantage of being able to use the tuned circuit as a striker and then to discard this section for the adjustment part.

We take now Sketch 2. Coil A is close wound, Coil B double spaced, the

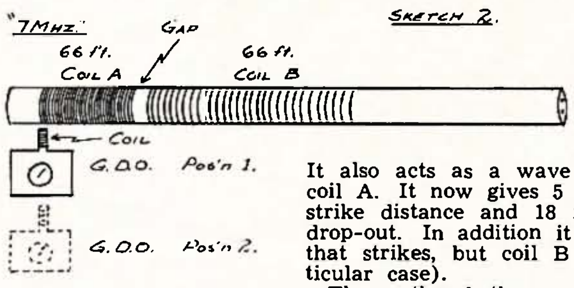
* Skyrings Creek, Pomona, Qld., 4568.

two coils are placed close together. The g.d.o. coil in use is 3.7-8 MHz.

Place the g.d.o. in touching position on the end of coil A and then alter the frequency for the strike. The output of the g.d.o. is poor at 7.1 MHz. and the coil system is not correct, so in this case the firing would occur at about 5.6 MHz.

Now draw the g.d.o. back and forward, as in Sketch 2, noting the distance at which the strike can be made to occur (½ to 2 inches).

Now try in a similar manner for the hold and the drop-out distance. It will have been noted that **the pull changes the g.d.o. frequency for each different distance.**



It is evident then that the exact tuning for maximum strike distance can not be suitable for a good drop-out distance as they occur at different distances. The latter distance may be 2-4 inches. It should be noted that coils A and B pull the g.d.o., with its coil a long way off frequency. They cannot pull a feed line or antenna off frequency. Having noted these peculiarities, it is now necessary to raise the frequency as shown by the g.d.o. up to the frequency of the tube coils. The characteristics of the two coils have to be such that the limited tuning effect of altering the gap ¼" to 2" between coils A and B is sufficient to raise the frequency to 7.1 MHz.

We take now Sketch 1 with the coil data No. 4. The tuned circuit X uses a receiver type condenser and 17 turns of heavy gauge self supporting al. wire tapped at the 12th turn. (It was on hand at the time.) The remaining 5 turns can carry the signal at that frequency in its capacity as a wave guide. This is simply another tuning device.

We have an instrument of sorts now, so we can turn round and use it to test the performance of our g.d.o.

In Sketch 4 the measuring instrument is a f.s.m., the circuit of which is given. At this QTH three different meters were used for these tests. It should be noted that in both this case and in the tuned circuit X of Sketch 1, both condensers prevent striking if they are meshed too far.

Both methods can be used as tuning devices for field work on coils A and B.

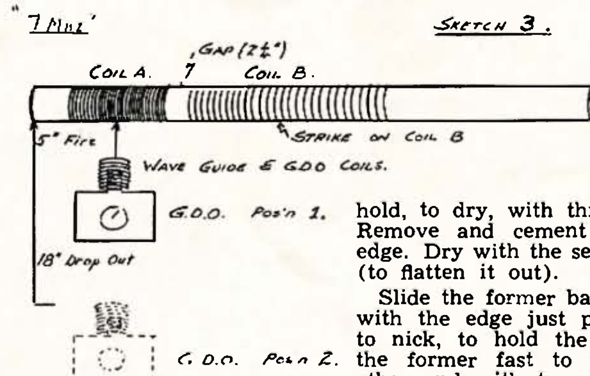
The f.s.m. is coupled from the antenna terminals to 2 turns around the centre of coil B. The g.d.o. is coupled to coil A (to influence its usual end) with 2 turns around coil A and 2 turns round the end of the g.d.o. coil. The output at different frequencies is obtained with the adjustment of the condenser and that of the coils.

In this test the highest output of 10 mA. was obtained at 5.6 MHz. The output at the desired frequency of 7.1 MHz. was very poor indeed. It is noted that high capacity gives a high reading but it is not suitable for the strike.

The gear around coil A and the g.d.o. can now be removed and similar tests taken to note the influence of the g.d.o. on the tube coils at quite surprising distances.

Now take Sketch 3. This time we test with the g.d.o. and get a normal ½ and 1 inch distance respectively for strike and drop-out at 7.1 MHz. By placing a close wound coil (like coil A) over the g.d.o. coil we force an alteration in the g.d.o. peak frequency. It also acts as a wave guide toward coil A. It now gives 5 inches for the strike distance and 18 inches for the drop-out. In addition it is not coil A that strikes, but coil B (in this particular case).

The path of the energy from the g.d.o. to coil B is: 18 inches from the wave guide of the g.d.o. to coil A, through that coil and a gap of 2½ inches and only then does it fire or drop-out at coil B. The phenomena of coil A acting as a wave guide is quite usual. By altering the frequency (as an example) the wave-guide effect can switch from one coil to another.



Better results could be obtained if the g.d.o. and the wave guide were better balanced up. We should by now have had a bit of practice in adjusting these things in order to work exactly on 7.1 MHz. if required. It should have been noted that we have here a very silent method of firing a fluorescent tube, and a very economical way of keeping it just alight. You will find also that with the aid of a fluorescent tube hung on the end of a dipole and by using a Gamma-match you can turn the fluorescent up and down just like using the wick on a lamp. It turns your plate meter up and down too, if you don't watch out. The same effect is obtained by altering the frequency on the g.d.o. in Sketch 2. We now have to adjust these coils for actual use. Our aim is a long drop-out figure.

The lead to a dummy load is good for a start. The aim (preferably) is for a "low" glow in coil B, using coil A for the strike and adjusting the gap while quite a distance away from the lead. The tube itself is held at the coil B end but using a thick insulation such as rubber. This will also give a steady capacity to ground. The upright position is usually best as it is very directive. (It can be used as an r.f. sniffer.) The writer prefers to have several different types of half wave coils and has also a couple of tubes with one permanent winding right on the glass. It doesn't take long to find a pair of coils that match up.

For using the strike part, an egg insulator on the element end makes a good pulley. The tube is hauled up in an upright position by bricklayer's nylon string and if suitably placed will indicate that a certain strength was there. As previously shown, the power drain is slight for strike and much less for the hold. The ordinary fluorescent tube can be used for very strong outputs and is not frequency conscious.

WINDING THE COILS

We deal now with a method of winding the necessary 66 ft. of wire on to a detachable former. The method is easy and the product will not fall to bits. These coils have to be interchangeable. Tubes vary slightly in diameter. A medium grade of sandpaper is good. (The writer uses several tubes with one winding fixed on the glass itself.) Wrap the sandpaper round the tube, sandside inside, for 1¼ turns. Cement along the edges and hold, to dry, with three rubber bands. Remove and cement along the inner edge. Dry with the seam on the bottom (to flatten it out).

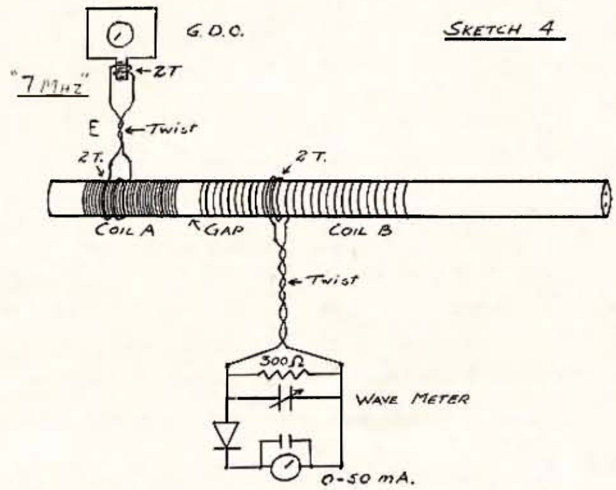
Slide the former back on to the tube with the edge just protruding enough to nick, to hold the first turn. Hold the former fast to the glass at the other end with tape.

We have now to wind 66 ft. of wire on to each of the two formers required. Several coils of different electrical lengths (but all 66 ft. long) should be wound for this band. We will take the coil data from (1) which is a single and a double spaced coil. Excellent wire can be obtained from defunct genemotors and large step-down transformers.

For coil A stretch out 70 ft. of wire attached to a nail. Have a marked loop 2 ft. from each end. This 2 ft. and probably an inch of the former, is to be sacrificed in order to get a firm cut close to the coil proper. Have some short pieces of sticking tape attached to the glass in case of emergencies. The first few turns can be overwound and taped for firmness.

Wind the wire in the same direction each time, taking care not to pull too tightly. For right to left winding, rotate the tube with the right hand, in an anti-clockwise direction with a guiding thumb being parallel to the tube. Spread the final 2 feet. Cement round the "former" where the knife will cut and then again in four places lengthwise, to hold the wires in position. Cut and discard the 2 ft. of wire at each end together with the surplus former. Should any end-winding come loose use half an inch of narrow tape both inside and then outside to hold it.

Coil B has twice the length of wire, it being hooked over a nail in the middle, to keep the winding tension equal. It is close wound, using two wires, in the same manner. When complete, unwind one of the two wires. If the wires have been crossed over, it is easiest to cut the wire each time it has been crossed over.



PRACTICAL APPLICATION

We will deal now with its practical application. Two quite unusual effects came in the use of a multiband and a vertical. The multiband was an off-centre fed affair. It was a very indifferent performer over several years. With the present set-up (in the direction of Adelaide) it suddenly behaved with such efficiency the writer was afraid to alter or touch it for six months. Visiting Amateurs all agreed that it had more things wrong with it than any antenna they had ever seen. Very recently an effort was made to find out just what made it tick.

Sketch 6 gives the layout. The multiband (used only on 7 MHz.) is placed between two 16 ft. sections on one end (west) and the reflector of the yagi beam on the other end (east). This part of the experiment failed, as it over-ran the first egg insulator on the west and had no effect on the reflector on the east. Using the attenuation marker, it was struck on the feed line, and then the varying intensity of the fluorescence was an indication of the intensity of the r.f. It was easily seen that the feed line (300 ohm t.v. line) F-G-H was radiating from F to G (half wave 66 ft.) but not G to H (16 ft.). This latter was inside the shack to the transmitter. A hunt for the cause of such a curious state of affairs revealed that a discarded quarter wave feed line, of 300 ohms, was coiled at the point G. The remaining wire crossed via the rafters to the earth at the opposite end. It had good r.f. all the way. It was then ascertained that the multiband, section B, radiated not at all (like a reflector). The other section A had some r.f.

The next test was for the distance away for the strike to occur. It gave 6 ft. at F and G and 1 ft. at C. Lastly, the hold position was tried to give the drop-out distance. From the point F it was 70 ft. to the N. and 40 ft. S. At this stage it was decided to see what happens when two antennas are energised at the same time. (The writer does it this way when changing over to a different antenna.)

It will be seen in Sketch 6 that the transmitter with 3 ft. of co-ax would have 66 ft. of 300 ohm line to the yagi beam on one side and then 16 ft. plus 66 ft. on the other side (this latter section would **radiate**). On test, the multiband was the same, only the output was down a little, but the yagi beam did not radiate at all, nor did the reflector work. However, the feed line radiated. It was strange to see the dimly lighted tube pass right under the reflector without blanking out. The drop-out occurred at 70 ft. to the N. and, although not recorded, about the same to the S. The two feed lines were in series and almost centre-fed by the 3 ft. of co-ax.

We deal now with a vertical which acted very queerly. It is seen in Sketch 5. The pole used was 40 ft. high. Section X was a standard type vertical taken from a text book. It consists of 300 ohm t.v. line with the two wires at the top soldered together. The length is 33 ft. The bottom two wires were connected, one to earth and the other through a tuning unit at the base to a co-ax. lead-in. It loaded up well and did radiate but the reports were not good. Under the following circumstances it ceased to radiate, but apparently became a wave guide instead.

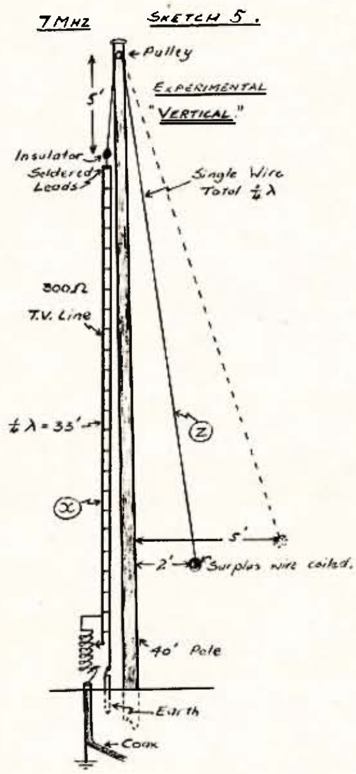
The wire that did radiate is marked Z. It is a stranded wire clothes-line type. It is separated by the insulator from the two-wire 300 ohm section. (The distance was not recorded, but would be between 1 and 5 inches.) This single wire goes up 5 ft. then round the pulley and down to total 33 ft. At this point the surplus wire was scrambled into a ball where it hung 2 ft. out from the pole. Using 120w. on a.m. it gave strength 8 in Sydney (in a single test) against 9 by the yagi beam.

The attenuation marker gave the drop-out point as 70 ft. as against the yagi 130 ft. On the strike the fluorescence showed unduly strong on the bottom where this ball hung, but was lighter higher up. The strike and drop-out tests on the standard section of 300 ohm line showed no radiation over quite a large sector beyond 6 ft. away. The line Z was then shifted until the single wire Z was 5 ft. away at the end. In this new position it ceased to radiate, but the other section X then radiated.

It should be noted that the writer uses the term wave guide for the coils, but in this case and also in the multiband, the section that should have radiated but didn't had also all the symptoms of being a reflector (under test).

CONCLUSIONS

In the cause of simplicity, linear measurements have been quoted. However, the principle concerned here is the "inverse square law of light". Certain factors prevent it from applying here 100%. With yagi beam, the drop-out attenuation point will always be between two of the directors (in this case 90 or 140 ft.). A beam of this kind contains more energy than is put into it. It is believed to come in from the sides. In addition, the strength of say director 5 is less than at director 4,



TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

Manuscripts should preferably be typewritten but if handwritten please double space the writing. If possible collaborate with any local draughtsman, student or engineer to do illustrations after the method shown in "A.R.," May 1971, page 5. Otherwise drawings will be done by "A.R." staff.

Please address all articles to:
EDITOR "A.R.,"
P.O. BOX 67,
EAST MELBOURNE,
VICTORIA, 3002

REMINDER REMINDER

Are you financial with your Division? If not, time is running short. Please pay your subscription **now** to W.I.A., Box 67, East Melbourne, Vic., 3002, to avoid having "A.R." cancelled. It is easy for "A.R." to be discontinued, but much delay occurs in re-instatement.

but director 5 would be stronger than at the half-way point between them.

Einstein's Law of Relativity would suggest that the square law of light would fix the relative strengths between adjacent elements rather than the distance from the r.f. source itself. This point the writer saw demonstrated with the aid of a 14 MHz. two element yagi, a transmitter power of 120w., and an ordinary household 40w. fluorescent tube. If the director was just close enough so that the fluorescent tube could just pass the approx. half-way point, then the fluorescence **increased** with the distance **away** from the source up to the director. Another factor that we have to consider is that we are not looking at "light". We are seeing the effect that light has on a certain substance.

The writer has found that much fresh information is obtained on the behaviour of antennas just by using an instrument that is based on a different principle.

In the actual experimental work at this stage and at this QTH the course to be followed would be to take the unusual features in both the vertical (Sketch 5) and the multiband (Sketch 6), then reproduce the same conditions.

By an elimination process it would be hoped to eventually arrive at the correct solution. Results of single tests, as set out in the diagrams, are seldom reliable, but if any unusual features "tie in" with tests from other sources, as in this case, then further investigation would be in order.

With regard to the attenuation marker itself, the next logical step would be the calibration.

It may be recollected that in the power tests with the g.d.o. (Sketch 4) the actual strike itself occurs, not at the high power point but at the low. In addition, at the actual strike moment itself, apparently a complete phase reversal effect occurs that immobilises the g.d.o. meter, yet it apparently operated normally on the harmonics. This characteristic itself can be used as an indicator in daylight hours by using the meter to indicate the presence of fluorescence.

A perusal of suitable text books on the relevant subject brings forth the following information which is very briefly stated.

In fluorescent tubes we see not light itself but the effect of light on a material.

It is only luminence intensity that stimulates the eye, particularly in the yellow-green part of the spectrum. Actually it is the work done by light. The chemical substance in the fluorescent tube becomes luminescent when bombarded by electrons. The light is produced by the conversion of part of their kinetic energy into light energy.

We have two factors here:—

(1) The density of the electrons striking the material,

(2) Their velocity.

In photography we must add the time factor also.

For experimental purposes it is assumed that if any clearly defined differences can be created then we have a good basis for measurements.

In the present instance with this attenuation marker we have several co-related clearly defined points:—

(1) The linear measurements for the strike;

(2) The linear measurements for the drop-out;

(3) The moment of the phase reversal as registered by the g.d.o. meter.

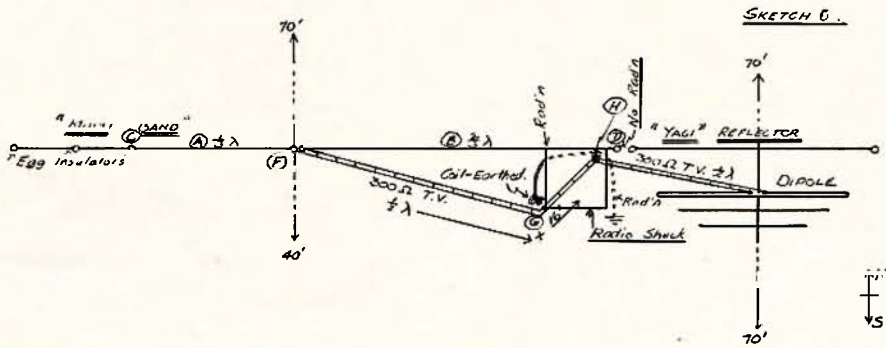
Less clearly defined are:—

(1) The action of the various kinds of fluorescence materials.

(2) The difference between (a) a sodium vapour lamp (which follows the rise and fall in the a.c. voltage to within 90%); (b) a 40w. fluorescent tube (which alters only about 20% similarly).

We have also, the oretically. The "inverse square law of light," as it applies to the full and half power results in actual practice.

As this law applies "in a vacuum" it does not necessarily limit the speed of the electrons in the magnetic field to that in the electrostatic field.



It is trusted that these remarks on the importance of our instrument upgrading will channel experimental work into this particular field of research.

While waiting for this article to be typed, the writer re-tested Sketch 4, but this time for "phase" purposes. The strike occurs at maximum instead of minimum. It will be remembered that while in the strike position both meters were immobilised, yet they showed some activity on harmonics. Evidently then either the meters did not work while the tube was luminscent or else the meter's indication of no current was correct.

The method of test and the results are as follows:—

A narrow strip of sandpaper, the width of the space between the coils, was placed there, to prevent the tape from sticking to the glass tube. Tape was applied to it and the adjacent end of each coil so that the glass tube could be removed without altering the relationship of the coils to each other.

With the tube removed, the g.d.o. dial was rotated from 3.7-8 MHz. Maximum and minimum points, together with their frequencies, were noted. The most efficient spot appeared to be in the centre of the coil.

The tube was then re-inserted. The dial was again rotated, first from the 3.7 MHz. end to the maximum point of 13 mA., where the tube fired, then (in this instance) from the 8 MHz. end to a maximum at 8 mA. where it did **not** fire, then down and up to the maximum point of 13 mA. where it **did** fire.

Of particular interest is the fact that it fired at the maximum point as indicated by the meter, yet it was the minimum point as registered by the luminescence. This was indicated because the luminescence increased as the g.d.o. dial was rotated to either end. The meters gave no indication of this phenomena either.

These tests would appear to indicate that (1) the current flow through the coils cease at the moment of the strike, (2) the total energy contained in the coils is absorbed by the tube-gas and the luminescent material, (3) a phase change occurs at that point. This turning of the luminescence up and down by this method reminded the writer of the text book method of doing the same job.

There they operate on the 50 cycle a.c. with two thyratrons. These are used to cut off the voltage for a period in each cycle. The "persistence" factor of the flourescence material saves the tube from extinguishing during the voltage cut-off period.

In this last experiment, two points are of interest:—

(1) A clear-cut indication of fluorescence is given, by the meter registering the on and off currents.

(2) The fluorescence is quick enough to save a germanium diode while using a transmitter instead of the g.d.o.

Commercial Kinks

Last month I started this series off with a few hints on receivers. This time I will continue our discussion on audio a.g.c. as applied to old or to some of the newer low priced receivers. Also a few notes on the Galaxy transceivers.

AUDIO DERIVED A.G.C. FOR S.S.B. ON OLD RECEIVERS

Anyway, let's get under way by returning to the problem of reasonable sideband reception. I think perhaps I raised a few eyebrows when I stated that stability and selectivity were not quite the important things that S.w.l's needed.

It has seemed to me for a long time now that the most infuriating thing about tuning s.s.b. is the constant adjustment of the r.f. gain control.

The circuit in Fig. 1 has proved to be the answer in several widely different receivers.

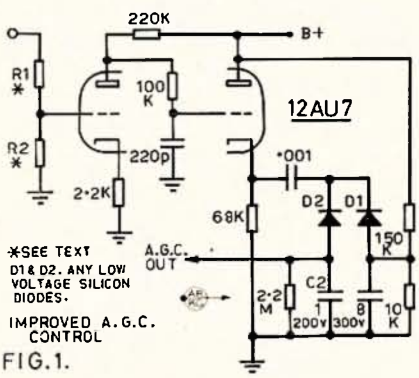


FIG.1.

The input to R1 goes to the hot end of the audio gain control, and the ratio of R1 to R2 sets the amount of a.g.c. voltage developed.

You can also adjust the value of C2 to obtain any amount of delay that you require on the a.g.c. decay.

I suggest that the normal a.g.c. be left in for a.m. reception, and that you use the audio derived a.g.c. for sideband and c.w. only. The high voltage is not critical and anything from 100 to 300 volts will be fine.

The complete unit can be built up on a small scrap of aluminium and tucked in under the receiver chassis, so you should not need to modify the actual set in any way. By the way, don't forget to copy out the circuit and pin it in the instruction book. This will not only help you in the future, but also any new owner to whom you might sell the set.

GALAXY RECEIVERS

Considering that these units first came on the Australian market early in 1964, and sold at something just over £200 for the III., they still command a very good price on the secondhand market, if you can find one.

Over the years most of them have given very little trouble to their owners. Probably the worst fault found in them has been faulty soldering in the 9 MHz. filter. It takes a brave man to open one of these up, but most of those who have, have been rewarded with success. Symptoms of a faulty filter are low transmitter output coupled with generally poor transmitted audio quality. However, check out all the other possibilities before you open up the filter.

Galaxy have supplied some service information on the early three and five-band units that would be worth adding to your files.

Bias Adjustment.—It is recommended that the Galaxy III. and V. bias be adjusted by placing the function switch in the c.w. position, with the mike gain control full counter clockwise (off position) and the sideband selector in SB-1. The bias should be adjusted midway between 4 and 5 on the meter scale.

This adjustment should be checked periodically and re-adjusted if necessary. Older instruction books recommend a lower setting than this. The newer setting will give better p.a. tube linearity and the audio quality should be better.

Meter Adjustment.—Occasionally the meter movement will appear to stick or hang momentarily. This can normally be corrected by carefully removing the snap-on plastic face of the meter and adjusting the meter bearing mount assembly. This should be done with care and any slight adjustments made should be re-checked for freedom of needle movement. If the bearings are set too tight the needle will hang.

S Meter Adjustment.—Proper adjustment of the S meter should be made prior to tune-up adjustments of the transceiver. After approximately ten minutes warm-up time, remove the antenna and place the function switch to p.t.t. position. R.f. gain control must be fully on. Adjust R2 control (on top of chassis near the dial light) for a zero setting.

One other problem with the early Galaxy that has come to my notice is a spurious signal output on 80 and 20 metres. Our own "A.R." Editor reports this one on his III. It appears that the spacing of the spurious from the wanted signal changes at twice the normal tuning rate, which would suggest that maybe the second harmonic of the v.f.o. is beating against something. If you have any ideas on this, perhaps you could let us know here at "A.R."

Next month I will continue with transceivers on a more general theme. I am also working on a run down of problems, modifications and ideas in general on the famous FT200. Perhaps you would like to add a few of your ideas. Don't be backward, let's have them.

— · · · —

AFTER-THOUGHTS

"A Drop of Home Brew," page 5 of Feb. '72 "A.R.," top left section of key. The dimension between the pivot and the front contact should read 1½" and **not** 2" as shown. Please amend your copy now.

ROSS HULL V.H.F. CONTEST, 1971-1972 RESULTS

This year's contest is noteworthy because of the narrow margin between the winner VK5SU, and the runner-up VK4RO, also their excellent scores. Congratulations Kerry and Ross, who was so close, on your fine efforts.

Last year's winner, Don VK4ZFB, was not far behind with Joe VK7ZGJ in fourth place.

Don VK4ZFB got into the picture as winner of the 48-hour section, while Bob VK3AOT listed the greatest number of scoring contacts.

With such a narrow winning margin, detailed cross checking was necessary, but this was limited, by the number of logs returned, to a small percentage of the winning log. Part logs contributed to the problem.

If you give numbers in a contest **please** return a log, be it ever so small. If you don't want your score listed, just mark your log "check log only".

I appreciated, and many of the contestants also appreciated, the table of distances provided by Derek VK3AVW, which assisted me immeasurably.

You will note that the number of logs returned is down on last year, and that only 16 limited licensees returned logs in a contest which I thought would have been their "piece of cake".

It appears that we should investigate national contests and by participation or new ideas give these contests a boost.

You, individually or collectively, give me the ideas and I will sort them out to what the majority appear to want.

Let us have a good return for next year's contest.

VK5SU and VK4RO logged 6 metres only for scoring, not many logged 2 metres, VK5ZTN logged 2 metres only, and VK5ZMJ only logged 70 cm. It was almost a 6 metre contest.

The standard of logs was good.

Thanks to those who included comments, to which I will reply.

—Peter VK4PJ.

TROPHY WINNER
VK5SU—J. W. K. Adams

48-HOUR CERTIFICATE
VK4ZFB—D. F. Blanch

Section (a)—Transmitting, Open

	Best 7-Day Score	Best 48-Hour Score	No. of Log Scoring Contacts
VK7JV	277	161	22

Section (b)—Transmitting, Phone

	Best 7-Day Score	Best 48-Hour Score	No. of Log Scoring Contacts
VK2BHO	1329	584	111
2ZSC	955	430	81
2ZQJ	934	417	71
2HZ	496	126	40
2BMX	490	140	54
2ATQ	318	181	27
VK3AOT	1290	441	445
3KU	677	181	87
3BFG	612	184	123
3AMK	596	210	132
3ZYO	521	—	145
3YEJ	458	96	45
3ALK	307	—	40
3ANP	171	—	16
3ZXB	153	72	18
VK4RO	3171	855	216
4ZFB	2841	967	210
4ZGA	1075	230	117
4ZBH	75	75	4
VK5SU	3206	1260	263
5ZMJ	1565	650	123
5ZTN	601	601	35
5ZGF/8	885	510	66
VK6ZAA	1115	528	70
6XY	972	315	34
6ZCD	810	280	75
6PD	578	—	59
6ZFF	Check Log		
VK7ZGJ	2674	791	212
7KJ	535	201	66
7AX	280	—	27
VK8ZGF	Refer VK5ZGF.		
VK9ZAP	155	155	7
ZL3RZ	1830	1080	103

Section (c)—Transmitting, CW
No Entry.

Section (d)—Receiving, Open
L50088—S. Ruediger .... 1164 pts.

☆

TRADE INFORMATION

From Lockheed Aircraft Corp. via Infoplan, P.R., in Sydney, comes news of the development of batteries producing electrical power from the controlled reactions with water of alkaline metals such as sodium or lithium.

• • •

The University of New South Wales has drawn attention to the operation of professional education by tape correspondence in their post-graduate extension studies programme in operation for the last nine years.

• • •

News from the Australian Broadcasting Control Board is that Mr. J. Wilkinson, formerly Assistant Director-General (Radio) in the P.M.G's Dept., has taken over the position in the Board of Controller, Technical Services Division arising out of the personal request, for health reasons, of the transfer of Mr. Brownless to another Branch.

• • •

Another item to hand is a brochure from Fairchild Australia Pty. Ltd. entitled "Ban the uA776" and containing details of their ICs.

OBITUARY

MAJOR W. (BILL) T. S. MITCHELL, VK3UM

Amateurs, both in Australia and overseas will be saddened to learn of the sudden death of Bill Mitchell, VK3UM, on 3rd February last.

Bill obtained his licence in 1937 and his prime operating interest was c.w. with a preference for DX working. However, he took a break from DX in 1939 during the notorious Victorian bushfires of that year when he actively assisted in providing communications from some of the worst stricken areas.

After the second world war, Bill became involved in the administration work of the W.I.A. at a Federal level and served in one capacity or other on the Federal Executive for nearly 16 years—from 1947 to 1966, with a short break in 1950 to 1953 when he served in the United Kingdom. In his time on Executive, Bill held positions as Federal Secretary from 1947 to 1950 and as Federal President of the W.I.A. from 1955 to 1957 and again from 1962 to 1964. At other times he served as Federal Business Manager and Federal Vice-President.

Although not very active in recent years, Bill had, like many of the old-time c.w. men, succumbed to the fascination of s.s.b. techniques and had used this mode of transmission latterly, although his main love remained c.w.

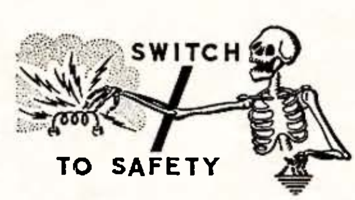
He leaves a wife and four children, and to them, members of the W.I.A. express sympathy in their loss.

COOK BI-CENTENARY AWARD

The following additional stations have qualified for the Award:

Cert. No.	Call	Cert. No.	Call	Cert. No.	Call
1481	UW0LI	1483	UW0LR	1486	UA0LZ
1482	UW0FP	1484	UO5AP	1487	DL6WE
		1485	UK5MAA		

This completes the issue of Cook Bi-Centenary Awards. Applications were received from over 100 different countries and a total of 1,527 Certificates issued, 1,487 were issued for h.f. operation and 40 were issued for v.h.f./u.h.f. operation.



INTRUDER WATCH SUMMARY

OCTOBER TO DECEMBER, 1971, INCLUSIVE

Frequency kHz.	Mode	Average Time GMT	Identification	Traffic and Remarks	Reported by VKs
28020	A1	0700	CN5	CN5 repeated	4KX
27125	A3	0800	—	CB unlicensed this frequency	3ASV
21004	A1	0600	2FB	2FB repeated	4KX
21005	A1	1230	BNJ	BNJ repeated (China)	4KX
•21005	A1	1030	7A1	7A1 repeated (Indonesia)	4KX
21014-5	A1	1100	HXG38	HXG38 repeated	4KX
21015	A1	0130	G7M	G7M five-figure code	4KX
21015	A1	0830	HGX37	HGX21 de HGX37	4KX
21017	A1	0700	SERI	SERI repeated	4KX
21020	Multiplex	0030	—	Operates continuous daily	4PB
21020	A1	0200	UWAK	HZUK de UWAK	4KX
21030	A1	0300	WTSH	PREG de WTSH	4PB
21040	A1	1030	HZUA	HZUK de HZUA	4KX
21050	Multiplex	0200	—	Operates continuous daily	4PB
21050	A1	1100	HZUAA	HZUK de HZUAA	4KX
21078	A1	1000	HZUA	HZUG de HZUA	4KX
21095	Multiplex	0200	—	Operates continuous daily	4PB
21101	A1	1030	HZUA	—	4KX
•21130	A1	0900	P7F	P7F repeated	4KX
14003	A1	0800	JTW	FCL, JTW	8HA
14003	A1	0830	BTW	BTW repeated	8HA
14004	A1	1300	XMWD	—	8HA
14004	A1	1000	9VA1	9VA1 repeated	4KX
14011	A3	1230	—	"calling for rx tuning 1 2 3-10"	4KX
14013	F1	2100	—	RTTY	2ZO
14016	A1	0730	PSEX	—	8HA
14021	A1	1115	NRJG	—	4KX
14027	A1	0700	53IU	—	8HA
14029	A1	0700	E9SF	M2MB de E9SF	8HA
14030	A1	0600	GYR3/4/5	CQ de GYR3/4/5 (Malta)	4PB
14032	A3	0400	Kupang	Telephone link testing, Kupang to Sourabaja (Indonesia)	8HA
•14037-41	A1	0900	PBJ	R9PH 53IU J9MW de PBJ (Indon.)	4KX, 8HA
14039	A1	1000	UXMA	RCC7 de UXMA	4KX
14040	F1	1500	YBU	Morse then RTTY	4KX
14041	A1	2300	YBU	—	8HA
•14050	A1	1200	PKD	CQ de PKD (Indonesia)	4PB
14052	A1	0900	XFG	XFME de XFG	4KX
14053	A1	0900	ZYI	ZYI repeated	4KX
•14054	A1	0830	7BD4	7BD4 (Indonesia)	8HA
•14055	A1	0630	8IUP	8IUP (Indonesia)	8HA
•14056	A1	0630	7BD4	7BD4 (Indonesia)	8HA
14050	A1	1000	ROD28	ZM4 de ROD28	4KX
14060	A1	0600	UCKT	UXCZ de UCKT	4KX
14062	A1	0020	GYF	GYF repeated	4KX
14063	A3	2300	Peking	Broadcast, Radio Peking	8HA
14067	A1	0730	N2FU	RX22 de N2FU	8HA
14069	A1	0630	ZWKA	—	4KX
14065-9	A1	0700	N2FU	FRNL de N2FU	4KX
14075	A1	1100	H34S	—	4KX
14076	A1	1200	OZTV	—	4KX
14077	A1	1030	WNP8	BLEC de WNP8	4KX
14079	A1	0900	UJA	UJA (Soviet)	4KX
•14079	A1	1030	YGL	YGL repeated (Indonesia)	8HA
14080	A1	1030	ETUA	ETUA heard for months passing traffic	8HA
14084	A1	0700	BXM	—	8HA
14103	F1	2100	—	RTTY	2ZO
14140	A4	1000	—	Foochow Helles Schrieber Facsimile	2ZO, 3ASV
14145	F1	2100	—	RTTY	2ZO
14150	A7A	1000	—	Multi channel	4NF
14150	F1	1230	ZHUV	Morse and RTTY	4KX
14198	A3	1500	Moscow	Broadcast, Radio Moscow	4UC
14204	A1	0900	—	Vs	3ASV
14223	A3	2300	—	Broadcast	4NF
14275	A1	1330	QOHR	—	4KX
7005	A3	1030	DU9LT	Broadcast in English by foreigner	2ZO, 4KX
7015	F1	2000	—	RTTY	4NB
7010	A3	2000	—	Broadcast, German announcer	8HA
7011	A1	1400	NUJ	NUJ repeated	4KX
7016	A3	2000	Peking	Broadcast, Radio Peking	2ZO
7020	A3	2000	—	Broadcast	2ZO
7028	A3	1930	—	Broadcast	4NB, 8HA
7028	A1	1000	QKW3	5VN8 de QKW3	4KX
7030	A3	1930	—	AQQT de K7XG	4KX
7035	A3	2100	Peking	AQQT de K7XG	4KX
7040	A1	1300	K7XG	Broadcast	8HA
7048-54	A1	1900	K7XG	Broadcast with jammer	2ZO, 8HA
7050	A3	2100	—	Broadcast, foreign language	2ZO
7064-5	A3	0600	Tirana	Broadcast, Radio Tirana, (Albania)	2ZO, 4NB
7075	A3	2000	—	Broadcast, foreign language	2ZO
7090	A3	0630	—	Broadcast, foreign language	4NB
7095	A3	1000	Peking	Broadcast with jammer	2ZO, 4NB
7098	A3	2000	—	Broadcast, foreign language	2ZO

Note: Jammers occupy most of the band jamming Radio Peking, and are worse than the broadcasts.

Frequency kHz.	Mode	Average Time GMT	Identification	Traffic and Remarks	Reported by VKs
3528, 3530, 3554, 3535, 3549	A3	2230	—	Two-way telephone. Thought to be Japanese fishing vessels	3TX
3545	A1	1900	URD	—	4KX
3600	F4	0830	—	Chinese facsimile	4KX

• Indonesian tactical army stations are becoming more and more numerous.

—Alf W. Chandler, VK3LC, Intruder Watch Co-ordinator for W.I.A.

DIVISIONAL NOTES

NEW SOUTH WALES

MORSE TAPE SERVICE

The VK2 Morse Tape Service will be closed until early April when it will be operated from a new location. The new address will be advised as soon as possible and until such time please return tapes or forward requests to 93 Kingdon St., Scone, 2337. As there will be no tapes to hand for a period none can be forwarded, but requests for information will be answered and any orders for tapes will be held and filled as soon as tapes come to hand. —Max. Francis.

BALANCE SHEET

As at 31st December, 1970

Accumulated Funds:		
Balance, 1/3/70		$40,729
Add Excess of Income over Exp.		229
		$40,958
Special Funds:		
Club	$441	
Dural Equipment	298	
J. R. Corbin Trophy	13	
Library	148	
J. W. Miller	2	
		902
Capital Reserve:		
Land and Buildings Revaluation		39,161
		$81,021
Represented by—		
Current Assets:		
Cash on hand		$50
Bank of New South Wales		1,213
Fixed Deposits		4,192
Sundry Debtors		609
Stock on hand		488
Prepayments		161
		$6,713
Less		
Current Liabilities and Provisions:		
Sundry Creditors and Accrued Charges	$430	
Subscriptions paid in advance	1,816	
Class Fees paid in advance	566	
		$2,812
		$3,901
Fixed Assets—at Valuation:		
Plant, Equipment, Furniture and Fittings	$11,111	
Less Accumulated Depreciation	7,841	
	$3,270	
Land & Buildings—Dural	12,650	
Crows Nest	61,200	
		77,120
		$81,021

I have examined the accounts of the Wireless Institute of Australia (N.S.W. Division) for the ten months to 31st December, 1970, and report that in my opinion the Balance Sheet and Income and Expenditure Account are properly drawn up so as to give a true and fair view of the state of the Institute's affairs and of its results for the year then ended. The accounting and other records examined by me are properly kept.

Sydney, 1st February, 1972.

(Sgd.) Dan Lawrence.
Chartered Accountant.
Registered under the Public Accountants, Registration Act, 1945, as amended.

INCOME AND EXPENDITURE ACCOUNT

For 10 Months ended 31st December, 1970

Income—		
Membership Subscriptions and Entrance Fees		$8,976
Trading		245
Educational		1,412
Group Activities:		
Surpluses—W.I.C.E.N.	$464	
Less Losses—Y.R.S.	130	
		334
Sundry Income:		
Bank Interest	$227	
Miscellaneous	158	
		385
		$11,352
Less Expenditure—		
Crows Nest Property:		
Electricity and Gas	$156	
Rates	514	
Telephone	121	
		$791
Dural Property:		
Electricity	$9	
Rates	123	
Telephone	52	
		184
Operating Expenses:		
Salaries paid	$2,411	
"Amateur Radio"	3,294	
Insurance	242	
Office Expenses	1,333	
Depreciation	663	
Per Capita and Convention Expenses	1,462	
Travelling and Entertainment	153	
Divisional Grants	43	
Annual Dinner and Convention	286	
General Expenses	31	
Audit and Accountancy Fees	150	
Miscellaneous Expenses	80	
		10,148
		$11,123

VICTORIA

Most of the news this month concerns two Conventions which will be occurring at Easter. The Federal Convention this year is in Melbourne and a welcome is extended to all delegates to this. As well as the formal sessions there will be informal activities with the Convention Dinner being held on the ship "The Argonaut" and a barbecue at the home of the Victorian Federal Councillor, John Battrick, at Frankston.

The V.h.f. Group will be holding their annual Convention at Wandin East on Saturday, April 1, and Sunday, April 2. This convention is a reasonably informal affair with plenty of activities and the opportunity to meet your fellow Amateurs.

Many Victorian Amateurs appear to be taking up facsimile transmission and mechanical scanning slow-scan television. Many interesting developments have taken place. A very good display of facsimile was recently given by the Eastern and Mountain District Radio Club at an exhibition in Lilydale. This club will also be sponsoring a special interest group which should be meeting during this month.

This month the Victorian Division holds their elections for Council and the Annual General Meeting will take place on the 5th April.

SOUTH AUSTRALIA

February, as usual, saw the A.G.M. For the first time since 1965, we had sufficient Council nominations for an election, which pleased everybody. According to the Constitution, the new Council elects its office-bearers so this took place at a Special Council meeting the following Friday after the A.G.M.

President/Fed. Councillor: Geoff VK5TY.
Vice-Presidents: Rob VK5RG and Marshall VK5QO.
Secretary: Ross VK5KF.
Treasurer: Tom VK5TL.
Minute Secretary: Jim VK5NB.
VK5WI Operator: Colin VK5XY.
Associates' Representative: Tom Hannaford.
Other Council members: John VK5UL, Arn VK5XV, Bart VK5GZ.

The other office-bearers remain substantially with their previous holders; to save space, further details will appear in the local journal.

The V.h.f. Section also held its A.G.M. in February to a very gratifying attendance. During quite a lively meeting, the following officers were elected: Chairman, Ian VK5ZIP; Vice-Chairman, Leith VK5QH; Sec./Treas.: Bevan VK5ZBB; Committee members: Garry VK5ZK, Steve VK5ZNJ, Colin VK5ZHJ, Kevin VK5ZKT, John VK5QZ.

From what I have gleaned, the year's programme should be quite interesting, since several projects are being examined.

The main April activity is a repeat performance of last year's prenomonal Swap-and-Shop. This will be held in the same location behind the Repco Building, King William St., Adelaide, on Sunday, 16th April, in the afternoon. Bring along your good gear, old gear or any gear, rent a table and go for your best, sell it yourself and have a good time. Last year's was an extremely popular event, so come and meet the rest of the gang.

Remember, this month's meeting is on a Wednesday.—Bart VK5GZ.

EVENTS CALENDAR

31st Mar.-2nd Apr.—Federal Convention, Melbourne, Zebra Motel Conference Room, Parkville.

6th Apr.—VK5 V.h.f. Section Meeting.

16th Apr.—VK5 Swap-N-Shop (see advert.).

26th Apr.—VK5 Div. Mtg.

☆

INTRUDER WATCH REPORT

Through the vigilance and courtesy of VK4NP I have received a comprehensive read-out of teletype heard on our 14 MHz. Amateur band.

There are reams and reams of "RYR RYR RYR . . ." (if you have noted my identification tape you will remember the "trilling your tongue" type signal) demonstrating how the station occupies the frequency between traffic. The identification of the station gives a call sign of "TCX", it sends at a speed of 45.5 bauds, has a shift of 850 herts, a true bearing from Brisbane of 320 degrees, and was operating on 14090 kHz. This verifies the QTH as Ankara in Turkey, and communications are to Tehran, Iran. So you see not all Intruders are Iron Curtain based!

I have reported this to our Radio Branch, to F.C.C. via A.R.R.L., and to R.S.G.B., and hope some action can be taken.

There are many more such stations to be observed, and I would urge more Amateurs with r.t.t.y. facilities to follow Norm's initiative. Complacency, and "let's let the other fellow do it" attitude is no longer an attribute because the number of intruders are growing rapidly, and if we don't do something about it you will not be able to operate the h.f. bands soon. They'll be full of commercials.

—VK3LC, Federal Co-ordinator.

DX

Contributing Editor: DON GRANTLEY,
P.O. Box 222, Penrith, N.S.W., 2750.
Times: G.M.T.

A little care and courtesy works wonders on the bands. Every instance of rudeness or carelessness I have noted over the years has been more than offset by the activities of those who go out of their way to assist and encourage the other operator whether he be an s.w.l. or a newcomer to the Amateur ranks. Whilst speaking of assistance, can I quote here a paragraph from a letter written by a well known DX man who lives in a town quite close to me. "Can I enter a plea to VK and ZLs not to use 14 MHz. for a local natter band? There is plenty of space on 21, or why not use 160, 80 or 40 metres? One hears VKs and ZLs making skeds with one another when the band is full of DX, also if they cannot hear the DX it is possible that some other VK can, and it is most disappointing to lose a rare one when someone comes on to chat about his dahlias or fishing. Finally, the place to tune up is on the nearest commercial and not on top of the active DX QSO frequency. This means winkling out the DX, noting the frequency, and swinging the rx back on to the DX and waiting for the QSO to finish. I say waiting advisedly since some people cannot even do that and assume they have a natural right to break into a QSO." I make no comment on the foregoing, which is included at the request of the writer.

ON THE BANDS

20 metres is still producing most of the workable DX, the following stations having been worked by VK2AHK: 5U7AK, CT3AR, 5H3LV, HC2RZ, 5Z4DW, CR7IZ, ET3JH, 4X4CZ, 9P6AZ, OX3TN, JD1ABZ, 9J2LL, 4Z4HF, 5W1AE, 9U5BB (QSL to Box 14, Bujumbura, Burundi), CR7AC, 9G1BF, CR8AG, VP2MA, FL8NP, JT1KAA, ZF1GC, VP7CQ, 7Q7AD and 9Q5MF just to name a few. Geoff's list is most comprehensive, and most indicative of just what is about.

On 40 metres I have reports from Eric Trebilcock, one of the world's top S.wl's, of HL9GK, HL7KBE, 5H2LV, VP2AAA, VP9AD and HP1IE on c.w., whilst I have logged many of the more common European stations in the early hours of the morning, most of my activity however is confined to 20 c.w.

My thanks to Mal VK2BMS for the following information on 160 mx DX. Ralph W1HGT advises that he will be on 1802 each Sunday until the end of April, 40 minutes before his sunrise and until 40 minutes after, looking for VKs. His sunrise times in GMT are April 2 1025, April 9 1013, April 16 1002, April 23 0951, and April 30 0941. Sorry I can't answer your letter Mal, as I don't have your QTH.

SCORE BUILDERS

The following stations, together with their operating times and frequencies where possible, are included to assist those who are after the new ones.

CT2BC: Mon., Tues. and Wed. 7025-7030 c.w. from 0800; Thur., Fri. and Sat. 3525-3530 c.w. (time not given). QSL to W4SYL.

FB8XX skeds manager F2MO 14120 s.s.b. at 1645, also on 7003 or 3503 c.w. at 2300. F2MO has all logs to Nov. 21, and is 100 per cent. QSL.

FH8CG 21285 s.s.b., Fri. and Sat. at 1700; QSL to Claude Labarbe, Box 135, Moroni, Comoro Is.

Andre FR7ZU/E was reported en route at about 15th Feb. for a two months' operation using FTDX500 and dipole. QSL to F9MS, but the logs won't be received until after the end of April.

JT0AE will interest the prefix hunters, 14032 on c.w. 0610, and on 21010 c.w. at 0750. QRV for three years, hopes to go s.s.b.

VP8ME now on from Sth. Orkneys, following recent operation from Halley Bay. Skeds WA5FWC 14255 s.s.b. Tues. and Sat. 0200. Also on r.t.t.y. 14003 at 0300. Manager's QTH is Gary Pannell, 2013 Melissa St., Arlington, Texas, 76010.

XU1AA is said to check into the S.E.A. net on 14320 daily at 1200, and has alternative of 0900-1500 on 14250, 1500-1600 on 40 mx, 1600-1800 on 21295, or back to 14250 if 21 is out.

ZM7AH daily 14225 s.s.b. at 1320 working to a list by W4DBT, also has been noted 14030 c.w. at around 1800.

ZS3AW daily from about 1830, 3503, 7003, 14045, 21045, 23045 c.w., also 14232 and 21327 s.s.b.; manager is DJ3KR.

NETS

Regardless of the ethics of compiling a DX score by participation in DX nets, the fact remains that they are here to stay, hence I must publicise them. The North Carolina DX-info Net, 3845 s.s.b. Tues. and Sat. at 0200 with K4CIA as net control, wouldn't be of much use here. The West African Net, 21300 s.s.b. Mon. and Wed. at 1900; the U.S.S.R. Net 3620 or 3630 s.s.b. from 2100 (also QSX around 3800), net control is UB6WJ or other UAs. The Pandoras Box DX Net, daily 14277 s.s.b. 0400 to 0430 and 0530 to 0600, with a possible QSY to 14300 at 0600 is more in our line down here. Net control is KH6HIF. When KH6HIF is net control, all QSLs for that session may be sent to him, and an award is issued for working 10 net members.

JY PREFIX ALLOCATION

The following is the list of prefixes for operation by Jordanian stations: JY1 King Hussein, JY2 the Royal Household, JY3 Advanced Class Licences (the highest), JY4 Top Class, JY5 Novices on c.w. only, JY6 Club Stations, JY7 special stations, JY8 and JY9 are set aside for reciprocal licences. One of the latter is John JY8JK who was noted working his QSL manager G3LQP in the Commonwealth Net 14170 at 1430.

QSL MANAGERS DIRECTORY

Much of the news imparted from this page, and from this QTH via tape and letter comes from the pen of Geoff Watts, whose popular DX news sheet is used by DX men far and wide. Geoff is able to distribute copies of the very comprehensive QSL managers directory, by arrangement with its compiler, W6GSV. I make no apology for giving Geoff a plug here for he has assisted us in the past, and his service is far better than that of any major business which I have been acquainted with over the years. The 76-page 1972 edition lists the QSL managers of 3,500 DX stations, the QTH of each manager, plus an up to the minute list of world QSL Bureaux. Surface mail to this country costs £1.75, which is about three VK dollars, and airmail delivery costs very little more. I suggest if anybody wants an airmail copy that they enquire the total cost from Geoff Watts, 62 Belmore Rd., Norwich, Nor 72-T.

As space is running short I will close at this stage, thanks to all who have written. 73 de Don L2022.

Despite the sunspot decline the bands appear to have been reasonably lively and interesting with good openings into "difficult" areas such as West Africa.

Darlene was on Safari again. This time to the Galapagos Islands as HC8DK from Santa Cruz. Does anybody know her next QTH? Maybe another rare spot. Hopes for an all-Australian DX-pedition (see Feb. "A.R.," page 12) to Mellish and Frederick Reefs are fading rapidly.

PREDICTION CHARTS: READY-READER

Here are the numerical predictions for April. A word or two of explanation may be useful. As an example. The VK2 to ZS6 chart reflects a very steep rise in the M.U.F. from about 12 to 28 MHz. in the space of three hours from 1300 hrs. local. There is then a much slower decline from the peak at 1600 hrs. to a low of about 11 MHz. at 0600 hrs. The A.L.F. is shown as not extending above about 13 MHz.; the A.L.F. curve drops sharply below 7 MHz. at 0100 hrs. and rises sharply about 0800 hrs.

Now, the M.U.F. peak is at 1600 hrs. with a sharply rising face and a slower time decline. For 21 MHz. band, therefore, the "mid" time will be that of the peak—i.e. 1600 hrs. From the 1600 hrs. vertical to the sharply-rising face is two hours and to the declining curve is four hours. Hence the notation: minus 2 1600 plus 4; i.e. the theoretical opening to ZS6 is from 1400 hrs. to 2000 hrs. local time, but the possibilities of getting through to ZS6 are likely to be better after 1600 hrs. than before it. The time as given denotes a peak. If the peak is sharp only a single time notation appears. This oversimplifies the position when the A.L.F. curve intrudes.

Looking now at 7 MHz. for the same chart. The A.L.F. curve is as sharply rising as it is declining. The curve begins at 0800 hrs. and within two hours reaches 11 MHz., the decline is similar to 0100 hrs. As the M.U.F. curve at these hours is hovering around 12 MHz. there will be a theoretical opening to ZS6 on 7 MHz. from 0100 hrs. to 0800 hrs. This can be shown in this way as a numerical notation and is ordinarily so done when the curves are not too steep. When the curves are steep sided the notation reads: minus 4 0400 plus 4. This indicates a mid time as possibly least subject to disappointment, having regard to the M.U.F. However, there is a slight lowering of the M.U.F. in the period 0400 to 0700 hrs. from 12 MHz. to a little over 10 MHz. Because of this factor, the numerical notation will merely read 0000-0800 since, if the M.U.F. drops further than predicted the mid-period of the A.L.F. "opening" may produce no opening at all because of the M.U.F. It does show, however, that an opening on 3.5 MHz. could be a possibility.

The object of any prediction chart or numerical notation is to indicate the approximate times when openings might ordinarily be expected to occur during the period in question. Hence, the indication of a sharp peak in the M.U.F. as seen on the 21 MHz. band would indicate that this band could open to the area concerned on "good" days, but in any event a 14 MHz. opening would be possible subject to the antics of the A.L.F. curve. Two notations indicates two peaks.

Here are the predictions for April, courtesy of the I.P.S. Predictions, Series P:—

Times—Local for first-named area.
VK4(T) is Townsville.

28 MHz. Band:

VK2—8P (S.P.)	0900
W6	minus 2 0900 plus 4
VK9 (IF)	0800-1700
ZS6	1600
5Z4	minus 1 1500 plus 3
9G (S.P.)	1700
VK3—KH6	1000-1700
VK4(T)—KH6	minus 6 1300 plus 4
VK5—KH6	minus 5 1300 plus 3

21 MHz. Band:

VK2—8P (S.P.)	minus 3 0900 plus 8
VE1 (S.P.)	0600-1100
VE1 (L.P.)	0900
W6	minus 3 0900 plus 6
PY1	minus 1 0900 plus 2
VK0 (MIs)	minus 5 1300 plus 5
ZS6	minus 2 1600 plus 4
5Z4	minus 2 1500 plus 5
9G (S.P.)	minus 1 1000 plus 3
	minus 1 1700 plus 3
9G (L.P.)	minus 1 0600 plus 4
	minus 1 1700 plus 2
VK6 (2F)	1300-1700
(1F)	minus 6 1400 plus 6
G (S.P.)	1900
(L.P.)	0700
VK3—VK8 (2F)	1000-1700
(1F)	0800-2000
VK5—KH6	minus 7 1300 plus 6
VK4(T)—KH6	1400-0300
	0500-0700
VK6—VK9	0700-1700
G (S.P.)	minus 5 2100 plus 1

14 MHz. Band:

VK2—8P (S.P.)	0600-0000
VE1 (S.P.)	2200-0200
VE1 (L.P.)	minus 1 0900 plus 4
W6	0600-2000
	0100-0300
PY1	minus 3 0900 plus 9
	minus 1 2000 plus 2
VK0 (MIs)	minus 6 1300 plus 8
VK6 (2F)	0900-2000
ZS6	1400-2300
5Z4	1300-1500
	2100-0400
	0800-1000
9G (S.P.)	0700-1800
9G (L.P.)	1300-1400
	1600-2000
G (S.P.)	2000-0700
G (L.P.)	minus 1 0700 plus 5
	minus 2 1800 plus 3
VK3—VK8	0800-2000
VK5—KH6	1200-0600
VK6—VK9	minus 6 1200 plus 8
G (S.P.)	2000-0500
	0700-1000
G (L.P.)	minus 3 1800 plus 2
	minus 1 0700 plus 2

7 MHz. Band:

VK2—8P (S.P.)	minus 2 1800 plus 3
W6	1700-0100
VE1 (S.P.)	1700-2200
VE1 (L.P.)	0800
PY	1700-2000
ZS6	0000-0800
5Z4	0100-0800
9G (S.P.)	0300-0800
G (S.P.)	minus 2 0500 plus 2
G (L.P.)	0500-0600
VK3—VK8	1900-0600
VK5—KH6	1600-0200
VK6—VK9	1800-0500
G (S.P.)	0100-0700

3.5 MHz. Band:
Reduce the 7 MHz. by one hour.

VHF

Contributing Editor: ERIC JAMIESON, VK5LP,
Forreston, South Australia, 5233.
Closing date for copy 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK3	144.700	VK3VE, Vermont.
	144.925	VK3ZQC, Moe South.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4VV, near Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VE, Bickley.
VK7	144.900	VK7VF, Devonport.
VK9	144.600	VK9XI, Christmas Island.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

There has been some pruning of the beacon list this month. In the absence of any information indicating whether in operation or not, the previous VK0 beacons have been removed and the new listings above substituted. I am indebted to Roger Harrison, VK2ZTB, Senior Technical Officer, Low Latitude Division of the Ionospheric Prediction Service for the following: (letter dated 7/2/72): "Firstly for your beacon list, it is hoped that, by the time this reaches you the VK0GR beacon, built by the I.P.S.D. workshop, will be operational from Casey (110° 32' East Long. by 66° 15' South Lat.). The beacon for Mawson VK0MA (also built by I.P.S.D. workshop) should be operational shortly after. Both beacons run somewhat more than 120 watts output with A2 (keyed tone, 1 kHz.) modulation. The sequence is 7 seconds of call sign followed by 3 seconds of carrier and then repeated. The antenna will be 3 element, wide-spaced yagis beaming across the Australian mainland. The frequency for VK0GR is 53.200 MHz. and VK0MA is 53.100 MHz. The modulation depth is approximately 30 per cent. Reception reports would be appreciated and should be sent to the High Latitude Section, I.P.S.D., 162-166 Goulburn St., Darlinghurst, N.S.W., 2010."

It appears from an h.f. contact with the Carnarvon area that VK6TS is not now operational, that has been deleted until further notice. All other overseas beacons have been removed except JA and HL. Overseas beacons will be published for the time being as a separate listing in the September issue.

Of noteworthy interest seems to be the lack of reports concerning any reception (to me anyway, VK5LP) of the four ZL 144 MHz. band beacons. I would be interested to hear from anyone having heard any of these during the last DX season.

144 MHz. DX

Further to my notes regarding Garry VK5ZK last month, tending pot plants has now been forsaken for really serious 144 MHz. DX across the waters to Albany, W.A. The following should be of considerable interest to all Australian v.h.f. operators, and our prize for this month goes to Garry for his tenacity. Here is a resume of 2 metre openings across southern Australia for the past two months:

3/1—5ZK worked 6XY, 5 x 4 sigs.
16/1—5ZK worked 6XY, 5 x 4.
17/1—5ZK worked 6BE, 5 x 3. 6XY worked 5ZTN, 5MC. 6BE worked 5ZTN, 5DK, 5MC.
23/1—5VF beacon copied in Albany S5. 6WA and 6SS heard in Mt. Gambier, on c.w., no QSOs.
27/1—6BE copied 5ZK on c.w. No QSO.
6/2—6BE copied 5ZK on c.w. No QSO.
7/2—6BE worked 5KA, 5ZTN, 5ZK, 5ZDX, 5GG, 5RO, 5ZDR, 5QZ. 6BE heard 5ZK on 432 MHz. at S1 at 2230 ESST.
22/2—6XY, 6BE and 6WG heard several Adelaide stations; no QSO. 6VE beacon not audible in Adelaide. 5VF beacons peaking S7. 10 kw. tropopheric beacon on 135 MHz. very strong (transmits from Albany using beam pointing east).
23/2—10 kw. beacon S6. 6VE at S5 at 2115. No QSO.
24/2—6VE to S6 during morning, 10 kw. beacon up to S7.
26/2—6VE heard weakly by 5ZK and 5ZDY. 10 kw. beacon S7 on peaks, for hour, then disappeared.

Garry reports nothing has been heard between 26/2 and time of these notes (28/2). He believes it logical the 135 MHz. beacon should be heard well, as it runs high power and has a directional antenna. It is also better situated than 6VE, being on the coastline. 6VE is about 20 miles inland, and signals need to travel for about 100 miles over land before striking the ocean. Bernie VK6KJ, with more time to spare these days, is planning to get back on 144 MHz. from Albany, so with four stations available from there and gradually improving equipment, some interesting contacts may be forthcoming, including 432 MHz. Garry maintains a daily sked with Albany on 14.130 MHz. at 2000 EST.

It is noted a short paragraph in the Feb. Newsletter of the VK2 V.h.f. and T.v. Group, regarding interest currently being shown in Wagga, N.S.W., for operation on 144 MHz. tuneable. Several Amateurs there are constructing 2 mx gear and Phil VK2YS proposes transverting from his FT101. This is good news for VK3 and VK5. Distance to Melbourne about 240 miles and Adelaide 500 miles. Melbourne should not be too much trouble, good conditions could see signals reaching Adelaide; after all, the VK5ZDX Field Day station worked nearly that far last December with good signals!

SIX METRES TO JA

Wally VK5ZWW advises hearing JA signals in Adelaide on 26th Feb. around 1800. JA2WVO on a.m. on 52.07, JA1 on 52.010 weak, JA7 on 50.1. Beacon station JA1IGY on 52.5 not audible. Wally suggests any stations from that area heard below 52 MHz. are not likely to be interested in working VK, and suggests not getting too worked up about them if you cannot attract their interest. Wally will be returning to New Zealand for a month from the middle of March to renew old acquaintances, so there will be no M/S experiments during that time.

Andrew VK1DA sends a letter with an outline of VK1 v.h.f. activity. He advises slow progress with the 144 MHz. beacon. Latest thoughts are to place it on a rooftop 10 storeys high in the centre of the city, and possibly using FSK at 850 Hz. shift. On 20/2 Andrew and Eddie VK1VP both worked VK2NN in Sydney on 52 MHz. on a direct path. This is considered a difficult thing to do due to the mountainous terrain in between. Usual method to work Sydney is via backscatter. Andrew also remarks on a point I have often raised: The virtual futility of setting up a National Field Day station to operate on v.h.f. only, pointing out that Eddie VK1VP scored 437 points only after much effort, while he (Andrew) ran up 1600 points with one h.f. rig. 52 MHz. close to dead with only 91 points!

A similar situation existed in VK5 with the N.F.D. VK5AWI went out in force covering the h.f. and v.h.f. bands, scored some 3,000 points, but again the v.h.f. participation by other stations was most disappointing, bringing Bob VK5ZDX, who manned the v.h.f. station, to say v.h.f. on such an occasion on the present points system was not worth the effort in setting up a substantial v.h.f. station—and I am forced to admit he is quite right. Unless something is done soon to bolster scoring for v.h.f. operators in the Field Day it will very soon be like the Remembrance Day Contest—purely an h.f. contest!

VK7 appears to figure quite actively during February and thanks to the operation of their beacon VK7VE, many contacts were made to VK3 and into Mt. Gambier area of VK5, on 144 MHz. During the last week of Feb. 432 MHz. was of particular interest. Winston VK7EM worked VKs 3BDL, 3ZBB, 3ZYO, 3ZUT, 3AKC, 3ZBZ, 3ZUR, 3ZPA and 3AOT. VK7ZAH was worked by Ron VK3AKC. On Thursday, 24/2, Amateur Television was received across Bass Strait for what is believed to be the first time ever. Bill VK3ZBZ received snowy pictures from Winston VK7EM. On Saturday 26/2 Peter VK3ZPA at Sunbury received completely noise-free pictures from Winston and was able to read valve markings only a quarter of an inch high when VK7EM pointed the camera at his 432 MHz. transmitter. Greg VK3YGB in Essendon also copied the pictures from VK7EM. Congratulations chaps, your efforts have finally been rewarded. On the same Saturday morning on 1296 MHz., Ron VK3AKC in Geelong worked VK7ZAH in Launceston, and again on Saturday night, this distance of 274 miles equalling Ron's present Australian record.

Interesting to note that the ZL Propagation Project Group in VK3 are going ahead with equipment design, after meeting at the QTH of Dave VK3ZDH. To lend support to their activities and beliefs for something more consistent in trans-Tasman contacts, it is noted that ZL1GM was recently believed copied on 2 metres Channel B in Melbourne, on the same night that New Zealand Channel 3 TV on 70 MHz. was copied on TV receivers in Melbourne. Thanks to Bob VK3AOT for the last two paragraphs.

Mike VK2II passes on further information regarding the Ionospheric Prediction Service warning system for the coming equinoxial period. Although the operation of this warning system will be more than half completed before you read this, I feel it is essential for you to be advised even if only a week of the period is left. The warning system starts on 14th March and concludes on 9th April. 11440 kHz. will be used from 1600 to 2000 hrs. and 6815 kHz. from 2000 to 2100, and possibly to 2200 depending on conditions at the time. This will continue each day of the week except Monday. Both frequencies use upper sideband operation.

Information will be broadcast every quarter hour on the following basis: 2 minutes past the ¼ hour: Sydney will give a summary of previous reports. 4 minutes past the ¼ hour: Canberra observations. 7 minutes past: Brisbane observations. 10 minutes past: Townsville reports, including M.O.F., and advice on reception or otherwise of Korean f.m. station on 45.9 MHz. or JA1IGY on 52.5 MHz. After 1915 hours reports may be transmitted from the New Guinea station at any time.

As pointed out last month, this warning system is to provide advance information of the possibility of trans-equatorial propagation (T.E.P.) due to increasing maximum observable frequencies on the various Australia-Japan circuits, relating particularly in the case of the Amateurs to 52 MHz., but keeping an eye on 144 MHz. Afternoon type T.E.P. may be observed betwen 1200 and 1900 hours and evening type between 2000 and 2300 hours. Afternoon type T.E.P. signals tend to have very little or no fading, while evening-type signals are accompanied by a very deep, rapid flutter. Both types may exhibit very strong signals. Afternoon signals are usually found between 28 and 65 MHz., while evening type signals may go higher.

The "Victorian VHF-er" lists 40 stations having obtained the Cook Bi-Centenary Award V.h.f./U.h.f. Section. 9 from VK2, 12 from VK3, 10 from VK4, 7 from VK5, 2 from VK7. Of this total 7 only were Amateurs with full licensee participation. Greater overall interest may have been shown had the award been available for an earlier start.

That will have to do for this month. Guess I have missed something interesting—someone will tell me later! Closing with the thought for the month: "Perhaps host and guest is really the happiest relation for father and son." 73, Eric VK5LP, The Voice in the Hills.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

INTRUDERS

Editor "A.R.," Dear Sir,

With reference to my recent letter regarding the "QRM Brigade" it is gratifying to know that amongst the apathetic Amateur fraternity at least I have one supporter (although the VK7 boys have been heard carrying out the idea).

I heard on the air the other day two VK3s complaining, and I quote: "20 metres was full of commercials the other evening, both on the c.w. and the sideband ends, and there were very few Amateurs indeed".

What a state of affairs? Why don't we all get on the bands and QRM them off?

It is my considered opinion, for what it is worth, that the Intruder position is so hopeless because of the difficulty of getting positive identifications (and without such diplomatic representation is impossible) that the Amateur has only one recourse, and that is to take the matter into his own hands, crowd the bands, and make it so hard for the commercials to get their traffic through that they will shift to another sector of the frequency spectrum.

Intruders, you may be well assured, do not only operate the Amateur bands, they're on other frequencies too, but they find the Amateur frequencies easy prey, and open spaces to operate without QRM. Those that I advocate QRMing only use as much or less power than we, and they'll soon move if QRMed enough, and out of the band too, so go to it! You will not be sanctioned for it.

—Alf Chandler, VK3LC.
Intruder Watch Co-ordinator, W.I.A.

SUNSPOT PREDICTIONS

April 49, May 47, June 45, July 44. Provisional sunspot numbers for January 1972 varied from 135 on 24th to a low 22 on 11th. Smoothed mean for July 1971: 63.6. From Swiss Federal Obs., Zurich.

SILENT KEYS

It is with deep regret that we record the passing of:—

VK2AT/T—L. Altman.
VK4KB—P. J. Kelly
VK6PL—P. L. Mahan

W.I.A. AWARDS

52 MHz. W.A.S. AWARD

New Members:

Cert. No.	Call	Additional Countries
99	VK7ZRO	–
100	VK3AMK	2
101	VK4ZFB	3
102	VK4ZIM	3

V.H.F.C.C.

New Member:

Cert. No.	Call	Confirmations 52 MHz.	144 MHz.
81	VK4ZFB	375	—

Amendments:

Cert. No.	Call	Confirmations 52 MHz.	144 MHz.
44	VK3AMK	197	—
73	VK3AMK	—	127
80	VK4ZIM	749	—

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	320/344	VK4VX	296/296
VK6RU	318/344	VK5AB	296/314
VK3AHO	310/326	VK2APK	293/300
VK4KS	307/322	VK4FJ	286/307
VK4UC	303/303	VK4TY	284/288
VK6MK	303/324	VK3ZE	279/282

New Members

Cert. No.	Call	Total
126	VK5QB	103/103
127	VK2ZA	112/112
128	VK4VX	296/296
129	VK8CW	142/142

Amendments:

VK3AMK	240/240	VK4RF	224/224

C.W.

VK3AHQ	310/325	VK3XB	270/284
VK2QL	305/328	VK6RU	265/288
VK2APK	289/297	VK3YD	263/282
VK4FJ	289/315	VK4TY	259/272
VK3YL	287/304	VK3TL	254/260
VK3NC	273/300	VK3RJ	249/263

New Member:

Cert. No.	Call	Total
99	VK4VX	235/235

Amendments:

VK4RF	196/208	VK3LV	118/118

OPEN

VK6RU	318/344	VK4VX	304/304
VK4SD	315/330	VK4UC	303/303
VK2VN	311/330	VK6MK	303/324
VK4KS	308/327	VK2EO	301/325
VK2APK	307/319	VK2SG	298/304
VK4TY	306/321	VK4FJ	297/323

New Member:

Cert. No.	Call	Total
138	VK4VX	304/304

Amendments:

VK4RF	260/272	VK3LV	123/123

BOOK REVIEW

BEAM ANTENNA HANDBOOK

A book which should be in the bookshelves of every Amateur. In clear language amply supported by explicit diagrams and photographs, this book explains the theory of parasitic beam antennas so that it can clearly be understood by everybody.

The two hundred pages not only cover the theory and design of parasitic beams, but also complete construction details of all-metal arrays, composite structures, multiband beams, stacking of beams, wire-beam antennas, 40 metre compact beams, antenna installation, how to evaluate your beam, some useful test instruments, and the extremely successful and popular W6SAI compact 20 metre beam.

Author: William I. Orr, W6SAI; publisher: Radio Publications Inc.; availability: Divisional Secretaries or Federal Publications.

HAMADS

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See Jan. 1972 "A.R." page 23 for complete details.

FOR SALE

McKinnon, Vic.: 1 A.W.A. 50w. FM Base, BS-50-B, mod. to 52.5 MHz., 2 ch., tx-rx xtals and wall mount. 1 A.W.A. Rem. Control RC-1A, AC/DC PS-Skpr. and A.W.A. Deck VR Mic. set. VG cond. $100. VK3EM QTHR. Ph. (03) 58-7745.

Hazelwood Park, S.A.: "QST," solid 1944 to date in A.R.R.L. Binders; Heathkit SB102 Transceiver; Cush Craft 6 and 2 mx antenna; VK5QO, 25 Russell Ave., 5066. Ph. 79-5103.

Ararat, Vic.: Hallicrafters HT32 Tx, $200; Lafayette HA350 Rx, $175. Both in good order. Freq. Meter Class "C", $10. Any offer considered, changing QTH. VK3AQD, Box 25. Ph. 21821.

Maldon, Vic.: Numerous bits and pieces, 108T/SCR, 122 set, Q5er, and many other items. Must clear, no reasonable offer refused. Write, phone or call. VK3FO QTHR. Ph. (054) 75-2245.

Sydney, N.S.W.: Swan 350 complete with all manuals and matching power supply. Condition as new; had little use, owner having been overseas. Cash price $400. Ph. (02) 90-1766. Al Davis-Rice.

Sydney, N.S.W.: Galaxy V. Mk. 2 PS, 2 el. 2 bd. Quad, SX100 Rx, LSG11, BC221, VTVM, two MR10Bs, TCA1674, Pye Reptr., 450 MHz. PA 2X4CX150A, Valve Tester Paton VCT-V, 522, GDO, Xtal Filt., Ant. 2 mx 4 el. 6 mx 5 el., shack sell out. Inquiries Ph. (02) 519-1504 A.H.

Kyabram, Vic.: Swan 350, good condition, inspection invited, or can be heard on air, $285.00. Power supply and speaker for same, $15. VK3TG, QTHR. Ph. 058-5/21636.

Frankston, Vic.: Mosley V-4-6 Trap Vertical Antenna, 40-20-15-10 mx, $28. VK3CDR QTHR. Ph. 698-6058 or 787-2318 (A.H.).

Mt. Waverley, Vic.: Yaesu FL-DX-400 Transmitter, 12 months old, as new, $275. VK3ARY QTHR. Ph. (03) 277-4798.

Ceduna, S.A.: FL-200B Transmitter, $220 o.n.o. FL-DX-2000 Linear Amp., $180 o.n.o. Trio JR300S Receiver, 80-10 mx with mechanical filter, $120 o.n.o. VK5IG, Box 244, Ceduna. Ph. 295 or 325 AH.

WANTED

Melbourne, Vic.: Does anyone have old copies of "Radio Constructor" or "Practical Wireless" for sale? VK3AQ QTHR. Ph. (03) 288-2326.

Reservoir, Vic.: DX-20 or equivalent crystal-locked low power c.w. Transmitter. Write C. Nichols, VK3BGF, 162 Spring Street.

Melbourne, Vic.: Case and Coils suit BC312 or BC342 HF Rx; both genemotors suit ARC3 or ARC49 PSU; Control Unit type MN28E suit Bendix Radio Compass MN26H, tuning range 200-400 kHz., 550-1200 kHz., 2900-6000 kHz.; unmod. tuning units RF24, 25, 26, 27. VK3AOB, 76 David Ave., East Keilor. Ph. (03) 337-4902.

Goulburn, N.S.W.: 2 mx Transceiver, hybrid, similar to TCA1675-77. Good price for good unit. Contact Robert Girdo, VK2ASD, C/o. Radio 2GN, Goulburn, 2580. Pho. (064) 21-3377, AH 29-7137.

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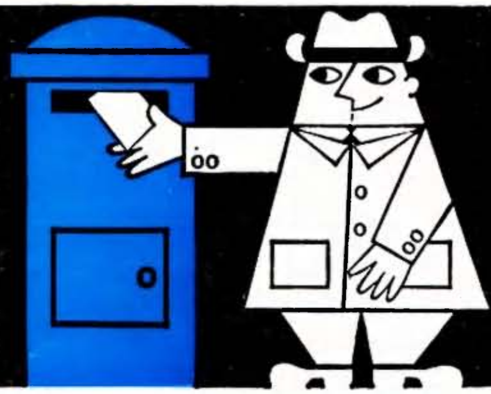

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MODEL M303: 30K O.P.V.
D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 2".
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MODEL SK120: 20K O.P.V.
D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 1¾".
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MODEL F75K: 30K O.P.V.
D.C. V.: 0.25, 2.5, 25, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500.
D.C. mA.: 0.05, 10, 250.
OHMS: 1 to 8 megohms in 3 ranges. Inbuilt Signal Injector.
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A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 5, 50, 500.
OHMS: 0.5 MΩ in 4 ranges.
PRICE: **$15.00** + 15% sales tax.

MODEL 500B: 30K O.P.V.
D.C. V.: 0.25, 1, 2.5, 10, 25, 100, 250, 500, 1,000.
A.C. V.: 2.5, 10, 25, 100, 250, 500, 1,000.
D.C. mA.: 0.05, 5, 50, 500; 12A.
OHMS: 1 Ω to 8 MΩ in 3 ranges.
PRICE: **$25.00** + 15% sales tax.

MODEL MVA5: 20K O.P.V.
D.C. V.: 5, 25, 50, 250, 500, 2,500.
A.C. V.: 10, 50, 100, 500, 1,000.
D.C. mA.: 2.5, 250.
OHMS: 1-6 MΩ in 2 ranges.
SIZE: 4½" x 3¼" x 1⅛".
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MODEL TS-60R: 1K O.P.V.
D.C. V.: 15, 150, 1,000.
A.C. V.: 15, 150, 1,000.
D.C. mA.: 1, 150.
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5AS4	1.61	6GW8 (EC186)	2.05
5U4G/B	1.61	6H6G/T	0.50
5X4G	2.82	6K8	3.9)
5Y3GT	1.38	6K8G/T	3.41
5Z3	2.82	6L6	5.85
6AB7	4.11	6M5 (EL80)	1.53
6AC7	0.50	6N3 (EY82)	1.32
6AG5	0.50	6N7GT	3.99
6AJ8 (ECH81)	2.37	6Q7G/T	2.94
6AK5 (EF95)	1.80	6S2 (EY86)	2.25
6AL3 (EY88)	1.84	6S4/A	2.32
6AL5 (EAA91)	1.39	6SJ7	0.75
6AM5 (EL91)	2.37	6SL7GT	3.18
6AM6 (EF91)	2.28	6SQ7	3.18
6AN7A (ECH80)	1.90	6U7G	0.75
6AN8	3.06	6V4	1.10
6AR7GT	2.28	6V6	3.61
6AU4GT/A	1.84	6X2 (EY51)	2.40
6AU6	1.61	6X9 (ECF200)	2.09
6AU7	2.87	6Y6G	3.18
6AU8	3.06	6Y9 (EFL200)	2.30
6AV6	1.35	12AT7 (ECC81)	0.75
6AW8A	1.93	12AU6	1.78
6AX4GT	1.84	12AU7A (ECC82)	1.72
6B8	3.88	12AX7 (ECC83)	1.95
6BD7 (EBC80)	1.30	12BE6	2.02
6BE6 (EK90)	1.68	12SN7GT	3.18
6BH5	1.61	16A5	2.15
6BV7	1.61	16A8 (PCL82)	2.46
6BW6	2.25	17Z3 (PY81)	2.25
6BW7	2.23	30	0.50
6BX6 (EF80)	1.61	KT66	6.20
6BZ6	1.61	KT88	7.05
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MAY, 1972
Vol. 40, No. 5

CONTENTS

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EASTER 1972

Easter means different things to different people. To most it is a break from work—holidays; for some it is a time of deep religious significance; and to children, it is the time for chocolate eggs and the Easter Bunny. But to a group of fifteen to twenty Amateurs it is a time for work. Admittedly, for most of them a type of work different from that of their normal daily toil. Nonetheless, it was still work and this dedicated band of people met together in a motel at Parkville, Melbourne, over the Easter week-end of March/April, 1972. The occasion was the thirty-sixth Federal Convention of the Wireless Institute of Australia. Councillors from all the Divisions of the Institute were in attendance as well as members of the Federal Executive, whilst s.w.l. members of the Victorian Division assisted with recording equipment.

As at previous Federal Conventions, many valuable discussions took place, but this year there were some differences. This Convention was the first held within the framework of the Federal Company formed earlier this year and consequently Councillors were able to vote without their decision being subject to later Divisional ratification.

For much of the Convention two prominent members of the N.Z.A.R.T. sat in and on a number of occasions were able to assist the Council in its deliberations. In particular, the editor of "Break-In," Mr. Don Mackay, ZL-3RW, and the editor of our own "Amateur Radio" were able to discuss much of mutual interest and it is anticipated that close ties will be maintained with our sister society.

Mr. Gareth Bradshaw, ZL3VP, a Councillor of the N.Z.A.R.T., described the contributions the N.Z.A.R.T. members make to the public in New Zealand through their A.R.E.C. organisation—"Amateur Radio Emergency Corps" and these gave much food for thought to W.I.A. Federal Councillors.

Thirty-three items were on the agenda and those plus the various reports and statutory requirements of an annual general meeting meant that nearly thirty hours were spent by the Council around the conference table. Agenda items ranged over a number of subjects including a review of the licensing structure in Australia, new v.h.f. awards, W.I.A. Project Australis and future planning of v.h.f./u.h.f. bands.

The question of the licence structure was considered at length and the W.I.A. has adopted the policy of a four "grade" structure. The Executive will now present the case for this to the P.M.G. Department, but it is stressed that a result cannot be expected within the next two or three months. Brief details are as follows:

Grade A—formerly A.O.C.P. with all qualifications and privileges as at present.

Grade B—a new licence involving regulation and theory examinations as for Grade A plus a 5 w.p.m. c.w. test. Privileges to be operation on the 21 MHz. band and above on all modes. A holder may convert to Grade A at any time by passing the appropriate c.w. exam.

Grade C—formerly A.O.L.C.P. but with the restriction that all new licensees would be permitted operation on 144 MHz. and above only. Present A.O.L.C.P. holders, however, would retain all their privileges. A holder may convert at any time to Grade A or B by passing the appropriate c.w. exam.

Grade D—a new licence involving a regulation exam. as for Grades A, B and C plus a lower level theory exam. and a 5 w.p.m. c.w. test. Privileges to be 10 watts d.c. input c.w. only, crystal controlled transmitters; frequency sub-bands permitted—21.075 to 21.150 MHz. and 28.100 to 28.200 MHz.; two years tenure in which time a holder must convert to either Grades A or B or else the licence will lapse.

(Continued on Page 20)

VHF TRANSEQUATORIAL PROPAGATION

PART ONE

*ROGER LENNED HARRISON,**
VK2ZTB, ex-VK3ZRY

● Reception of VHF signals over very long paths that cross more-or-less transversely to the equatorial zone have been reported on many occasions in the last 25 years. The frequencies involved are generally far in excess of the predicted MUF and signal strengths sometimes approach free-space values. Path lengths reported are usually greater than 5,000 km. with a few up to 18,000 km. These signals are generally regarded as having arrived by "anomalous" transequatorial propagation.

Throughout the remainder of this article the author uses the letters TEP to denote this form of propagation, dropping the word "anomalous" since it turns out that it is not so anomalous as was first thought.

A SHORT HISTORY

The first instances of intercontinental VHF contacts were reported in "QST" by Ed Tilton in "The World Above 50 Mc", May and October 1947.[1, 2]

The discovery of TEP by Radio Amateurs did not receive a great deal of attention in the scientific world until the late 1950's and the IGY in 1957/58.

Contacts between Australia and Hawaii, Mexico and Argentina, and the U.S.A. and Peru were fairly common during the years 1947 to 1951. There was then a sharp decline during the sunspot minimum, but new reports began to appear again in 1955. The number of reports reached a maximum during 1957 to 1960 and again during 1968 to 1971. Some contacts were reported over extremely long paths, e.g. South Africa to England (1,300 km.), Buenos Aires to Western U.S.A. (9,860 km.), Argentina to Hawaii (12,150 km.), Argentina to Japan (18,760 km.), and Australia to Mexico (10,500 km.).

The first scientific paper to appear on the phenomena of TEP was by Ed Tilton, published in the Proceedings of the Second Meeting of the Mixed Commission on the Ionosphere in Brussels 1951.[3]

The contacts were rather surprising since the frequencies used exceeded the conventional MUFs for the circuits involved and path lengths were far in excess of that possible for a single hop mode via the ionosphere.

From the late 1950's ionospheric scientists took quite a deal of interest in this form of propagation and early efforts aimed at explaining the phenomenon attempted to correlate these unusual contacts with magnetic/ionospheric storms.[3, 4] However, only a few could be correlated with these storms and most contacts could not be explained in this fashion.

Observations made between 1950 and 1966 by a number of people of the characteristics and propagation modes of TEP,[5-11] along with research into the equatorial ionosphere,[11] brought to light a lot of very interesting information about TEP. In addition to collecting Amateur observations, a number of experiments were set up involving HF and VHF scatter soundings, oblique incidence stepped frequency ionosondes, CW beacon observations, observations of TV and FM stations in Korea, Japan and Russia, and topside ionospheric sounding by satellites. These efforts led to a better understanding of the structure of the equatorial ionosphere and to suggestions regarding the various modes that support TEP.[12]

However, all is not yet explained, and research is currently being carried out in Australia by the Department of Supply, the Ionospheric Prediction Service Division and the Physics Department of the James Cook University at Townsville. Of particular interest to the author is the night-time mode about which more will be said later.

The current research programme being carried out in the low latitude section of the IPSD includes the reception of beacon transmissions, examining the signal characteristics and correlating this information with other geophysical phenomena.

GENERAL CHARACTERISTICS OF VHF TEP SIGNALS

There appears to be two distinct types of TEP, distinguished by the times of peak occurrence, fading characteristics, path lengths, and the principal mode of propagation.

One mode, designated **Class I.**, exhibits the following characteristics:—

(a) A peak occurrence around mid-to-late afternoon (1200 to 1900 local mean time, measured at the point where the path crosses the magnetic equator).

(b) Normally strong, steady signals with a low fading rate and, more specifically, a small Doppler spread (around ±2 to 4 Hz.).[12]

(c) Path lengths of 6,000 km. to 9,000 km. and sometimes longer.

The proposed propagation mode for Class I. TEP is generally termed the "super-mode" or ^{2}F mode. As can be seen from Fig. 1, the ray, transmitted from A, "skips" from the crest in the equatorial ionosphere at X, across to the crest at Y and is refracted down to earth at B. These "crests" are a feature of the equatorial ionosphere about which more later.

The other mode, designated **Class II.**, shows the following characteristics:—

(a) A peak occurrence around 2000 hours to 2300 hours local mean time.

(b) High signal strengths but with deep, rapid fading (typical rates are 5 Hz. to 15 Hz.) accompanied by a Doppler spread much greater than for Class I. Generally the Doppler spread is in the order of ±20 to 40 Hz. (i.e. ten times that for Class I.).[12]

(c) Path lengths are usually shorter than for Class I., being around 3,000 km. to 6,000 km. Sometimes they are longer.

The propagation mode or mechanism for this class of TEP is not yet fully understood, but it is believed that irregularities (dense "clouds" of electrons having a certain specific shape) in the equatorial ionosphere, which are aligned with the earth's magnetic field, are responsible for "ducting" or efficiently "scattering" the signal such that the path geometry looks like that in Fig. 1 (from C to D).[12]

Additionally, Class II. will support much longer frequencies than Class I. and signals have been observed up to 102 MHz. This does not imply that 102 MHz. is the maximum frequency that Class II. TEP will support. It is just that **nobody has reported an authentic case any higher in frequency.**

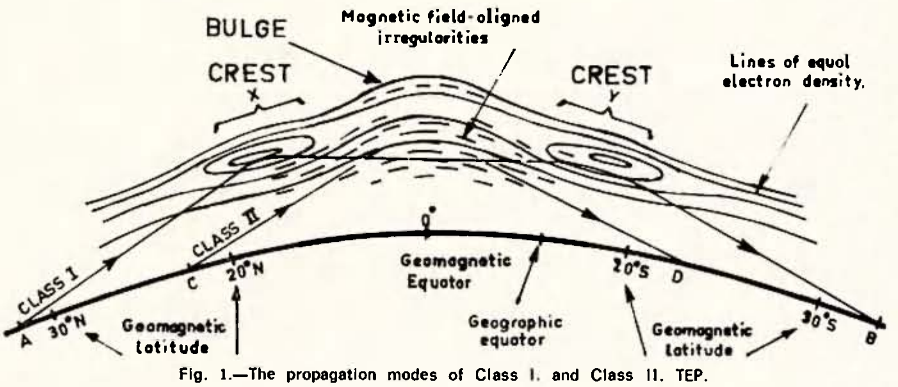

Fig. 1.—The propagation modes of Class I. and Class II. TEP.

* Ionospheric Prediction Service Division of the Bureau of Meteorology, 162-166 Goulburn Street, Darlinghurst, N.S.W.

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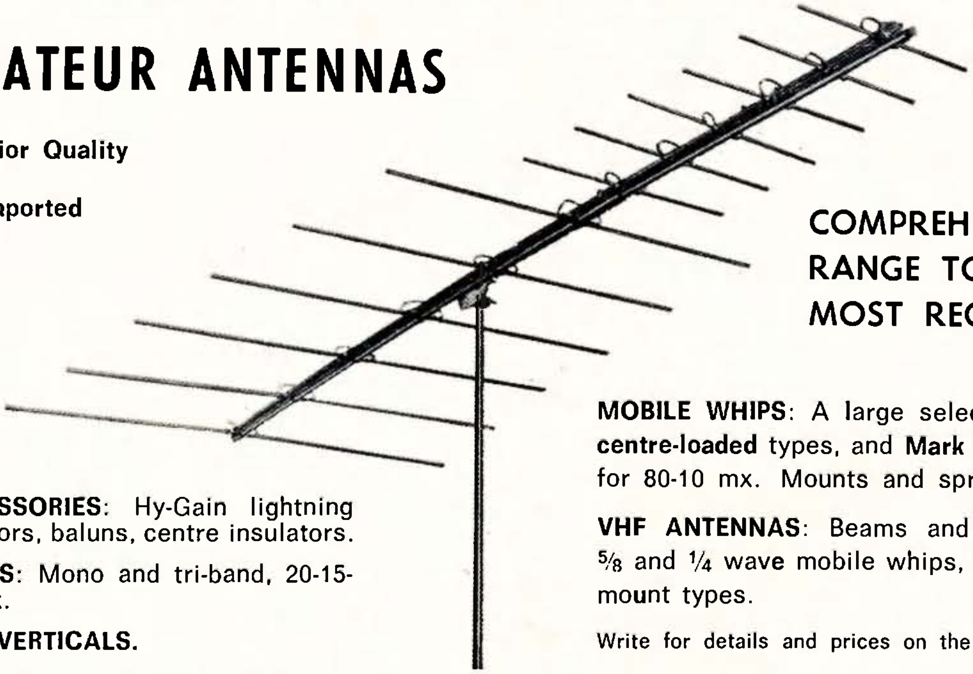

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Who will be the first to make Australia-Japan on 144 MHz. via TEP? No upper limit has yet been proposed for Class II. TEP.

Class I. TEP is sometimes called "afternoon-type TEP" and Class II. is sometimes called "evening-type TEP" for obvious reasons.

Before discussing TEP in further detail, we should look at the equatorial ionosphere.

THE EQUATORIAL ANOMALY

The equatorial ionosphere does not have an even distribution of electron density. As can be seen from Fig. 1, the F-region iso-electronic contour lines (lines of equal electron density) show a depletion of electrons, together with a rise of the F-region height, above the magnetic equator. Roughly symmetric, north and south of the geomagnetic equator, are two "crests" that represent an increased electron density in the F-region. These crests are located between 10° and 20° (geomagnetic latitude) north and south of the geomagnetic equator.[13] The location of these regions can be obtained from Figs. 2, 3 and 4 which are maps of the various continental zones with the geomagnetic latitude lines superimposed.

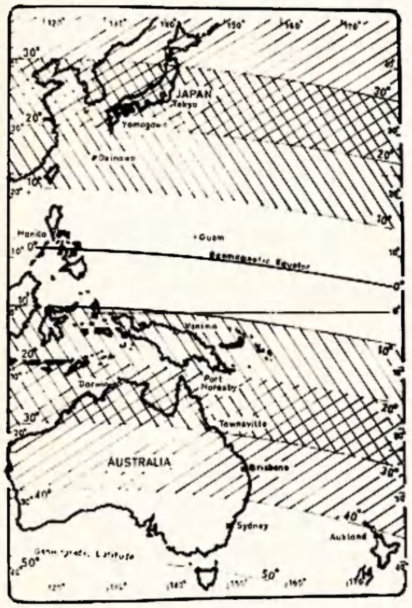


Fig. 2.—Australasian sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

This region of the ionosphere (within aproximately ±20° geomagnetic latitude) is generally referred to as the equatorial anomaly region despite the fact that it is a regular feature of the equatorial ionosphere.

If the electron density within the crests increases sufficiently it will be possible for a signal, incident upon one crest at a very small angle, to be refracted across the geomagnetic and geographic equators to the opposite crest and thence to earth as illustrated in Fig. 1.

VIRTUAL HEIGHT OF THE EQUATORIAL ANOMALY

The virtual reflection heights of signals in the anomaly zone varies between about 350 km. and 550 km.,[12, 13] giving path lengths in the order of 3,000 km. to 9,000 km.[12] for signals propagated by the modes shown in Fig. 1.

DIURNAL VARIATION OF THE EQUATORIAL ANOMALY

In the Australasian sector of the world, the equatorial anomaly starts to develop between 0800 LMT and 1000 LMT, the crests moving away from the magnetic equator between 0700 LMT and 1500 LMT.[13]

In the American sector, the development time of the equatorial anomaly is much more variable, but it is generally present after 1800 LMT. The build-up of the anomaly appears to occur between 1100 LMT and 1800 LMT. However, these statements must be tested further since they are based on very little data.

Comparisons between the positions of the crests over the Australasian sector and the American sector at the same LMT show that they are further from the equator in the Australasian sector than they are in the American sector.[13]

The behaviour of the anomaly in the African sector is similar to that in the Australasian sector.

When the sun sets on the base of the equatorial ionosphere (about 1½ hours later than ground sunset, i.e. 1930 hours LMT), the base of the layer generally rises and the equatorial anomaly begins to break up into large "blobs". This is not always so, the base of the layer may not necessarily rise and, on occasion, is found to fall or remain at the pre-sunset height. Sometimes the anomaly does not break up into distinct blobs and the electrons appear to diffuse over the magnetic equator. The ionosphere is generally like this during early morning and late evening.[13] The detailed behaviour of the decay phase of the equatorial anomaly has not yet been fully established.

Fig. 3.—The American sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

THE EQUATORIAL ANOMALY AND MAGNETIC ACTIVITY

On magnetically disturbed days the equatorial anomaly is not as well developed as it is on magnetically quiet days and it is known that, in the Australasian sector, the bulges are closer to the magnetic equator on disturbed days than on quiet days.[13]

Recent research also indicates that, in the American sector, the anomaly develops earlier on very quiet days and in the late afternoon on disturbed days.

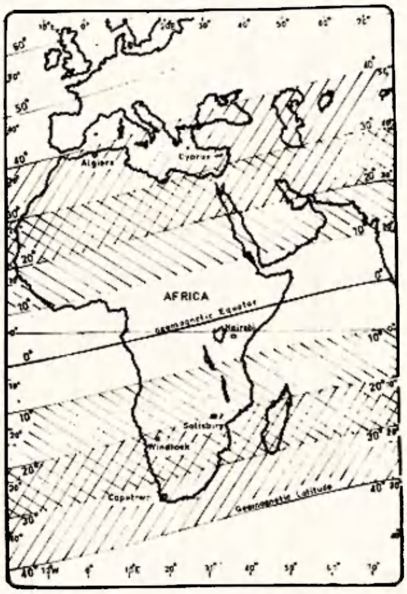


Fig. 4.—The African-Mediterranean sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

Insufficient work has been done in the Australasian sector to give a complete picture (which promises to be quite complex) of the influence of the level of magnetic activity on the equatorial anomaly.

SEASONAL VARIATIONS OF THE EQUATORIAL ANOMALY

The crests lie very nearly symmetrically either side of the magnetic equator at equinox and asymmetrically at solstice. The electron densities of the bulges are greater at equinox than at solstice and this, combined with the anomaly symmetry at equinox, favours Class I. TEP at the equinoxes. The separation and overall width of the crests varies seasonally also, being greatest at equinox.

"Tilts" in the base of the F-layer are known to be associated with the crests and are most pronounced between 1200 and 2000 LMT and at equinox.[11] These tilts, which are departures of the iso-electron density contours from concentricity with the earth, enhance the tangency of a radio wave with the layer, consequently increasing the MUF for suitable circuits and improving the chances of propagation via a supermode (Fig. 1).

SUNSPOT CYCLE VARIATIONS OF THE EQUATORIAL ANOMALY

At sunspot maximum the break up of the crests is generally later than at sunspot minimum.[11] This appears to be the major effect of the sunspot cycle on the equatorial anomaly.

The relative depletion of electrons over the geomagnetic equator is greater at sunspot maximum than at minimum. There is a consequent increase in the number of electrons in the crests at maximum and an increase in the presence of tilts, increasing the MUF.

The crests of the equatorial anomaly are present for fewer hours during sunspot minimum and their height, size, associated tilts and ionisation density decrease with decrease in sunspot number.[11]

All these factors contribute to the observed dependence of Class I. TEP on the sunspot number.

"SPREAD-F" OR "RANGE-SPREADING"

On some days irregularities start to appear in the base of the F-layer by 2000 hours LMT and cause what is termed "range-spreading" or "spread-F" on vertical incidence ionograms. An illustration is given in Fig. 5, comparing an "unspread" ionogram to one showing spread-F for different times on the same day at Cocos Island. The cause of these irregularities is not yet known. They are not necessarily associated with the decay phase of the equatorial anomaly. There appears to be a connection between spread-F and evening-type TEP.[11]

The duration of spread-F is quite variable, sometimes lasting for less than hour and at other times lasting until 0600 hours the next morning.

The occurrence of spread-F is more common on magnetically quiet days, in periods of sunspot maximum, and is more common in areas where the geomagnetic and geographic equators are widely separated.[11] There appears to be no correlation between magnetic activity and spread-F at sunspot maximum.

The occurrence of spread-F favours the equinoxes, particularly in the Australasian sector,[11] except at sunspot minimum where it favours the summer solstice. This effect is not so pronounced in the American sector.

Spread-F appears to be dependent on the post-sunset rise of the F-layer base which is most pronounced at sunspot maximum.[11]

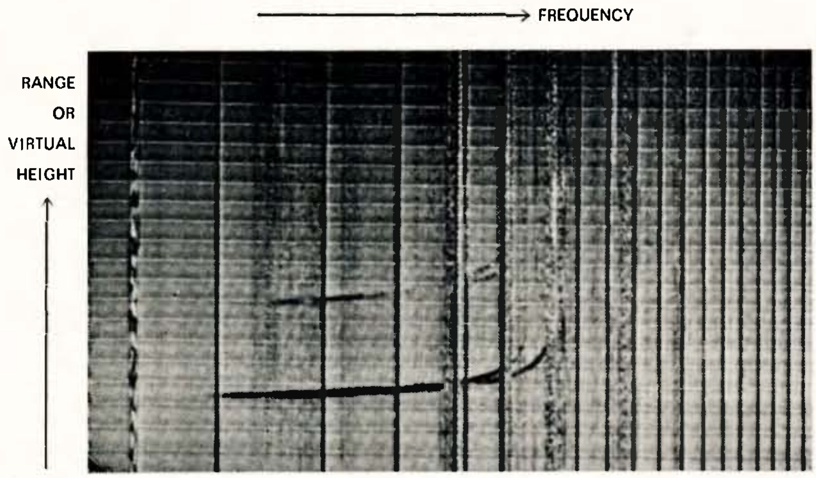


Fig. 5 (a)—Vertical incidence ionogram from Cocos Island, 1900 hours LMT, 5th August, 1970, showing typical F-layer trace without range-spreading.

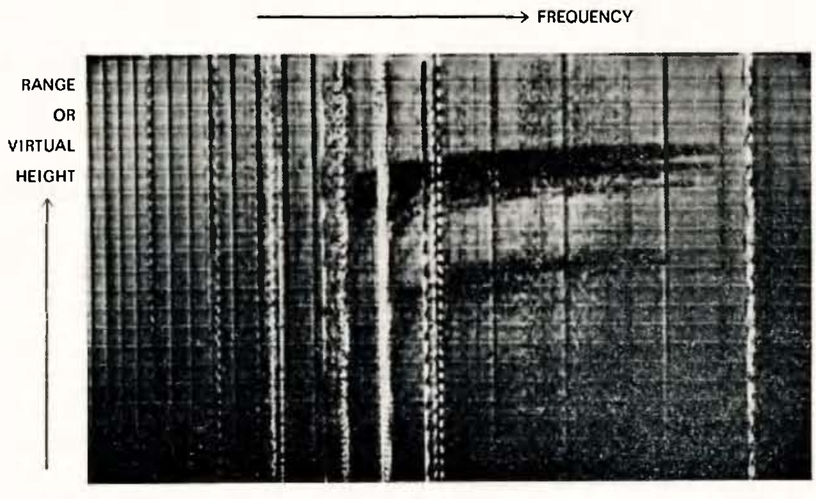


Fig. 5 (b)—Vertical incidenle ionogram from Cocos Island, 2200 hours LMT, 5th August, 1970, showing typical equatorial spread—F or range spreading. Range spreading is caused by oblique incidence reflections from irregularities in the base of the F-layer.

CLASS I. TEP—CAUSES AND CHARACTERISTICS

It is now well established that Class I. TEP depends on the equatorial anomaly. All the observed variations and characteristics of the equatorial anomaly influence Class I. TEP in a predictable manner. However, what is the cause behind the cause? or, what causes these two crests that are a feature of the equatorial inosphere?

The Fountain Effect

During the day, electrons from the base of the F-layer move upwards, in the region of the magnetic dip equator (where the magnetic field lines are horizontal), under the combined influence of the earth's magnetic field and the electric field that exists between the E-layer and the F-layer. These electrons then diffuse along the magnetic field lines and accumulate at two places, either side of the magnetic equator, forming the crests of the equatorial anomaly.[15] The effect is illustrated in Fig. 6.

This explanation is, of necessity, simple and perhaps not entirely accurate, but should serve for the purpose of this article. For those who wish to know more, read reference 15.

The effect of the equatorial anomaly on foF2 (critical frequency of the ordinary ray at vertical incidence for the F2 layer) for the area either side of the geomagnetic equator is given in the inset of Fig. 7. As can be seen, foF2 reaches a peak where the crests are located and a trough over the magnetic equator. This partly accounts for the high MUFs observed when supermode propagation is used.

DETAILED CHARACTERISTICS

The characteristics of Class I. TEP will now be discussed in detail with reference to its dependence on the equatorial anomaly. The reader can refer back to particular paragraphs in the discussion of the equatorial anomaly if necessary to elucidate the dependence of various characteristics on the associated characteristics of the equatorial anomaly.

Occurrence Times

There is a peak occurrence of Class I. TEP between 1200 and 1900 LMT for all sectors. Individual circuits will have slightly different peak occurrence times somewhere within these limits. The peak occurrence times coincide with the stable phase of the equatorial anomaly which is generally well developed after 1100 LMT and begins to decay around 1900 LMT. Occasionally it remains stable after this time, particularly at equinox at sunspot maximum[11] and observations bear this out, signals remaining stable for several hours after 1900 LMT before experiencing the flutter fading of Class II. TEP.[1]

Paths that are normal (or nearly so) to the geomagnetic equator and symmetrically located either side are favoured, experiencing earlier start times, longer durations and a greater number of occurrences—especially at sunspot minimum.

Australia and Asia-Japan are ideally situated in this regard as are Central/South Africa and North Africa/Mediterranean. The Americas are not so well off except for circuits involving Venezuela, Guyana, Surinam, etc., and Chile/Argentina. See the maps in Figs. 2, 3 and 4.

TEP can occur at any time of the night or day, but it is most infrequent between 0400 and 0800 LMT[11] for either Class I. or Class II. TEP.

Occurrence times are generally dependent on:—

(a) Suitable path geometry, including tilts which allow supermode propagation.

(b) Build up of sufficient ionisation density in the crests of the equatorial anomaly such that foF2 of each crest is sufficiently high to increase the MUF above that normally expected.

(c) Sunspot number (b) is obviously dependent on sunspot number, but this is not the only factor involved. This dependence is not as great as one would imagine and is much less than for Class II.

(d) Season.

Path Characteristics

As Class I. TEP is propagated via a supermode (Fig. 1) the path geometry can be determined for the maximum and minimum range possible for the observed parameters of the bulges of the equatorial anomaly. The parameters affecting the path geometry are the height and location of the virtual reflection points, foF2 for these points and incidence angles to those points. Knowing these, it becomes possible to predict the maximum and minimum ranges. These work out to be between 5,000 and 9,000 km.[12] This was calculated assuming that the path and equatorial anomaly were symmetrical about the geomagnetic equator.

Oblique paths and asymmetrical paths will encounter different conditions about which more will be said later.

The best paths are those which are located symmetrically about and normal (or nearly so) to the geomagnetic equator and the terminals of which lie in areas between 20° and 40° geomagnetic latitude north and south of the geomagnetic equator. These areas are marked in Figs. 2, 3 and 4 (cross hatched to the right). These paths tend to experience Class I. TEP more often than oblique or asymmetrical paths.

Very long paths (greater than 10,000 km.) are always oblique and some other form of propagation appears necessary to assist the signal in being favourably incident on the bulges of the equatorial anomaly. Sporadic E (Es) is the most likely cause but this has yet to be confirmed. An observation by Roger Hord, VK2ZRH (private communication) appears to support this. On 8th November, 1970, he reported hearing WB6KAP on 50 MHz. from 1310 to 1435 EAST. At the same time he reported sporadic E signals from New Zealand. Now WB6KAP is located in California some 12,000 km. from Sydney. For this signal to have been refracted across the equator via a supermode, it must have struck the southern crest of the equatorial anomaly somewhere above Western Samoa which is some 4,500 km. from Sydney. A ray, leaving the earth tangentially would strike the F-layer some 2,000 km. away at the most. Thus some other form of propagation was necessary for the signal to reach Sydney. It works out that it is possible for sporadic E, located over the Tasman Sea east of Australia, to refract the signal sufficiently for it to arrive at the equatorial anomaly over Western Samoa.

Southern California is located sufficiently close to the geomagnetic equator for a ray to strike the equatorial anomaly at a favourable angle.

A ^{3}F mode has been suggested,[11] but as yet is unconfirmed. Its likelihood is rare.

of foF2 with geomagnetic latitude assumed for the particular circuit. The printout is reproduced here with the kind permission of Mr. B. C. Gibson-Wilde, of the James Cook University of North Queensland.

Ray focussing is a very important characteristic of Class I. TEP as it provides the strong signals and "area selectivity" (signals being heard in one narrowly defined area and not in others) that is often noticed as being associated with afternoon type TEP[1] (also reported by D. Tanner, VK8AU, private communication).

Many observers have noted that, from their location, TEP signals are observed first from the most eastern area and thence move west—following the sun. For example, Amateurs in the Eastern States of Australia first hear Amateurs in the eastern regions of Japan. The eastern stations gradually disappear and are followed by stations in central Japan, then western Japan, then Korea. Japanese Amateurs first hear stations in the eastern States (Qld., N.S.W., Vic.) and then stations in central regions of Australia (N.T., S.A.) followed by stations in Western Australia.

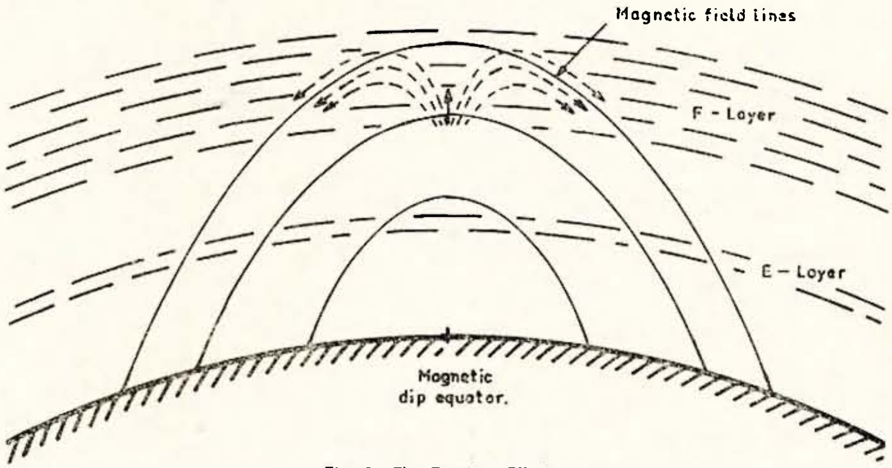


Fig. 6 —The Fountain Effect.

TEP over paths which are fairly oblique to the geomagnetic equator (65° or less) tend to be reasonably long (greater than 8,000 km.), rare, short lived and tend to occur mainly some weeks after the equinoxes. Many of them are asymmetrically situated with regard to the geomagnetic equator, but this bias is probably due to observer station distribution. Very long range TEP is generally observed one to two years after a sunspot maximum and rarely, if ever, during the sunspot minimum.

Ray Tracing

If a series of rays from a transmitter in one hemisphere is traced, using computer simulation through a model of the equatorial ionosphere, it is found that much of the low angle radiation travels via the supermode of propagation and experiences a large degree of focussing at the receiver.

In Fig. 7, a computer printout is shown illustrating this ray-focussing effect. The inset shows the variation

Referring back to the diurnal variations in the equatorial anomaly, you will notice that the build-up of ionisation in the crests is time dependent and hence the critical frequency is time dependent. Thus the region of maximum ionisation will follow the sun and will have a westward motion. Consequently contacts between Australia and Japan would be expected to commence first in the east and move westward.

Seasonal Characteristics

There is a maximum number of occurrences around the equinoxes for all sectors of the world. This is due to the more favourable conditions that exist in the equatorial anomaly at the equinoxes. Reference to the seasonal variations in the equatorial anomaly will show that the important parameters satisfy the best conditions for Class I. TEP at the equinoxes. The attitude of the earth with respect to the sun and the ecliptic plane is obviously the major controlling factor on the symmetry of the equatorial anomaly at equinox.

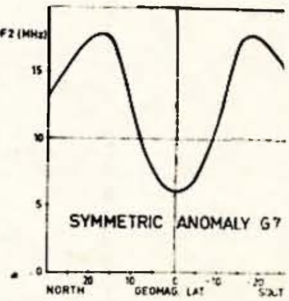
There is always a greater number of occurrences of Class I. TEP near the sunspot maximum than during the minimum. It is well known that sunspot number affects the MUF of the F-layer and foF2 for the crests of the equatorial anomaly follow a similar pattern.

However, the greatest number of occurrences of Class I. TEP lags behind the sunspot maximum by one to two years. The reason for this is, as yet, unknown.[11]

Contacts can be had almost daily around the equinoxes with Class I. TEP as was evidenced by the openings reported in "Amateur Radio"[10] and "QST" during 1970 and 1971 as well as earlier in "QST."[1, 2] Similar results are recorded by oblique ionosondes operating on transequatorial circuits between Okinawa and St. Kilda (S.A.) and Okinawa and Townsville (Qld.).

that Class I. TEP affects the HF region as well as the lower VHF region. Contacts on the HF bands via Class I. TEP have been reported,[13] but are not often recognised by Amateurs.

The MUF for oblique paths is generally lower, owing to unfavourable "look" angles on the equatorial anomaly, and consequently the MUF for these paths exceeds 50 MHz. less often



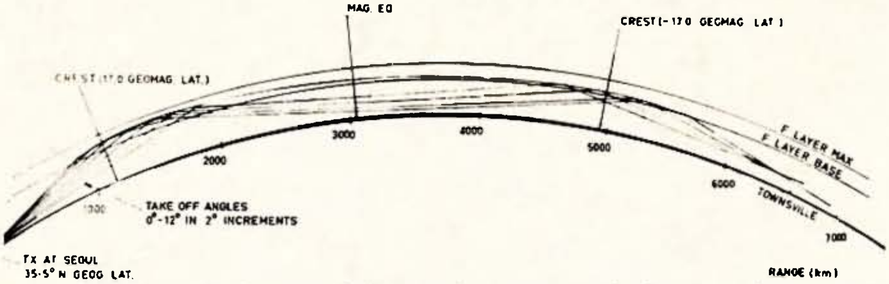


Fig. 7.—A copy of a ray tracing printout showing the focussing effect obtained when transmissions are propagated via the supermode. The inset shows the theoretical symmetric anomaly assumed in the ray-tracing programme that produced the printout. (Reproduced with the permission of B. C. Gibson-Wilde.)

Signal Characteristics

Apart from the frequencies involved, the most extraordinary characteristics of Class I. TEP signals are their strength and steadiness (absence of fade). Signal strength can sometimes approach free space values[1-] and the fading rate is normally quite low and not very deep.[1-3, 7, 10-12] This is explained by the fact that rays strike the tilts associated with the crests of the equatorial anomaly very near to tangency and are efficiently refracted; this, combined with ray focussing, and the same absorption for a one-hop path, leads to very little signal loss.[7, 8, 10, 11]

Many Amateurs report good results running only medium to low power (under 20 watts) and small antennas[16] (also in private communications).

The low fading rate is also associated with a low Doppler shift—generally around ±2 to 4 Hz.[12] If a power spectral density graph (signal power level versus Doppler shift) is examined for Class I. TEP signals, it is observed that most of the Doppler shift is less than ±2 Hz. with another, smaller, peak at ±4 Hz.[1-]

The peak MUF for Class I. TEP appears to be around 60 MHz.[12] which places the 6 metre Amateur band in a very fortunate position.

The frequencies involved in Class I. TEP will always be above the predicted MUF, for the path involved, by a considerable factor. So you can see than for paths which are more nearly normal to the magnetic equator.[7, 11, 12]

Although Class I. TEP provides fairly stable signals, wideband systems will suffer distortion due to multipath effects (see Fig. 7). Voice transmissions will not appreciably suffer, especially FM, but television picture signals will be of very poor quality.[12]

It must be understood that Class I. TEP is not a "normal" F2 mode of propagation as many VHF Amateurs seem to think, but it is certainly not "anomalous" within the definition of the word. The MUF of the F-layer for ^{1}F or ^{2}F modes in general rarely exceeds 50 MHz. so that Class I. TEP cannot be classed as "normal" F2 skip on these grounds alone. Secondly, Class I. TEP travels via a two-hop ionospheric mode **without intermediate ground reflection**. This supermode or ^{2}F-mode is sometimes referred to as "chordal-hop" propagation.

(to be continued)

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WILDCAT DX AWARD

The Eastern Zone of the Victorian Division of the W.I.A. has made available to v.h.f. operators the Wildcat DX Award certificate.

V.h.f. operators who establish contact with five stations normally resident in the Zone (who may be portable within the Zone) on all authorised frequencies 50 MHz. and above, excluding net and repeater frequencies, where the distance between the stations is 50 miles or in excess, can qualify by sending:—

1. **Proof of log—for the v.h.f. award contacts on or after 1st Nov., 1971;**
2. **Three 7c stamps.**

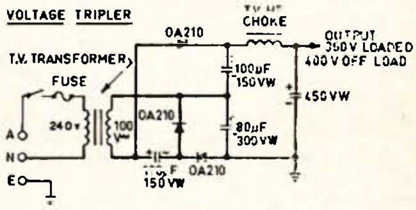
Send to Award Manager, VK3DY, Maffra.

A Voltage Tripler Power Supply Using TV Components

RODNEY CHAMPNESS, VK3UG*

The power supply transformers out of old television sets have been the basis for a great number of Amateurs' high voltage power supplies. The sources of supply of the t.v. type of transformer using a valve rectifier are not as common as a couple of years ago. The newer sets are using smaller transformers of the voltage doubler type. These, unfortunately, do not lend themselves to the much used technique of bridge rectification.

In the normal voltage-doubler mode the voltage obtained is in the vicinity of 250 volts. This, however, is not really suitable even for lower powered Amateur transmitting equipment. A voltage between 350 and 400 of high tension was required for a project so experiments were carried out with a voltage tripler. Good voltage regulation was not expected, but it was possible to obtain an output of 360 volts with a load of 120 mA., and an off-load voltage of about 400 volts. This regulation compared favourably with power supplies of the normal full-wave variety.



The voltage tripler circuit used is quite standard, but by re-arrangement of the circuit all standard t.v. electrolytics could be used with the exception of the last filter. In fact in the particular supply made up, only old t.v. components were used. The 80 µF. capacitor and the 450v.w. capacitor were chassis-mount can-type electrolytics. The two 100 µF.capacitors are the only two which are insulated from chassis, these types are usually insulated inside a plastic sheath anyway. The diodes are any 400 p.i.v. diodes.

This supply has proved to be a very economical way of getting about 350 to 400 volts using only scrap t.v's for parts. The sensible upper current level would be possibly about 160 to 180 mA.

[NOTE.—The working voltage of the final filter condenser would be the main thing to watch for. Owing to the choke, almost any value of C would give sufficient filtering. On the primary side of the transformer it would be preferable to have both input legs switched with a double-pole switch. If the unit is plugged into any g.p.o., it would be uncertain as to which leg was the active one.—VK3GK.]

* 24 O'Dowds Road, Warragul, Vic., 3820.

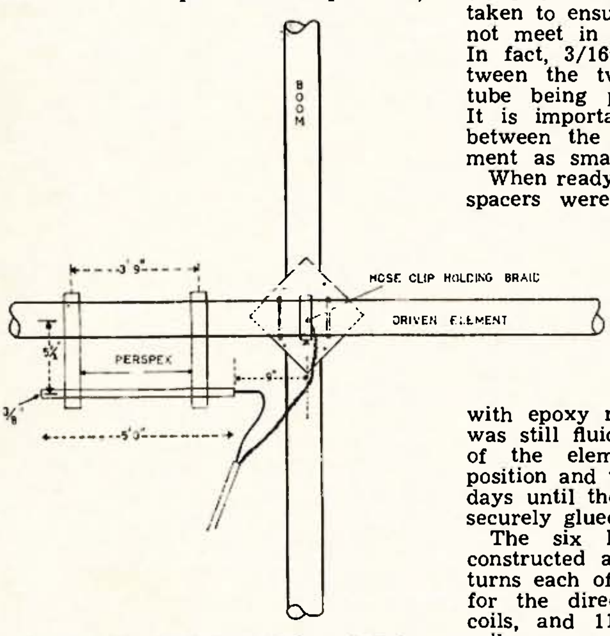
A 20 METRE MIDI-BEAM

GERRY LACEY,* ZL2BFU

The antenna is a much neglected part of Amateur Radio gear and too many people spend far too much money on purchasing something they could quite easily build themselves.

This antenna was born of necessity which, as we all know, is the mother of invention; or perhaps more correctly in this case, the utilisation of other peoples' ideas and modification of same to suit local conditions.

Living in a particularly wind-swept location where a full size quad or yagi on 20 metres would have to take a tremendous beating, it was necessary to produce an antenna with a reduced wind resistance. Also, having the "misfortune" to be surrounded by other active Amateurs, the nearest being less than 300 yards away, it was necessary to produce an antenna with reduced signal pick-up on the back and sides. Gain was not of paramount importance, but any odd decibels which might be offering would be gratefully accepted. Not being an engineer, it was also important that construction should be reasonably simple and because of this it seemed that "plumber's delight" construction was the obvious method to use. The antenna described here was the result of efforts to satisfy the above requirements.

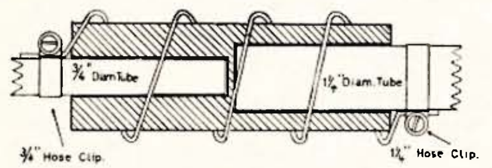


Aluminium tubing in ZL comes in 16-foot lengths so one length of 2" diameter tubing was used for the boom. This enabled spacing of approximately 0.1 of a wavelength between director and driven element and approximately 0.15 of a wavelength between the driven element and the reflector. There did not seem to be any logical reason why all the elements should not be of the same physical length, the electrical length being adjusted by varying the loading coils. This method seemed to be the easiest, so was adopted.

Each element consists of a 16-foot length of aluminium tubing, 1¼" diameter, for the centre section, at each end of which fit the loading coils. Into the outside end of each loading coil former or spacer, is inserted a 2 ft. 8 in. length of ¾" diameter tubing and into each length of this tubing is inserted a 2 ft. 8 in. length of ⅝" diameter tubing. The outside end of each length of ¾" diameter tubing is cut with a saw slot so that when the ⅝" diameter tubing is inserted, this latter can be clamped firmly into position using a hose clamp.

The wooden spacers at each end of the 16-foot centre section were made of oregon pine 6" long and turned to 2" diameter. One end of each spacer was bored to 1¼" diameter and the other end to ¾" diameter. Care was taken to ensure that the two holes did not meet in the centre of the spacer. In fact, 3/16" of timber was left between the two holes to prevent one tube being pushed inside the other. It is important to keep the capacity between the two sections of the element as small as possible.

When ready for assembly, the wooden spacers were painted inside and out with epoxy resin and while the resin was still fluid the appropriate sections of the elements were pushed into position and then left for three or four days until the resin had hardened and securely glued the sections together.



The six loading coils were next constructed and it was found that 10 turns each of 6 gauge aluminium wire for the director and driven element coils, and 11 turns for the reflector coils were required. The coils were initially wound on a 2⅜" diameter mandrel and when released fitted comfortably over the former, leaving ample clearance all round. No provision was made for weather-proofing the loading coils, but after assembly they were sprayed with a water repellent recommended for use on car ignition systems. In spite of the absence of weather-proofing no falling off of performance has been observed during heavy rain and no change in s.w.r. has been observed.

The elements were tuned by taking a piece of wire about four feet long and attaching one end to the element about 18" out from the boom and the other end to a similar position on the element on the other side of the boom. A one-turn link was then made in the centre of the wire and the g.d.o. introduced at this point. It is important to keep the coupling as low as possible to avoid false readings, but this was not difficult.

Tuning was done with the assembled beam resting on a couple of step-ladders approximately six feet off the ground and it was found that when the beam was raised to 30 feet, the resonant frequencies rose by about 100 kHz. Most operating from this QTH is done around 14.330 kHz. and the elements were tuned at 6-ft. as follows: Director 14.7 MHz.; driven element 14.23 MHz.; reflector 13.5 MHz. The resonant frequency of the elements is of course adjusted by compressing or expanding the loading coils, but adjustments to the coils on each side of the elements should be kept as balanced as possible.

The s.w.r. worked out at better than 1.5:1.0 over the whole of 20 metres when properly matched.

The driven element was fed using a gamma match, the tube of which is ⅜" o.d. by 5-ft. long and made contact with the element 4 ft. 6 in. out from the centre.

Matching was achieved by removing the braid from about 4 ft. of the co-axial feedline and sliding the uncovered section in and out of the tube until the impedance bridge showed a 75 ohm match. This method of matching was suggested by Max VK2ARZ and it worked out very well indeed. Much simpler than playing around with a variable capacitor and having to house it in a weatherproof box.

It is, needless to say, important to make sure that the odd strand of the centre conductor of the co-axial cable is not protruding beyond the insulation. For sealing, Silastic 732 RTV was used. This is a silicone rubber produced in the States and is excellent.

The element to boom clamps were made of 7" square pieces of ⅛" thick aluminium, but if the beam was to be re-built, a heavier gauge would be used as the present ones tend to "give" a little in the wind. Ordinary galvanised "U" clamps of appropriate size was used for attaching the boom and elements to the plates.

The all-up weight of the beam is about 25 lbs. and is rotated by a Stolle rotator. An additional thrust bearing has not been used, but this might be useful in taking most of the weight off the rotator. So far the beam has survived gusts of wind up to around 50 knots, but when the weather conditions are tough it can be lowered very quickly with the home-brew tilt-over mast which a thirteen-year-old can raise and lower single handed.

Experiments conducted across the Tasman with VK2ARZ gave the following results: 7 dB. forward gain

(Continued on Page 17)

* 27 Bledisloe St., Masterton, New Zealand.

Commercial Kinks

Listening around 40 metres the other day I was intrigued to hear two Amateurs, both on sideband, complaining about interference on the channel. As everything appeared clear at my end, I was somewhat mystified at their trouble, particularly as it seemed that they were each experiencing a different type of interference. Then I realised that, of course, their common trouble was i.f. break-through! While this is not a common trouble these days, it still plagues many Amateurs using some of the older sideband transceivers.

I well remember the first transceiver I owned, a National NCX-3. A very neat little rig for which I developed quite a liking. Unfortunately though, a local teletype station decided to open up on 5.2 MHz. which co-incided with the i.f. frequency of the NCX-3. The result; teletype at S9 over the entire three bands that the old NCX-3 covered.

No doubt quite a few of the early transceivers were affected in the same way. A few that come to mind are the Eico 753, which also had its i.f. on 5.2 MHz.; the early Swan models also had their i.f. in the 5 MHz. range.. The latest KW Atlanta has an i.f. on 5.2 MHz., and has had trouble from this same teletype station.

Well, what can be done about it? The trouble with most of the early transceivers was that they did not have adequate i.f. rejection. Quite a few did not even have an i.f. trap of any sort built into them. The National Co. soon noted the trouble and sent out details of an external trap that could be connected in the 52 ohm co-ax. feeder close to the transceiver. It consisted of a parallel tuned circuit with a very high capacity of 0.001 μF. The coil can be air wound and has 14 turns of 16 or 18 gauge copper wire. You will probably need to play around a bit to make it resonate on the exact frequency and an air spaced trimmer of around a 100 pF. in parallel with the 0.001 μF. fixed capacity will help to put it spot on. Two further points. Make sure the condenser you use is a good quality mica, and when completed seal the whole thing up in a suitable metal box with co-ax. connectors feeding in and out.

Another worthwhile addition to any transceiver, whether you are troubled with i.f. break-through or not, is of course a good antenna tuner. I have always been convinced that we would have cleaner signals both in and out if we all used one. However, that's another story that might be worth looking into one day.

Now let's get inside our transceivers and see what further can be done to improve the i.f. rejection. Most of the current models use a series resonant trap connected either from the r.f. stage grid or first mixer grid to earth. If you want to fit one to yours, you should make sure that it has high inductance and low capacity. A 3/30 pF. trimmer is ideal.

A slightly different set up, used to my knowledge only in some of the later National transceivers, is that the 5.2 MHz. i.f. rejection trap is installed in series with the cathode lead of the r.f. amplifier tube where the impedance allows the use of a high-Q parallel-resonant trap with an effectively high impedance providing better attenuation than the series tuned circuit mentioned above. The actual circuit consists of a 4.7 microhenry inductance with a 150 pF. mica and a 100 pF. trimmer in parallel, connected in series between the cathode of the r.f. tube and the normal cathode resistor and by-pass capacitor. If you are in doubt as to how it works, send me an s.a.e. and I will send you the complete circuit.

While on the subject of circuits, my offer to help readers has really kept me busy. So far I have been about 90% successful in finding the required data. One that has me tricked is a request from Mr. P. O'Shannessy, C/o. Radio Australia, Shepparton, Vic., for a circuit of a "Weston Radio Telephone" Type LM3 Mk. III. I wonder if anyone can help. If so, please write to Mr. O'Shannessy direct. I have also had a request for modification data on the popular Heath HW single-band transceivers. I have quite a lot of information which will be published in the near future. If you happen to have one of these units and know a few kinks, please let me know.

AN F.M. REPEATER

PART TWO

IAN CHAMPION, VK5ZIP*

CALL SIGN GENERATOR

The identification is generated by an electronic keyer designed and constructed by Rick VK5ZFQ.

The keyer is essentially a binary divider chain of flip flops with a decoding matrix of diodes. This choice was governed almost entirely by generous donations of these parts. The divided chain is driven from an a-stable multivibrator running at the "dit" speed. There are six dividers giving 64 bits in which to generate the call sign. (Slightly less than the number required to generate the recently allocated "VK5WI/R1" so that an extension will have to be made. We can only key "VK5WI R" at present.) The decoding matrix has been designed for easy re-coding.

The usual method of minimising the matrix would need extenive modification for even the simplest change of call sign. The method in this case is to decode only the "spaces" and the "dahs" which inherently gives some minimisation. The decoded spaces inhibit "dits" from an otherwise continuous stream of "dits" via a gate. Spaces between the Morse characters are thus formed. Another gate inserts "dits" to form "dahs" under the control of the "dahs" decoder. The result is technically perfect Morse code.

The square wave output is fed to a three-stage R/C filter network which produces a reasonably sinusoidal signal. This is coupled to the receiver audio prior to the take off point for the transmitter audio. This provides for convenient coupling of the ident to the transmitter and at the same time allows persons on site to monitor the ident through the receiver loudspeaker. The level is set so that the ident deviates the transmitter ±5 kHz. A more detailed description of a similar keyer has appeared since building this keyer in June 1970 "QST".

TEST FACILITIES

Whilst the main concern was to tie the transmitter and receiver together as a repeater, it was essential that some sort of manual control be provided for ease of servicing. Consequently the following control features were extended to the front panel. A two-pole switch marked Simplex/Repeat when switched to the simplex mode disconnects the receiver audio from the transmitter and connects a microphone. The second half of the switch grounds pin 11 of the transmitter control card and prevents the receiver cperating the transmitter.

A second switch, Manual tx, grounds pin 9 of the transmitter control card and turns the transmitter on. This can be operated in either simplex or repeat mode. A third switch, Timer Test, abbreviates the 10-minute timer to 30 seconds to allow a quick functional check of the circuit. The receiver mute and volume controls also appear on the front panel and are pre-set. These govern the system sensitivity and the audio level to the transmitter respectively. A multiposition switch allows metering of the following points:

- Unregulated volts 20-25v. (battery check with mains off).
- Regulated +14v. (power supply check).
- Transmitter volts (comparison of tx volts and reg. volts shows condition of solid state switches).
- Receiver +11.5v. (receiver reg. check).
- Transmitter p.a. current.
- Transmitter driver current.
- Transmitter exciter current.

A voltage sample from the s.w.r. protect circuit displays a relative "reverse r.f." reading that is useful when aligning the transmitter filter. The receiver limiter and discriminator voltages complete the metering facilities. A combined switch/potentiometer allows the receiver audio output stages to be turned on for on-site monitoring and a small socket permits an extension speaker to be plugged in for remote monitoring. (See Aerials and Filters.)

Fuses, a.c. and d.c. isolation switches complete the front panel set-up.

AERIALS AND FILTERS

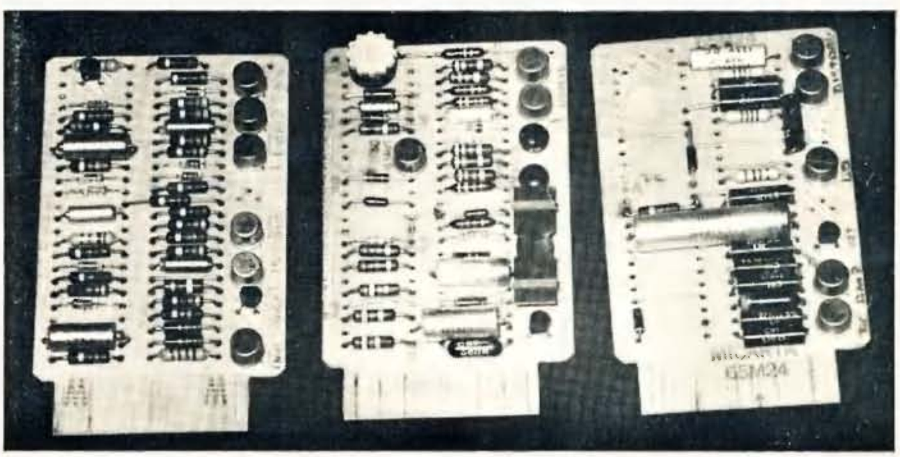
As it was intended that the transmitter and receiver were to be enclosed within a single unit, it was obviously contrary to this idea to have the aerials widely separated and incur substantial feedline losses. To have both aerials mounted on the same tower was more in keeping with the concept as planned, but to do this and overcome receiver desensitising would require considerable filtering.

Two possible problems were foreseen, namely (1) the direct radiation from the transmitter overloading the receiver front end; (2) noise generated by the transmitter at the receive frequency would greatly affect the signal/noise ratio. This meant that each feedline could require filtering, a rejection of noise at the receive frequency within the transmitter feedline, and a rejection of the transmitter carrier in the receiver feedline.

In anticipation of this problem, a four-section filter was initially constructed as described in March 1970 "QST", and initial on-air tests were done using this filter and two folded dipoles vertically spaced 10 feet. It soon became apparent, however, that a second filter was required, as while the existing filter completely eliminated either one of the two types of interference, the other still remained. Rough calculation suggested that although a second filter was required, it need not be as elaborate as the first, and on this basis a two-section co-axial filter was constructed. With this filter in circuit, and by careful adjustment of the phasing of the aerials, the objective of zero desensitising was achieved.

The repeater went into service in this configuration, but afer a few weeks it became apparent that day to day temperature variations caused sufficient detuning of the filters to affect the system's weak signal performance. After endless hours of experimenting, it was finally conceded that the two-section filter was inadequate and a second four-section filter was constructed. The installation of this filter provided more than adequate safety margin for any temperature drift that would occur.

(continued next page)



The control circuitry was built on reject computer cards.
Left to right: Ident control card, transmitter control card, 10-minute timer.

* 16 Tarranna Avenue, Parkholme, S.A., 5043.

As previously mentioned, the phasing of the aerials is all important and the technique developed to optimise this may be of interest. It involves the use of a third aerial into which a signal generator (tuned to the repeater receiver frequency) is fed. With the repeater transmitter on, the signal generator is adjusted to produce a noisy signal and the relative position of the two aerials is then adjusted for best signal/noise ratio. The intrepid soul adjusting the aerials is equipped with an extension speaker from the receiver which enables him quickly to optimise the adjustments.

The signal generator and third aerial technique is also used for adjustment of the filters. The need to be able to adjust the strength of the incoming signal over a wide range as the adjustments progressed ruled out the use of other Amateur signals and made the signal generator an indispensable tool.

Another aid found necessary to complete the adjustment of the filters was an r.f. indicator of some description. An s.w.r. bridge was permanently connected in the transmit feedline after the filter.

At the time of writing, the two original folded dipoles are still in service. With a general improvement in the weather, further experiments in this area are planned, possibly starting with some 5/8 dipoles.

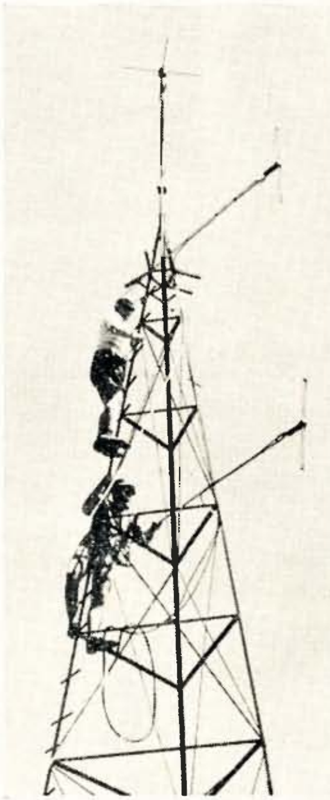
SUMMARY

The Adelaide Channel 4 repeater is situated 2,000 feet above sea level on private property at Crafers, about a mile south of Mt. Lofty and overlooking the S.E. freeway. From this location it has 360 degrees coverage from horizon to horizon except for a 15 degree shadow to the north through Mt. Lofty, but due to the topography of the Adelaide hills, it has line of sight to only 50% of Adelaide. Unfortunate as this is, mobile operation is still possible from almost anywhere in the metropolitan area, the most difficult areas being the N.E. and foothills suburbs.

The mobile coverage beyond the metropolitan area has proved to be fairly extensive. To the south it is limited by undulating terrain in places, but ultimately by the Southern Ocean. To the north it is undefined in terms of mobile operation, depending upon terrain and band conditions; mobiles pop in and out well beyond the 60-mile mark. Coverage to the west embraces almost any point on the Yorke Peninsular, while to the S.E. mobiles have worked in excess of 100 miles out along the Duke's Highway.

Garry VK5ZK and Ian VK5ZIP operating the Adelaide repeater VK5WI/R1.

Portable and country stations make light work of these distances, recently Ian VK5ZJF was operating portable from Mt. Lincoln (170 miles), but it surprises nobody any more that Hughie VK5BC at Berri (120 miles) and Tony VK5ZAI at Bordertown (150 miles) popped up for a chat. Jim VK5ZMJ at Port Pirie (140 miles) is another of the seventy sttaions currently using the facility.



Aerial phasing.—The ground plane is part of a commercial system located at the same site.

A few brief contacts made at a time prior to the equipment being optimised auger well for the DX season. Stations in Mildura (200), Mt. Gambier (250) and Warrnambool (350) were worked with excellent signals. During the two metre opening on 30/10/71 VK3AKU, mobile in Melbourne, copied the Adelaide repeater through the transmission breaks of the Geelong Channel 4 system.

In order to maintain its communication potential in times of emergency, the repeater has been equipped with a bank of nickel-iron batteries operating on a float charge system. In the event of a mains failure, the batteries will operate the repeater for two/three days depending upon usage. A low level tone (± 1 kHz. dev.) will be audible on all transmissions to alert the repeater group of the condition. Another feature, yet to be included, is an "off-frequency" warning system.

To overcome the problem of netting a transmitter to the repeater input frequency an IC comparator is to be added to the receiver discriminator circuit. Any signal off frequency by more than 3-4 kHz. will initiate a tone on the re-transmission—2 kHz. if high in frequency, 500 Hz. if low. The tone will continue into the transmitter "run-on" period so that any station can check and centre his transmission without the aid of another station. At the time of writing, this piece of equipment was complete and awaiting a convenient moment to be installed.

While it is realised there are many factors governing the approaches to the problem of setting up an Amateur repeater, it is hoped that the ideas expressed here will assist and stimulate ideas for those groups planning to set up an Amateur repeater in this country. If any person or group would like further details or circuits, you may contact the writer at his home address.

In conclusion, the author would like to thank Garry VK5ZK for his assistance in recalling the history of our project and our respective wives for their patience whilst "radio widows". Our thanks go to the rest of the repeater group, to those other stations who donated time and materials, and finally to the Adelaide operators in general whose ready acceptance of the service provided has made our effort worthwhile.

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"20 YEARS AGO"

Let's look back 20 years to the May 1952 issue of "Amateur Radio". In fact as from this issue we intend to do this every month Let's hope it brings a few memories to those of us old enough to have been active Amateurs at the time, and some idea of that era to the young new Amateurs of today.

The big news of May 1952 was the impending opening of the 21 MHz. band. The editorial tells how the 21 MHz. band was first discussed at the Atlantic City I.T.U. conference of 1947 up to the Extraordinary Administrative Radio Conference held in Geneva in 1951, and finally how Federal Executive pressed the Amateurs' case with the Australian Administration. It's a story that is still going on today.

Technical articles in the May 1952 issue include a description of a Low Power 2 Metre Crystal Controlled Transmitter by K. B. Mitchelhill, VK2ANU. With an 832A in the final, it looks like a lot of 2 metre transmitters one sees around even now.

Part eight of "Television Made Easy" by Ken Wall and John Jarman, VK3ADA was devoted to "Interference, and how the Hams can check it". This series of articles created an enormous interest as information on t.v. was rather hard to get at that time.

1951/1952 Ross A. Hull Memorial Contest results give the top scorers as VK5BC with 2521 pts., VK6BO 2285 pts., VK2ABC 2010 pts. Some 45 logs were received and about 200 stations took part. Incidentally, Hughie VK5BC is still as active as ever on all bands from 160 to 2 metres.

DX notes by Frank Hine, VK4QL, indicate that conditions on all bands were at a rather low ebb, the best of the bands being 80 and 40.

What was the average Amateur buying and selling in May 1952? A glance at the Hamads shows in the "for sale" department a Type 3 Mark 2 complete with modulator. An HRO Senior receiver for £60. A Palec valve and circuit tester for £15, plus the usual bits and pieces.

Advertisers still with us include Ham Radio Suppliers on the inside front cover, William Willis & Co. with a large ad. for British "Woden" Modulation Transformers, and R. H. Cunningham with a full page on Eddystone v.h.f. components.

PROGRAMMABLE DIGITAL KEYER

D. A. McARTHUR,* VK8KK

For years I have used meteor and forward scatter techniques on v.h.f. This is an interesting facet of our hobby. Procedures for using c.w. are defined by the medium and, although s.s.b. is an advantage, c.w. still remains a highly reliable form of transmission. "Pounding the Brass" during scatter contacts was very tiresome and an alternative means of generating c.w. sought; the use of digital techniques seemed to be the answer.

It was decided early in the design that not only call signs should be generated, but a flexible, random-selectable, programmable facility would be required. The unit I propose to describe has the following features:—

(1) Fully solid state.
(2) Use of ICs for simplicity.
(3) Capable of having a full QSO without touching the key.
(4) Capable of changing the programme at will.
(5) Repeat and re-cycle operations.
(6) Reset to start and reset at any stage.

Thus, with the basic specifications, a few typical examples of what the keyer will perform would be:—

CQ CQ CQ DE VK8KK repeated three times, END K.

WA6XXX (3X) DE VK8KK (3X) RST 599 END K.

CQ CQ CQ DE VK8KK BK listen for period "X" and repeat.

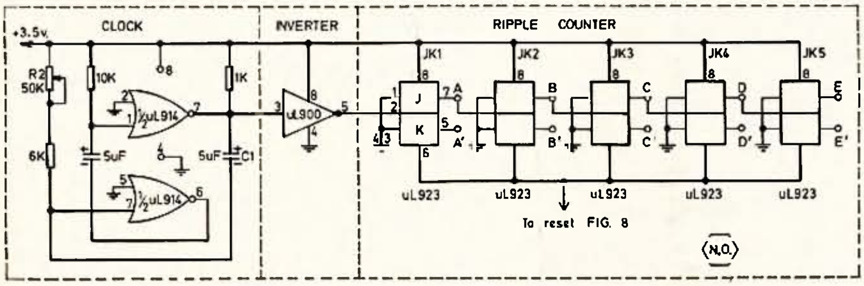
In other words the keyer is versatile to cover all forms of basic QSOs.

BASIC BLOCK DESCRIPTION

The theory of producing digital c.w. is not new and many articles have been published in recent years on the subject. However, to begin at the beginning it is best to have a variable speed clock. As will be seen later, this is the speed control for the c.w. being sent. The clock is a basic multivibrator using dual nand gates (see Fig. 1). The frequency of the multivibrator can be controlled to give a resultant c.w. speed of approximately 5 to 35 w.p.m.

The output of this clock drives a five-stage ripple counter (or divider) of which the true and false outputs feed into a diode decoding matrix. The output of this matrix will give cyclic counts 0-31 (32 counts).

Bit 0 of this counter is used to drive a secondary 16-bit counter. This secondary counter is used to select the encoding sequence stored or programmed. A switching matrix, between the secondary counter and the programmes, selects the order and any repetitions which may be required. The last four counts (bits 12, 13, 14 and 15) are not fed to the switching matrix but are arranged to zero keyer output. This is used to provide blank time for listening periods, hence saving an extra 32 switches.



CLOCK AND PRIMARY COUNTER FIG. 1

The storing of programmes is achieved by an arrangement of diodes across the basic 32-bit counter. These programme lines are activated by the secondary counter pulses of which the sequence of programme selection is set by the condition of the switching matrix. The output of all 32 basic count lines are "OR'D" to form the primary keyer output. This primary output is fed to an inverting shaping network, thence to another inverting stage to drive the actual keying transistor, which keys the normal 50 volt negative bias line of the transmitter. A split is taken at the input of the keying transistor—which is in grounded base—to control a dual nand gate audio oscillator. This then drives an audio amplifier IC type TAA300 providing inbuilt audio side-tone.

CLOCK

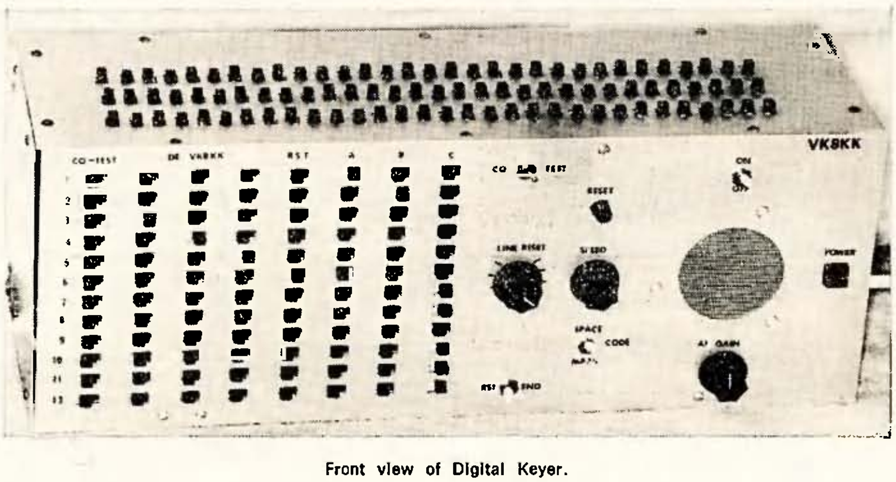
This consists of a Fairchild uL914 (dual Nand/Nor), connected as shown in Fig. 1. It provides pulses with repetition rates variable by potentiometer R1. Note that this potentiometer was wired back to front to allow for linear control of the speed (type C taper). The timing circuit p.r.f. is dependant on R2/C1.

The output waveform is shown in Fig. 3. This is fed to a uL900 inverter to provide correct pulse directions and adequate drive to the primary counter. (Note uL923 requires —ve going pulse edges for triggering.)

PRIMARY RIPPLE COUNTER AND DIODE COUNT DECODER

This consists of five Fairchild JK flip-flops type uL923. Pins 1 and 3 are grounded and the clocked input is applied on pin 2. True and false outputs appear at pins 7 and 5 respectively. The true output of each preceding JK drives the clocked input of the succeeding stage. Thus the true outputs (A-E) and the false outputs (A'-E') can be represented as in Fig. 3. To obtain the decimal output (i.e. 0-31 counts) the binary outputs of the primary counter must be decoded in the diode B/D matrix. Here computer germanium diodes were used for cheapness.

To explain the decoder matrix function, count 2 will be used as an example.



Front view of Digital Keyer.

* 4417 Bul Bul Street, Ludmilla, Darwin, N.T., 5790.

Count 2 decimal = 00010 in binary.

As E is the most significant bit of the counter the outputs for count 2 can be expressed thus—

00010 = EDCBA = required output from the **true** sides of JK.

11101 = E'D'C'B'A' = required output from the **false** sides of JK.

Thus to gate out count 2 the diodes are arranged as such—

True side of JKs:
- A = zero (no diode).
- B = one (diode).
- C = zero (no diode).
- D = zero (no diode).
- E = zero (no diode).

False side of JKs:
- A' = one (diode).
- B' = zero (no diode).
- C' = one (diode).
- D' = one (diode).
- E' = one (diode).

Hence whenever there is a condition of 00010 (count 2) a logic 1 appears at the output of that decoding line. This means that for 32 counts 5 x 32 diodes or 160 diodes are required initially. Having completed the binary to decimal decoder, the output lines will step from 0-31 at a speed determined by the speed setting of the clock.

The logic levels will be—

+1.2 to +1.5 for a logic 1, and
+0.2 to +0.5 for a logic 0
for each count output.

This may be checked with a c.r.o. or multimeter. Before progressing any further, it is highly desirable to prove this section is working correctly. There may be a double count or no count at all for some numbers due to faulty or incorrectly wired diodes. It is reasonably easy to fault-find by applying logic thus—

If a count output is achieved at count 15 and count 7 on line 7 but not on line 15, then by converting both to binary—

7 = 00111 = E'D'CBA
15 = 01111 = E'DCBA.

The only difference is diode D, and this is thus suspect.

STORED PROGRAMME MATRIX

See Fig. 4. At this point the builder must decide what he wishes in permanent store. In my case the following were chosen for my own application:—

Line 1—CQ.
Line 2—TEST.
Line 3—DE VK8KK.
Line 6—RST.
Line 7—END K.

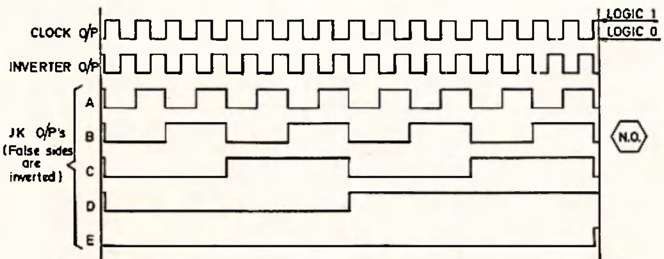
Note that DE VK8KK occupies three lines (3, 4 and 5).

Here it is suggested that the builder uses graph paper to discover how much area is required and what can be fitted into one line (yearn for the call sign of E5EE!).

As described earlier, there are 32 counts or 0-31; delete count 0 as this will be used for timing purposes. There remain 31 programmable bits.

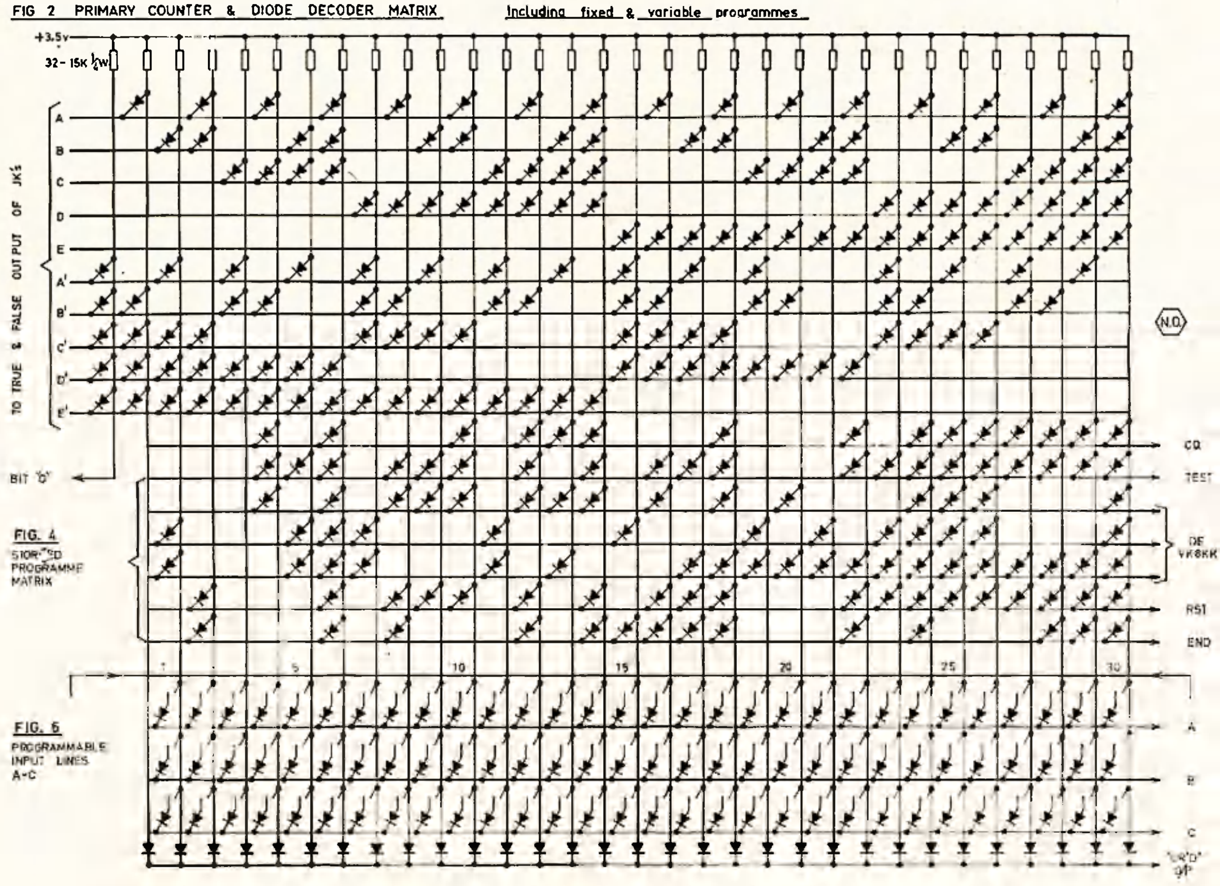
Imagine if counts 1-31 were "OR" gated, then the output from this "OR" gate would always be a logic 1. Now the problem of generating the c.w. This is very simple. Morse Code parameters are:—

Dot = 1 unit of time.
Dash = 3 units of time.
Space between characters = 1 unit of time.
Space between letters = 3 units of time.
Space between words = 5-7 units of time.



TIMING DIAGRAM FIG. 3

FIG 2 PRIMARY COUNTER & DIODE DECODER MATRIX Including fixed & variable programmes



Hence by taking the Morse symbol for A = · —, the timing will be as follows:—

Dot (1 unit of time),
Space (1 unit of time),
Dash (3 units of time).

Furthermore, relating this to the 32-bit counter, it can be seen, by placing diodes where spaces are needed, the Morse symbol can be thus—

"A" will occupy 5 units of time or 5 counts.

Count 1 = Logic 1 = a Dot
Count 2 = Logic 0 = Space
Count 3 = Logic 1 }
Count 4 = Logic 1 } = Dash
Count 5 = Logic 1 }

A call sign will usually occupy three lines, unless you have a very short one —short, that is, in terms of dots as these take up least units of time. The format used is shown in Fig. 3. Examination of the placement of the diodes reveals the stored programme.

condition it should be a logic 1 (or open circuit for that matter). This is obtained by using a uL900 feeding each programme line, as the drive factor is high. Hence a logic 1 from the secondary counter via the inverter (logic 0 output with 1 input) performs the read operation.

MANUAL SWITCHING MATRIX

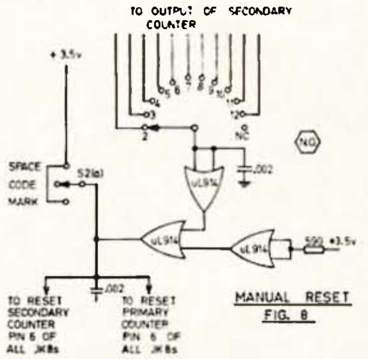
This is a simple method of selecting the order of the c.w. being sent. In Fig. 7 it is shown in the condition of CQ CQ CQ DE VK8KK.

The horizontal designations indicate the programme sources whilst the vertical designations indicate the secondary counter sequence. Diodes are used to isolate the secondary counter from the programme lines.

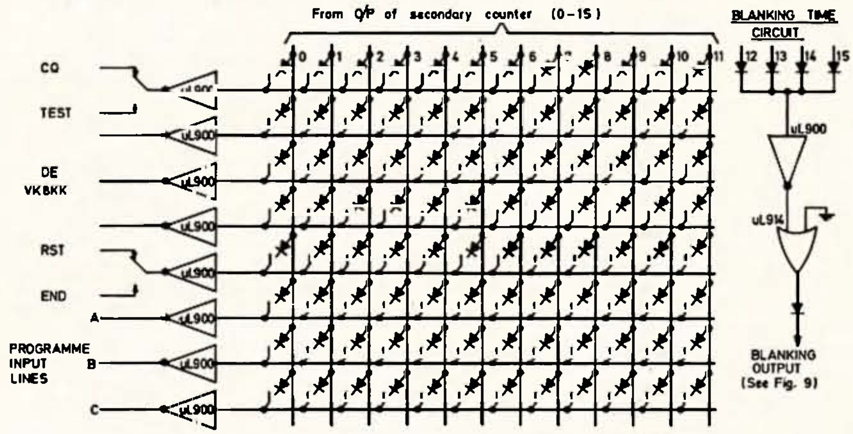
VARIABLE PROGRAMME INPUT LINES

These consist of three lines of 31 bits (switches) designated A, B and

the last four, as explained earlier in the basic block description, to provide "blank time". The 11th position of the switch provides a non-reset condition. This allows the secondary counter to count to its full capacity (0-15 or 16 counts), which, when completed, will start again back at count 0. Thus by the rotation of the switch the secondary counter can be reset at the desired position pertaining to what is being sent.



MANUAL RESET FIG. 8



PROGRAMME LINE DRIVERS FIG. 5

MANUAL SWITCHING MATRIX FIG. 7

SECONDARY COUNTER AND DIODE COUNT DECODER

This is exactly the same as the primary counter except that the count is only to 15, i.e. 0-15 or 16 counts. The clock pulse comes from bit 0 of the primary counter via inverter 6 to JKs J6-9. Here only four JKs are required for the 16 counts and all circuitry is the same as for the primary counter.

The secondary counter is used to control and sequence the manual switching matrix. This is achieved in the following manner. In Fig. 4 "CQ" is stored on line 1 of the stored programme matrix and if it is desired to send "CQ" three times in succession then counts 0, 1, 2 (from the secondary counter) are required to activate line 1 of the stored programme matrix (CQ). Further, if it is required to send VK8KK following the three CQs, then counts 3, 4, 5 (of the secondary counter) will activate lines 2, 3, 4 of the stored programme matrix (DE VK8KK).

ACTIVATION OF STORED PROGRAMME MATRIX

See Fig. 5. To read any programme line, the line concerned has to be a logic 0 (grounded) and in the idle

C. They are used to set up any additional information such as signal report or another call sign. Each switch is programmed in the same sense as the stored programme lines. Each switch must be capable of providing a logic 0 or a logic 1. This is achieved vide Fig. 6 by the use of diodes in the same configuration as is used in the programme lines though all count sequences must be capable of producing logic 1s and thus diodes are required in all 31 counts.

The 31 primary bit counts are in parallel with the three lines of 31 programmable inputs. These lines are selected in the same way as the fixed programme lines, that is by placing a logic 1 (from secondary sequence counter) at the input to a uL900 inverter, the output of which will fall to a logic 0 and thus read out that particular line.

RESET CONTROL

It is necessary to be able to reset the sequence counter at any time. Although there are 16 count sequences it is not entirely necessary to be able to reset at every count. As 11-position switches are common, only 11 positions or counts for reset were provided. Counts 0, 12, 13, 14, 15 were deleted—

The outputs of the secondary counter (logic 1) are fed to switch S1, the output of which feeds uL914 and is further inverted in the other half of this IC providing the desired logic 1 on the reset rail feeding all JKs.

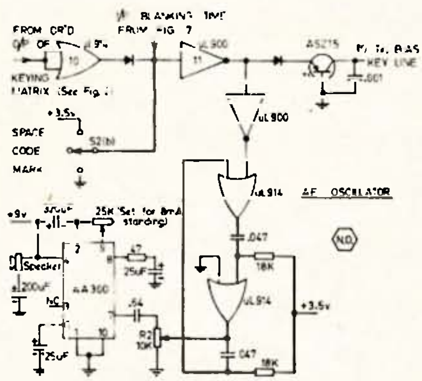
Capacitors C5 and C6 are used to provide r.f. filtering and delay. The uL914 is used as it has a low input loading effect on the secondary counter.

MANUAL RESET FACILITY

Manual reset (Fig. 8) is provided to achieve correct starting sequence of the digital keyer. This is achieved by placing a logic 1 on both primary and secondary counter reset lines (pin 6 of IC uL923) via the function switch S2 (space/code/mark). This resets both counters to count zero before sending c.w. Thus the digital keyer will always commence at the start of the programme.

KEYING AND MONITOR CIRCUITS

See Fig. 9. The OR'd output lines (31 primary counter lines all OR'd together) feed IC 10. This is a uL914 which is used as a low loading inverter.



KEYING AND MONITORING CIRCUITS FIG. 9

The output from the OR'd key lines is a logic 1, in the key-down condition, and will cause a logic 0 at the output of IC 10. This is turn will cause a logic 1 at the output of IC 11 (uL900) providing a high output loading to drive—

(a) Transistor T1, in grounded base which will key the bias tx line;

(b) The a.f. monitoring circuit.

The reasons for using double inversion through ICs 10 and 11 provide for lighter loading on the keying matrix output and also cleans up the ragged waveform caused by varying logic levels—mainly this is due to the differing forward resistance of the primary counter decoding diodes. See **diode decoder** logic levels.

This effect could cause false switching states as the ICs normally will change state at 0.7v. positive.

A.F. MONITOR AND AMPLIFIER

All logic 1 conditions from the keying line (a key-down condition) will cause the multivibrator uL914 to turn on. This generates a 4 kHz. tone and is applied via a.f. gain control potentiometer R2 to the input of a 1-watt a.f. amplifier IC type TAA300 (see Fig. 9). An internal 3" 8-ohm speaker provides the final link in the chain.

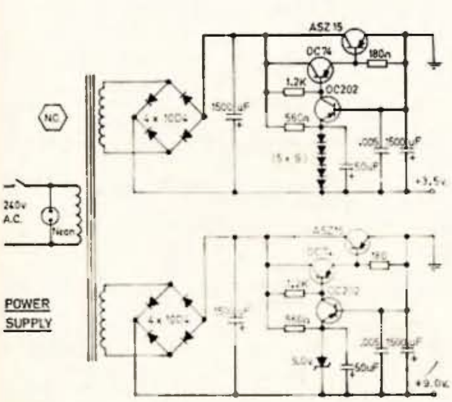
The use of the a.f. multivibrator key circuit is a highly useful tool in fault finding as it gives a tone on all logic 1 inputs applied to it, and thus can be used instead of a c.r.o. or multimeter where visual means of readout are needed. The switchable link in the circuit has been provided for this purpose.

POWER SUPPLY

Two basic supply rails are required for the +3.5v. logic circuits and +9.0v. for the TAA300. The transformer on hand at the time was a twin 12v. A & R rated at 2 amps. — more than adequate for the purpose.

The current drawn from the +3.5v. line varies up to 300 mA. under some keying formats, whilst the TAA300 draws about 12 mA. on peaks.

The regulation achieved during testing provided a 0.05v. variation for load of 0-1 amp. The regulated +3.5v. is achieved by the use of selenium diodes. They have a forward voltage drop (in the conducting condition) of 0.7v. and



POWER SUPPLY

thus five were selected to give +3.6v. Forward current was set to 20 mA. via R5 to achieve adequate stability. A suitable zener diode could have been used but the voltage spread at these low voltages is normally undesirable. The +9.0v. line is regulated by the conventional zener diode.

CONSTRUCTION

It is suggested the constructor use plug-in end connectors on the boards. The boards are double sided and were hand carved, not etched, mainly as design continued whilst building. As the logic levels are of quite a low order, care in avoiding a voltage drop must be remembered. Multi-stranded wire was used between the boards. This is vital on the 31 bit lines and the 16 bit lines.

The diodes were obtained from old computer boards. The switches (the cheapest available) came from a commercial supplier.

In conclusion, the keyer has been in use for over a year without a single fault. It can be seen that any amount of variations can be made to suit particular needs without much change to the basic concept.

ACKNOWLEDGMENTS

I wish to thank Colin Wall (VK8CM) who did the photography, and David Tanner (VK-3AUU, ex-VK8AU) for his suggestions in producing this Digital Keyer.

SUITABLE REFERENCES

Fairchild RTuL Composite Data Sheet, SL218.
Nashelsky, "Digital Logic," etc.

A 20 METRE MIDI-BEAM

(Continued from Page 9)

over the dipole; 25 to 30 dB. front-to-back and side attenuation up to 50 dB. One Amateur less than one mile away from this QTH indicated that with my signal adjusted to show S9 at his QTH, he virtually lost the signal entirely when the beam was rotated side on to him.

For various reasons the beam is mounted only 30 feet above the ground at the moment and no doubt better reports still could be obtained by raising the height of the beam and getting the advantage from the lower angle of radiation which would result.

The overall results with this beam have been most pleasing, enabling me to carry on QSOs without difficulty when it would have been quite impossible using a vertical, dipole or a G5RV.

AFTER-THOUGHTS

Readers are requested to amend their copy of the Part Two Slow-Scan T.V. article in "A.R." March 1972, page 7, as follows:

1st column, 3rd line of last para. should read: . . . A.W.A. **line oscillator** coil type 40047 . . .

2nd column, 4th para. should read: . . . exception of the **"P"** channel FET type 2N5462. A Fairchild type **2N4360** was used, but almost any **"P"** type should suffice.

3rd column, Semiconductors, No. 1 should read: Q11, Q17.—Fairchild **2N4360** or any **"P"** type FET. Note.—Do not fall for the trap and use "N" types that may be on hand.

The circuit in Commercial Kinks, "A.R.," April 1972, page 18, showing the audio derived a.g.c. system—please note that diode D2 has been shown reversed in polarity.

TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

Manuscripts should preferably be typewritten but if handwritten please double space the writing. If possible collaborate with any local draughtsman, student or engineer to do illustrations after the method shown in "A.R.," May 1971, page 5. Otherwise drawings will be done by "A.R." staff.

Please address all articles to:
EDITOR "A.R.,"
P.O. BOX 67,
EAST MELBOURNE,
VICTORIA, 3002

1972 John Moyle Memorial National Field Day Results

As a newcomer to dealing with the National Field Day Contests I was impressed with the interest in the 24-hour multiple operator section. There were quite large set-ups, involving up to 10 operators and up to six transmitters, working all bands from 160 metres to 70 cm.

If my experience with similar groups on similar projects is borne out, a great time was enjoyed by all.

Another matter of interest was the high participation by the VK3 Division. I suspect they are in training for the R.D. Contest?

My participation count of portable/mobile stations was as follows: VK1 3, VK2 16, VK3 55, VK4 5, VK5 12, VK6 2, VK7 3. I guess that an odd log or two got lost in the post?

In spite of the 96 listed above, we were down eight logs on last year, and participation could have been much better.

It is much more interesting, if after going to some trouble preparing for a field day, operators can be kept active. If the DX bands are open. it is very good, but more local fixed station activity would help.

VK4 was recovering from a cyclone which reduced activity there and the Victorian power strike would have taken toll of fixed stations. C.w. activity was very minor.

Thanks for the interesting comments. Bill VK7BM went to site by boat, and carried gear up sand-banks, up three down two, assisted by mossies and flies. Don VK3AHG and John VK4IE remarked on the friendly spirit. Jon VK6TU found 20 and 15 metres the only usable bands.

Some listeners had problems with their scoring, with which I will deal direct.

Standard of logs was high, particularly in the high scoring logs, and there were quite a few "copybook" logs.

I hope that you can organise a picnic day/week-end for next year's Contest and you will have a good time.

—Peter VK4PJ, Chairman, Federal Contest Committee.

SIX-HOUR DIVISION

Section A—Tx Phone:

VK2RJ	739 points
3ZA	853 „
3BBC	719 „
3AHG	546 „
3EF	415 „
3YQ	249 „
3AJP	85 „
VK4IE	763 „
VK5WI	380 „
VK6TU	209 „
VK7BM	255 „

Section B—Tx C.W.:

VK2YB	73 points

Section C—Tx Open:

VK7AL	574 points

Section D—Tx Mult. Op.:

VK3BDQ	2 ops.	528 points
VK4PJ	2 ops.	564 „

Section E—Tx Fixed:

VK2ZO	200 points
2JM	20 „
VK3BEK	130 „
3WM	80 „

Section F—Receiving:

G Clements, VK3	540 points
C. Thorpe, L4018	225 „
C. Hannaford, L50096	655 „
W. Clayson, L50015	480 „
M. Bosma, L60012	345 „

24-HOUR DIVISION

Section A—Tx Phone:

VK3DY	1360 points
3BBB	1063 „
3ZYP	306 „
3WM	135 „
VK4XZ	787 „
VK5RG	150 „
VK7AX	143 „

Section B—Tx C.W.:
Nil.

Section C—Tx Open:
Nil.

Section D—Tx Mult. Op.:

VK1VP	3 ops.	2038 points
1ACA	5 ops.	1438 „
VK2WG	9 ops.	2732 „
2ATZ	5 ops.	1419 „
VK3ATC	10 ops.	3882 „
3ATL		3338 „
3XK	4 ops.	3053 „
3MT	10 ops.	1868 „
3ATM	8 ops.	1719 „
VK5BW	3 ops.	3386 „
5AWI	9 ops.	2964 „
5LZ	6 ops.	1769 „

Section E—Tx Fixed:

VK3AYL	775 points
3AGF	720 „
3RN	515 „
3AUN	495 „
VK4IC	760 „
4PV	125 „

Section F—Receiving:

J. Vaarnela, VK2	1180 points
W. Newport. VK2	161 „
E. Phillips, VK3	265 „
I. Kirk, L50145	1220 „
B. Chammen, L5118	1014 „
R. Everett, L7043	1045 „

E. Trebilcock, L30042, c.w. check log.

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TRADE NEWS

Our good friends, R. H. Cunningham Pty. Ltd. announce a change of address for their Head Office to Cr. Dryburgh and Victoria Streets, North Melbourne.

NEW CALL SIGNS

DECEMBER 1971

VK3JG—J. V. Griffin, 85 Percy St., Glen Waverley, 3150.
VK3XI—H. G. Dugan, Laang Rd., Garvoc, 3275.
VK3ADT—V. A. Garnier, 16/27 Avoca St., South Yarra, 3141.
VK3ATI—R. Garnier, 16/27 Avoca St., South Yarra, 3141.
VK3ATV—A. J. Wighton, 6 Marcella Crt., Glen Waverley, 3150.
VK3AXY—J. O. Sanders, 2/78 Mathoura Rd., Toorak, 3142.
VK3AXZ—S. J. Donald, 64 Xavier St., Oak Park, 3046.
VK3BBN—J. Rotenberg, 6 Jeffrey St., Lower Templestowe, 3107.
VK3BGH—J. G. Hancock, 35 Glenebor Ave., Blackburn, 3130.
VK3YGO—P. W. Anderson, 42 James St., Belmont, 3216.
VK3YGP—R. G. Thomas, 2/12 Rosedale Ave., Glenhuntly, 3163.
VK3YUE—J. J. Sadauskas, 28 Gardenia Rd., North Balwyn, 3104.
VK3ZAZ—S. R. Gregory, Site of 3LK, Lubeck, 3378.
VK3ZDT—D. F. Taylor, 2 Walter St., Bulleen, 3105.
VK3ZGL—T. J. Barter, 7 Boonbarry Ave., Blackburn, 3130.
VK3ZJU—J. S. Sen, 31 Strezleki Rd., Yallourn, 3838.
VK3ZKH—D. K. Haustorfer, Apsley, 3319.
VK3ZKK—B. J. Wilson, 19 William St., Mt. Waverley, 3149.
VK3ZLG—L. G. Dowsey, 29 Woonah St., Chadstone, 3148.
VK3ZLQ—R. F. Hall, 64 Churchill Ave., Ararat, 3377.
VK3ZOA—J. A. Shaw, 34 Madeline St., Burwood, 3125.
VK3ZOS—P. R. James, 18 Brownbill St., East Geelong, 3219.
VK3ZSK—K. Sutcliffe, 66 Savige St., Morwell, 3840.
VK3ZTF—E. W. Boord, 2 Melrose St., Mordialloc, 3195.
VK3ZUE—J. U. Esselstrom, 7 Bowen St., Warragul, 3820.
VK3ZYG—J. C. Dennis, 69 Taylors Rd., St. Albans, 3021.
VK4BT—L. J. David, 82 Frangipani St., Inala, 4077.
VK4DU—N. W. Deague, 21 Illawong St., Buderim, 4556.
VK4ET—G. D. Widnall, 31 Kingstown Ave., Boondall, 4034.
VK4HF—R. A. Fulton, 3 Savoy Dr., Florida Gardens, Surfers Paradise, 4217.
VK4HX—W. D. Jackson, 24 Savoy Dr., Florida Gardens, Surfers Paradise, 4217.
VK4CEC—C. A. Cantor, 145A Grafton St., Warwick, 4370.
VK4ZET—E. L. Thomas, 47 Albert St., Rockhampton, 4700.
VK4ZHN—C. J. Hearn, 14 Trafford St., West Chermside, 4032.
VK5ZOS—O. G. Schmidt, 1 Verco Crt., Campbelltown, 5074.
VK6FF—F. McCartney, 22 Rudall Ave., Newman, 6753.
VK6OM—R. C. Marschke, R.A.A.F. Base, Pearce, 6085.
VK6CIQ—G. W. Hitch, Station: Portable; Postal: 49 Pandora Dr., City Beach, 6015.
VK6ZKA—M. W. Alsop, Station: House 827, Warrara St., Tom Price, 6751; Postal: P.O. Box 271, Tom Price, 6751.
VK7IR—I. R. Milne, 156 Roslyn Ave., Blackmans Bay, 7152.
VK7RH—R. L. Harwood, 5 Helen St., Launceston, 7250.
VK8VJ—C. M. Smith, 3656 Byrne Circuit, Moil, 5792.
VK8ZRD—D. R. Gordon, 3437 Yeadon Circuit, Moil, 5792.
VK9AI—G. N. Marks, P.O. Box 227, Madang, N.G.
VK9CC—D. Coyle (Rev.), Catholic Mission, Mt. Hagen, N.G.
VK9ZGM—G. Mears, C/o. D.C.A., P.O. Box 2087, Konedobu, P.

JANUARY 1972

VK1WB—W. A. Wells, 3 Booroondroa St., Reid, 2601.
VK2OP—E. A. Parker, 3 Cassidy Pde., Wagga, 2650.
VK2BMR—R. Miller, 3/18 Glena St., Fairfield, Qld., 4103.
VK2BNN—G. E. Gibson, 1201 Anzac Pde., Malabar, 2036.
VK2BNR—Nirrimba Radio Club, W.E.E. School, H.M.A.S. Nirrimga, Quakers Hill, 2764.
VK2BPI—P. R. Tomson, 91 Curban St., Balgowlah, 2093.
VK2ZNL—G. A. Puckett, 9 Alexandria St., Hunters Hill, 2110.
VK2ZTI—J. E. Conway, 1 Woodpark Rd., Sheridan Heights, 2161.
VK2ZTS—K. W. Close, 4 Goundry St., Gateshead, 2290.
VK2ZTY—N. D. Repin, 24 Bennelong Cres., Bellevue Hill, 2023.
VK2ZUA—J. J. Sharland, 897 Horsley Dr., Smithfield, 2164.
VK2ZXG—J. A. Gardner, 4 Tobruk Ave., Allambie Heights, 2100.
VK2ZXH—A. P. Minzenberger, 23 York St., Singleton, 2330.
VK2ZXM—R. K. Peters, 1/6 Putland St., St. Mary's, 2760.
VK2ZXP—D. J. Palmer, 32 Willoughby St., Epping, 2121.
VK2ZXT—J. E. Crighton, 78 Liverpool St., Paddington, 2021.
VK3CN—R. N. Elms, 18 Heritage Dr., Springvale, 3171.
VK3HD—J. P. Jonasson, 2 Roberts Ave., Castlemaine, 3450.
VK3KW—L. O. White, 48 Hart St., Niddrie, 3042.
VK3PE—J. Euripides, 208A Bridge Rd., Richmond, 3121.
VK3UV—L. E. Martin, 28 Leura St., Murrumbeena, 3163.
VK3ASE—B. R. Bathois, 3 Connewarra Ave., Aspendale, 3195.
VK3AYK—I. A. Keenan, 94 Dendy St., Brighton, 3186.
VK3BAI—J. F. Westley, 8 The Lookout, Heathmont, 3135.
VK3BDQ—D. S. McQuie, 34 Glengariff Dr., Mulgrave, 3170.
VK3BFJ—K. McL. Roberts, 42 Redesdale Rd., Dareblin, 3079.
VK3BFU—F. W. Bendon, 40 Price St., Essendon, 3040.
VK3BFV—A. V. Savory, 13 Orion Pl., East Doncaster, 3109.
VK3BFY—A. C. McBurnie, 35 Irvine St., Mt. Waverley, 3149.
VK3YGR—D. K. King, 113 Johnstone St., Broadmeadows, 3047.
VK3YGS—G. J. Clare, 4/18 Alma St., Lower Plenty, 3093.
VK3YGT—G. R. Uebergang, 1304A Mair St., Ballarat, 3350.
VK3YGU—R. L. Loveridge, 25 Milloo Cres., Mt. Waverley, 3149.
VK3YGV—R. W. Moore, 22 Strelden Ave., North Clayton, 3168.
VK3ZBP—T. F. Pool, 42 Festival Cres., Keysborough, 3175.
VK3ZGV—J. F. Sutcliffe, 24 Snowgum Rd., East Doncaster, 3109.
VK4KN—R. J. Sieber, 50 Formosa Rd., Gumdale, 4154.
VK4NM—A. B. Nyhuis, 82 Cinderella St., Machan's Beach, 4870.
VK5UY—D. L. Marshall, 52 Godfrey Tce., Leabrook, 5068.
VK5VY—P. B. Mayer, 11 Orley Ave., Stirling, 5152.
VK5ZST—R. W. Stephenson, 27 Hobart Rd., Henley South, 5022.
VK5ZSW—R. H. Whellum, 46 Tyne Ave., Kilburn, 5084.
VK6LW—W. M. Peterson, 25 Kingsland Ave., City Beach, 6015.
VK6CIJ—R. W. H. B. Jones, 61 People's Ave., Gooseberry Hill, 6076.
VK6ZBY—Bunbury Cathedral Grammar School, Gelorup, via Bunbury, 6230.
VK6ZDE—D. Edwards, 52 Parklands Square, Riverton, 6155.
VK6ZDR—R. H. A. Cochrane, Station: Flat 62, Hillside Gardens, 57 Malcolm St., Perth, 6000; Postal: G.P.O. Box J1586, Perth, 6001.
VK8ZGF—J. M. Farmer, 4/19 Gason St., Alice Springs, 5750.
VK8ZKL—K. T. Lock, 9 Milner Rd., Alice Springs, 5750.
VK9AP—K. C. Parker, P.O. Box 586, Madang, N.G.

LICENSED AMATEURS IN VK

DECEMBER 1971

	Full	Lim.	Total	
VK0	14	2	16	
VK1	90	30	120	
VK2	1389	519	1908	
VK3	1318	677	1995	
VK4	527	213	740	
VK5	515	219	734	
VK6	365	138	503	
VK7	157	65	222	
VK8	37	11	48	
VK9	89	13	102	
	4501	1887	6388	Grand Total

JANUARY 1972

	Full	Lim.	Total	
VK0	14	2	16	
VK1	91	30	121	
VK2	1389	527	1916	
VK3	1323	676	1999	
VK4	528	212	740	
VK5	514	219	733	
VK6	363	138	501	
VK7	155	65	220	
VK8	36	12	48	
VK9	90	13	103	
	4503	1894	6397	Grand Total

QSP

(Continued from Page 2)

The Council also determined that a review of the effects of the Grade D licence on the Amateur Service be carried out after a period of five years from its inception.

The adoption of this policy represents the culmination of an intensive examination of the Australian Amateur licensing structure initiated by the question of Novice Licensing. It is not proposed to deprive any existing licensee of any privileges already possessed. The policy takes into account all arguments advanced for and against a Novice type licence, it proposes new Australian licences that would be in accord with International Radio Regulations (which require a Morse code qualification below 144 MHz.) and simultaneously sets forth a structure that offers reasonable incentives for advancement to gain greater privileges.

Another most important Council decision was the direction to proceed with the setting up of an advisory body to deal with v.h.f./u.h.f. matters, in particular, band planning. The Victorian Division undertook to provide such a body which will work in co-operation with other specialist groups within the W.I.A.—groups such as the Federal Repeater Secretariat and the W.I.A. Project Australis. Council envisaged that, looking at the overall view, the v.h.f./u.h.f. advisory group would recommend blocks of frequencies be set aside for particular purposes—say repeaters—and then other specialist groups determine the precise "modus operandi" of their particular interest within that frequency block.

Other recommendations from Council were that for the time being at least, the f.m. simplex channels within the two metre band remain unchanged. Also that the Federal Repeater Secretariat undertake a technical investigation into the possibility of shifting the existing repeater output frequencies up by one megahertz and providing existing repeaters with two output signals for a changeover period of, say, 12 months or two years. Such a proposal would allow new users to set up in the new system whilst existing users have the change-over period to make the change if they so wish. In this way, the spectrum immediately below 146 MHz. could be cleared for use by the newly formed Amateur Space Service. It should be clearly understood that this is a proposal in the early stages of investigation and that a decision to actually recommend a frequency shift for repeater outputs has yet to be taken.

Detailed results of all the other discussions will be covered in the official minutes, production of which has commenced immediately after the conclusion of the Convention. However, members with queries should consult their Federal Councillor, who will either have the answer or be able to get it.

Only those that have ever participated or sat in a Federal Convention will appreciate the amount of work done by the group of fifteen or twenty Amateurs—work that was done during their Easter "holiday". Easter 1972 was no exception.

—D. H. RANKIN, VK3QV,
Federal Vice-President.

VISITORS TO THE CONVENTION

An Observer, Michael J. Knott, VK7ZMK, attended a Convention for the first time this year and commented: "Not having been to a Federal Convention before I was not fully aware of the vast machinery moving at a steady pace fulfilling a purpose, namely the overall operation of keeping Amateur Radio 'on the air'.

"It has become most apparent that without an organisation encompassing the whole of Australia (and Territories) looking after our interests, our transmitting privileges would disappear so fast we would not have time to turn off the rig."

He went on to say that the W.I.A. is essential and must be big enough to stand up for our privileges, internationally and otherwise and commented that some members pass adverse comments on the Institute as "too big", "lost the original aims of Amateur Radio", "no longer a hobby". He thinks the critics hit back at "the system" and he traces briefly the transition from experimenters to users of frequencies as the reason we must now justify our allocations. Hence "We must have strong representation to fight for our submissions or act on our behalf."

Even our own administrators pay subscriptions and therefore any decisions affect all members including the decision makers. "A an observer it is most apparent that we are being ably looked after by the members of the Federal Council."

NEW ZEALAND COMMENT

The Editor of "Break-In", the journal of N.Z.A.R.T., Don Mackay, ZL3RW, attended much of the Convention along with co-tourist Gareth Bradshaw, ZL3VP, an N.Z.A.R.T. Councillor. Don wrote of the differences between their system of conducting national business and that of the W.I.A. and of his apparent slowness in appreciating those differences and the reasons for them.

(continued next page)

He went on to say: "While observing at this Conference it is interesting to note similar type motions from States as those we have in New Zealand. Some of the topics which are discussed are items to be encountered and sorted out in the future in New Zealand, while other subjects (e.g. v.h.f. band plan) has already been promulgated in New Zealand."

He met Bill Roper, the Editor of "A.R." and he considered most worthwhile an interchange of problems and ideas between them. He touched upon the past interchange of visitors between W.I.A. and N.Z.A.R.T. and said: "One thing for sure comes out of all this—closer liaison and better understanding between Amateurs and their organisations is in turn better for all Amateurs in fulfilling their hobby.

"I am truly impressed," he writes, "in the way Federal Councillors argue their point of view. Members of the W.I.A. can be proud of their representatives at the meeting this week-end to make a better and greater world of Amateur Radio."

A parting shot from the scribe. If you had the time and could have dropped into the Convention this past Easter why didn't you? As a member of a Division you have the right to attend as a listener to every open session of the Federal Convention. An invitation is not needed. This Australian W.I.A. belongs as much to the W.I.A. Victorian Division as it does to every other W.I.A. Division. If this were not so, it would not have been listed in the Events Calendar.

MORE STANDARDS

The Standards Association of Australia announce the issue of a new Aust. Std. 1188 SAA Code for Safety of Electronic Equipment. This is based on international practice and is stated to cover additional precautions when using voltages in excess of 1 kv. and special measures when using high r.f. The SAA also announce the availability of their Annual List with Index and "AS Marks".

SKYLARC-SKYLAB

The proposal by Amsat to provide a Radio Amateur communications package for leisure time use by the crew on Skylab has been most regretfully rejected by N.A.S.A. at this stage of the programme. Many factors contributed to this decision, not least being priorities, funds and the diversion of management attention at a critical time. See February "A.R." page 10 for background details.

THIRD-PARTY TRAFFIC

Canada is stated to have third-party agreements with CE, CP, HI, HR, OA, TI, W and K, XE, YS, YV, 4X, 4Z. The U.S.A. third-party agreements extend additionally to several other South American countries and to W/8P and K/8P, XP, EL, 4U1ITU and official Amateur Satellite traffic with VK (special).

I.A.R.U. CERTIFICATES

WAC-SSTV. Yes, the I.A.R.U. now have a certificate for worked all continents on SSTV. Endorsements are currently available or RTTY, 160 and 80 mx, and 50 MHz.

S-METERS

A rig with a new S-meter and the mini skirt have a lot in common. Both save a lot of guesswork. (A.R.N.S.)

MAGAZINES

Delays in the receipt of U.S.A. magazines on subscription and other publications appear to be ended. This was caused by dock strikes in the U.S.A. Incidentally, the R.S.G.B. has announced price increases in their publications caused by massive increases in printing costs.

TECHNICAL ARTICLES

Got some pet project on the bench which works? The project, not the bench! Since, of course, a bench is always at work even if it holds a long cold soldering iron from falling onto the floor. How about telling us about it?

A.R.M.S.

Mr. Bob Snell, G3SBT, now living in Melbourne is the VK representative for A.R.M.S., the British Amateur Radio Mobile Society, devoted entirely to mobile working. A magazine is issued each month to members and is claimed to be the only Amateur Radio mobile periodical in the world. The subscription to this is £1 per annum or you can send $2.35 to his address at "The Pines," Locarno Ave., Kallista, Victoria, 3791.

PROJECT AUSTRALIS

Compiled by Richard Tonkin, W.I.A. Australis Launch Co-ordinator

The Amsat Oscar C (AO-C) satellite is still scheduled for launch in July. These notes about the satellite were compiled from articles appearing in the quarterly issues of the Amsat Newsletter. Amateurs and non-Amateurs wishing to join Amsat should contact their State Oscar Co-ordinator for application forms. A list of State Co-ordinators appears at the end of this article.

The following facts should be noted about the AO-C (Oscar 6 after launch) satellite and operations connected with it.

(1) The maximum Doppler shift on the 2 metre repeater input frequency is plus or minus 3 kHz. This means that a total guard band between s.s.b. stations of the order of 10 kHz. will be required.

(2) The sensitivity of commercial h.f. s.s.b. receivers should be checked before they are used to receive the 10 metre repeater output from the satellite. In the past, experience has shown that performance of such units on 10 metres is less than optimum for receiving satellite signals.

(3) People using helical antennas for AO-C should note that right circular polarisation should be used for both the 2 metre repeater uplink and for the 435 MHz. telemetry beacon downlink (if carried).

(4) George Long, VK3YDB, is building a 435 MHz. transmitter which, if time and satellite power permits, will transmit the 24-channel Morse telemetry and codestore data from the satellite (this data will also be transmitted on 29.450 MHz.). Note that this 70 cm. transmitter is a telemetry beacon and will not be capable of being used as a repeater.

(5) Unlike Oscar 5, there will be no need to send AO-C telemetry reports to either the W.I.A.-Australis or Amsat. This is primarily a repeater satellite and the telemetry is serving a housekeeping function in reporting on the status of the spacecraft.

OSCAR STATE CO-ORDINATORS

N.S.W.—Alan Hennessy, VK2RX, 23A New Illawarra Rd., Bexley North, N.S.W., 2207.

Vic.—W.I.A.-Project Australis, P.O. Box 67, East Melbourne, Vic., 3002.

Qld.—Lawrie Blagbrough, VK4ZGL, 54 Bishop St., St. Lucia, Qld., 4067.

S.A.—Gary Herden, VK5ZK, 52 Arthur St., Plympton Park, S.A., 5038.

W.A.—Don Graham, VK6HK, 42 Purdom St., Wembley Downs, W.A., 6019.

Tas.—Peter Frith, VK7PF, 181 Punchbowl Rd., Launceston, Tas., 7250.

An article describing the AO-C 2/10 mx repeater appeared in March "A.R." on page 24 and a description of equipment recommended for use with AO-C may be found in "A.R." Dec. 1971, page 14. Note that only the description of equipment to be used with the 2/10 mx repeater is applicable, as the German and Australian systems will not be flown on AO-C.

Photo by Howard Rider of an actual licence examination in Djakarta, Indonesia, last year. Of the three invigilators, standing, R. A. J. Lumenta, YB0BY, has his back to the camera, beyond him is K. H. Kwik, YB0CJ.

OBITUARY

G. L. HALL, VK7GH

Tasmania lost one of its oldest Amateurs when Mr. Geoff Hall, VK7GH, passed away on 17th February, 1972.

Geoff obtained his experimental licence in June 1925 when he was officer-in-charge of the large power station at Waddamana in the central highlands of Tasmania. From then on, he was very active on 80 metres and the old 32-33 metre band, using a single tube self excited oscillator in a coupled Hartley circuit with an input of about 30 watts. He also had permission to use non-Amateur frequencies to transmit urgent traffic in the event of the failure of the normal land line connecting the power station with the rest of the power network.

After his retirement, Geoff lived at Rosetta and Lindisfarne and despite suffering from a heart condition he maintained his keen interest in Amateur Radio and was active on the 3.5, 7 and 14 MHz. bands, using a modern sideband rig and an indoor roof antenna.

He was most co-operative and unassuming and had a keen Amateur spirit. Geoff will be sadly missed by his associates who will always remember him as a perfect gentleman.

Dr. I. R. PEARSON, VK7KB

We regret to report the death of Dr. Ian Richman Pearson, VK7KB. Born in Berwick, Vic., Ian spent part of his early life at Jarvis Bay and in the United States pursuing pharmacy, medicine and radio. Later he was associated with the Launceston General Hospital and practised in the south of Tasmania.

Moving to Burnie in 1948 to take up a local practice, he renewed his station licence from previous years and it was from this time that he became so well known. He was a leader in v.h.f. communications in the area and was active on all bands.

In 1949 he won a W.I.A. Award for 100 DX Countries and later a Medal for top score in the Jubilee VK-ZL Contest. He was an excellent c.w. operator. At various periods his interest was focused on hi-fi, radio comm. and car racing, maintaining his own vehicle, and added to his medical practice; he was always very busy. However, he was a perfectionist in all he did.

A few years ago Ian suffered a serious illness which incapacitated him to such a degree that for a time he was unable to follow any activity whatsoever. Overcoming adversity, he came back to radio after retiring to Port Sorell and was appointed the Tasmanian Intruder Watch Co-ordinator. He will be sadly missed by numberless acquaintances all over the world.

We extend to his XYL Jean and family our sincere sympathy.

1971 "A.R." AWARDS

The Publications Committee have granted the **Higginbotham Award** jointly to Les Jenkins, VK3ZBJ, and Harold Hepburn, VK3AFQ, for their articles on the "Transistorised Carphone" in the issues of March, April and June.

Awards for Technical Articles were made to C. Renton, VK4CR, for his "Filter Type SSB Transmitter" article in the December issue and to John Adcock, VK3ACA, for his articles on 160 metre antennas in the May to September issues.

— . . . —

Worked Zone 14 Countries.—There are 27 countries, Class A is for all 27, Class B 22, and Class C for 15 countries in Zone 14. GCR list plus a dollar or 10 IRCs to award manager s.w.l. activity, Box 209, S-780-24, Idkerberget, Sweden. Two IRCs extra for higher classes if wanted, and s.w.l's are eligible.

DX NOTES

It is much regretted that the usual DX Notes for this month have not arrived on time. Knowing that so many members look forward to this column, it had been possible in the past to prepare back-up notes at the last minute to cope with mail delays and the like. With Easter and the Federal Convention at the beginning of April it proved quite impossible to contact people to prepare any stand-by notes on this occasion.

From the Dec. '71 copy of "The Indian Radio Amateur" comes news from A.R.S.I. that the 40 and 80 metre bands had been withdrawn from use in India by the Amateur Service, until further notice.

Reports to hand indicate that there are more and longer periods of poor conditions on the DX bands, but these have been interspersed with periods of really excellent propagation. Most DX-ers hope these latter good openings do not presage a mighty let-down.

Here are the predictions for May from charts by the I.P.S.D. Times are local for first-named area, i.e. "H" to 120 deg. E. "I" for 120 deg. to 135 deg. E., and "K" for 135 deg. to 150 deg. E. Notes: VK4(T) is Townsville, VK0 (C) is Casey, VK0 (M) is Macquarie Is., 1F and 2F are modes, SP and LP are Long Path and Short Path respectively.

28 MHz. Band:			
VK1—VK6		1000-1700	
ZS6		1600	
5Z4	minus 2	1600	plus 1
VK3—9V1		1000-1700	
VK4(T)—KH6	minus 2	1200	plus 4
VK5—KH6	minus 2	1000	plus 1
	minus 2	1400	plus 1
VK6—ZS6	minus 2	1600	plus 2
5Z4		1200-1800	
21 MHz. Band:			
VK1—EA	minus 2	1700	plus 2
G (SP)	minus 1	1800	plus 1
G (LP)	minus 1	0800	plus 1
PY1	minus 1	0900	
VE1 (SP)	minus 2	1100	plus 1
VE1 (LP)		0900	plus 1
W6	minus 6	1200	plus 4
ZS6	minus 1	1600	plus 3
5Z4	minus 2	1600	plus 3
8P (SP)	minus 2	0900	plus 6
8P (LP)		0800	plus 2
9G1 (SP)	minus 1	1700	plus 2
		0900	
9G1 (LP)		0600	plus 1
		1700	
VK3—UA	minus 5	1800	plus 1
VE7	minus 3	1400	plus 1
VK8 (1F)		0800-1900	
VK0 (M)	minus 5	1500	plus 1
VK5—KH6		0700-1700	
VK6—G (SP)		1400-1900	
W6	minus 5	1100	plus 3
ZS6	minus 4	1600	plus 3
14 MHz. Band:			
VK1—G (SP)	minus 1	0700	plus 4
		2200-0500	
G (LP)	minus 2	0800	plus 12
PY1	minus 2	0900	plus 8
		2000	
VE1 (SP)		1200-1600	
		2100-0200	
VE1 (LP)	minus 1	0900	plus 5
VK6		0900-1900	
VK8 (2F)		0800-1200	
		1400-1800	
VK0 (C)		1000-1900	
W6		1300-0400	
ZS6	minus 2	1600	plus 6
8P (SP)	minus 3	0900	plus 13
8P (LP)	minus 2	0800	plus 4
9G1 (SP)		0800-1200	
9G1 (LP)		1300-1900	
VK3—UA		0700-1200	
		2100-0500	
VK8 (2F)		0800-1200	
		1400-1900	
VK0 (M)		0800-1900	
VK5—KH6		1200-0600	
VK6—W1		1900-2400	
7 MHz. Band:			
VK1—G (SP)		0400-0700	
G (LP)		1600	
VE1 (SP)		1600-2100	
VK6		1800-0800	
W6		1600-0100	
8P (SP)		1500-2100	
9G1 (SP)		0300-0900	
VK5—KH6		1600-0200	

It is interesting to compare these with the predictions in April "A.R." and to reflect upon the gradualness of the seasonable changes.

A late item of "hot" news from Alf Matthews, VK3ZT, is that the Mellish Reef DX-pedition is definitely on despite the lack of assistance. The scheduled date is expected to be the latter part of June. Please see "A.R." for Feb., page 12.

VHF

Contributing Editor: ERIC JAMIESON, VK5LP,
Forreston, South Australia, 5233.
Closing date for copy 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK3	144.700	VK3VE, Vermont.
	144.925	VK3ZQC, Moe South.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

A new beacon has been added to the list this month, that of one in Darwin, Northern Territory. News finally trickled through to me that such a beacon was operating and that it had already been heard in Nauru by Bob C21AA ex-VK2ASZ). It runs 50w. input to stacked dipoles antenna.

A change of call sign for the VK4 two metre beacon from VK4VV (now allocated to Mrs. Linda Luther, of Brisbane) to VK4WI/R1. Advice has been received from Roy VK6ZFL that the Carnarvon beacon is still well and truly operational and has been included in the list again. Roy also mentions that HL9WI in South Korea is temporarily QRT whilst changing to a new job, but hopes to be back on 6 metres again soon. The HL9WI beacon has been included as it could well be operating again by the time this is read.

Mike VK2AM (previously VK2II) has further news of the proposed VK1 beacon which indicates it will probably go on top of a nine-storey building in Civic Centre, with a reasonable take-off to Sydney. Frequency 144.475 MHz., ID with call sign in code by f.s.k. 850 Hz. shift, 10 watts to a turnstile antenna. It is hoped to have the beacon operating this year. This will be a welcome addition to the beacon population. What we need now is a 2 metre beacon in Alice Springs and the long proposed 6 and 2 metre beacons in Sydney and the Commonwealth beacon coverage will be about complete.

Still on beacons, there is a strong possibility the Mt. Barker beacon VK6VE on 144.500 may be shifted to Albany some time this year. Continuous testing carried out between Garry VK5ZK and Bob VK6BE and Wally VK6WG indicate there are many occasions when a QSO has been possible on 2 metres when VK6VE has been inaudible in Adelaide due to being situated some 20 miles inland from the Albany operators, with the result it has not been serving its purpose adequately. Since 3rd January 1972 there have been about 16 openings on 2 metres between VK5 and VK6 at Albany, and there have been occasions when VK5VF has been stronger than VK5ZK, but by the same token contacts have been made between VK5ZK and Albany when neither beacon has been audible. The whole operation is a very interesting one and is to be the subject of a special article for "A.R." by Bob VK6BE in the near future.

SIX-METRE DX

The 6 metre band has really opened up for stations in favourable situations for t.e.p. during March. John VK4ZJB in Brisbane has telephoned me on three occasions reporting on the high level of activity available in VK4, extending to VK6 and VK2. John reports an opening to JA, KX6 and KR6 on 18/3/72 during the afternoon when the band became completely chaotic with a screaming mass of signals, and for about an hour it was well nigh impossible to work anyone. S9 reports both ways for hours, stations being worked mobile, others with dipole antennas, stations with a few watts of power, etc. T.v. stations from Asia were occupying large areas of band space. Following John's advice, I personally monitored 6 metres the following day, and heard a JA2 and a JA7 for four minutes at 1415. Nothing else! About the only opening of any consequence here in VK5 was on 22nd March when Tony VK5ZDY had eight contacts between 1530 and 1630 hours with JA0, 1, 7, 8 and 9. No one else appeared to be at home in VK5.

In VK2 the t.e.p. season got off to a good start on 6th March (following several brief openings previously) when the band really opened up. Roger VK2ZRH was home on that day and advised all JA districts were available, Vladivostok t.v., etc., from 1140 to 1600. The signals peaked to S9 both ways, and Roger worked one JA running 10 watts to a dipole! On Thursday, 9/3, a few contacts at 2000 hours were made to JA from Sydney and Tom VK2NN heard the HL9WI beacon. Further JAs were worked on 11/3 between 1400 and 1500.

As if all this is not enough to make us envious in VK5, a further telephone message from John VK4ZJB gives news of an outstanding contact. Des (a right hand helper for John) and John VK4ZJB were on a mountain and worked Bob C21AA in Nauru on 6 metres on 1/4/72 at 1400 hours with signals peaking to S9 both ways. Opening lasted for seven minutes. Bob was also worked by Malcolm VK4ZEL in Brisbane. Des and John consider this brief opening was probably assisted by influence from cyclone "Emily" off the coast of Queensland. Whatever the reason, this contact will make the southerners' mouths water!

CARNARVON NEWS

Apropos my comments in this column a couple of months ago when I queried whether the Carnarvon beacon, VK6TS, was still in operation, such a query brought a ready response in the form of a nice letter from Roy VK6ZFL from that town, confirming the beacon was still going, and that the regular reception reports they receive from JA and HL areas have encouraged them to keep the beacon operating. It has now been in almost continuous operation for three years and is located at the Tracking Station. It uses a QQE03/12 in the final, running c.w., with a mechanical keyer, power output about 8 watts to a dipole mounted vertically about 40 ft. high.

Roy goes on to say that a message from JA1LZK advises of plans to send a DX-pedition to JD1 this year with 6 metre equipment, and he suggests this will be worth listening for during our Spring months.

VK6ZFL is about the only active 6 metre station in Carnarvon, and is thus confined mostly to t.e.p. and occasional Es openings. He reports that for some reason Eastern States contacts have so far eluded him during his five years in Carnarvon. He operates a Heathkit HW-32 and a home-brew transverter. There is a stirring of interest in 144 MHz. in the area, especially since a station at Exmouth, about 170 miles further north, plans installing a 146 MHz. transceiver. T.v. from Perth (600 miles) and Geraldton (300 miles) can regularly be viewed, and points to the possibility of inversion type contacts on 2 metres on the same path. VK6VF on 2 metres has been heard on several occasions. (Thanks for your letter Roy, and good luck with your projects—will always be interested to hear your results. —VK5LP.)

Mike VK2AM advises a possible upsurge in 2 metre activity in Sydney, with 55 converter kits sold and a further 50 to be sold. This, coupled with a likely VK1 beacon this year, may see big things from Sydney yet. On 2200 MHz., Dick VK2BDN and Bill VK2ZAC will soon be trying a DX type contact as Dick has constructed his gear for portable operation. Good luck chaps.

From the VK3 scene comes news that my old friend Bob VK3AOT has relinguished the position of Publicity Officer for the V.h.f. Group. I am sure all readers will say "Thank you Bob, for a job well done." In his place we welcome Geoff VK3YER and look forward to hearing from him each month. Geoff certainly is right up to the mark with his equipment, and operates on 6 and 2 metres a.m. and f.m., and transmits on 432 MHz. His problems sound a bit like mine, having to operate from the bottom of a 150 ft. valley! However, he goes out on all field days and so finds some compensations there.

Geoff VK3AMK is still well up on the list of activity with working to VK3ANP in Wangaratta and VK3ZKN in Tahara, both on 6 metres. He advises more country stations could work into Melbourne on Sunday morning on six if they came on before 1000 hours when Channel 0 starts transmission. So there's a thought for you country operators.

BARBADOS ISLAND

From Jim VK5NB comes news that a former South Australian Allan (exVK5ZEI) is now resident in Barbados and has the call sign 8P6EN. He normally operates between 14150 and 14190 kHz. at 2100 nightly, and is currently engaged in setting up a 6 metre station. This has probably been hastened somewhat by the report from Allan that another Amateur on the island has now worked 34 countries on 6 metres! What a score—this must surely be at the top of the ladder. Without detracting from this gentleman's achievement, we must still give credit to our own Doug VK8KK for his 14 countries at my last counting. The Barbados area is situated geographically close to many different countries whereas Australia is in virtual 6 metre isolation. However, no matter where one lives, 6 metres has been and will always be a band of considerable attraction, and full of surprises.

T.E.P. WARNING SYSTEM

On behalf of the Amateurs of Australia I would like to thank the Ionospheric Prediction Service for their efforts in providing broadcast reports on the h.f. bands (where they might be heard by all), of the progress of t.e.p. conditions and hope that there have been many who have made good use of the information so provided. The stations were a little hard to find at times amongst all the QRM, but being on s.s.b. certainly helped. It is to be hoped the service can be continued again in September, and in subsequent years to come. Plenty of reports returned to the Service of contacts made or hearing of t.e.p. stations will no doubt assist in having this service continued.

Additional news is scarce this month, so the notes will close at this point. Thought for the month: "A driver is safer when the road is dry; the road is safer when the driver is dry." Until next time, 73, Eric VK5LP. The Voice in the Hills.

CALIFORIAN SIX-METRE BEACON

12450 Skyline Blvd.,
Woodside, California, 94062.

Editor "A.R.," Dear Sir,

The WB6KAP six-metre beacon station near San Francisco, California, has recently been re-activated on an attended basis on 50.013 MHz. (a frequency change), until June 21. The format is the same as used previously, transmitting the first half of each minute and listening the last half on 50.101 MHz. (for the ZK1AA beacon). A receiver and chart recorder are in operation on this frequency 24 hours a day during the listening periods. In addition, tape recordings are made from 1800 to 0900 GMT. These are then spot checked, erased, and re-used within a week. Times of transmitter operation will be at least 0200-0900 GMT, longer on week-ends. The beacon transmitter power is 900 watts and the antenna is an array of four 5 element yagis pointed towards the Cook Islands. The station is located on a hill overlooking the ocean about 30 miles south of San Francisco.

I am requesting reception reports from "Down Under" for not only this season, but also for previous years. I have received reports of reception of my beacon by Australian Radio Amateurs during the months of April and October.

I am continuously monitoring by chart recordings, the video carrier frequencies used in the lowest Australian and New Zealand t.v. channels (46.250 and 45.250 MHz. respectively). Stations have been received on these frequencies or 10 kHz. offsets more than half the days since the middle of March when these recordings were started. Signals appear on the New Zealand frequency as early as 2100 GMT and on the Australian frequency a couple hours later, and have lasted as late as 0300 GMT. No signals have yet been received this year on the audio channels (51.750 and 50.750 MHz.) (they are not being monitored continuously) but strong signals were received on 50.750 MHz. on occasion during the Spring of previous years, indicating very probable openings to the ZL 51 MHz. band. No New Zealand Radio Amateur stations were heard, however.

During periods when I am aware of t.v. signals coming in, I will also attempt to monitor near 51 and 52 MHz. for Australian and New Zealand Radio Amateur stations. I may also be reached after my nightly liaison schedule with ZK1AA on 14.082 MHz. at 0500 GMT, or by telephone 415-851-1570 (unlisted number).

—Victor R. Frank, WB6KAP.

FEDERAL AWARDS

W.I.A. 52 MHz. W.A.S. AWARD

Amendment:

Cert. No.	Call	Add. Countries
101	VK4ZFB	4

W.I.A. V.H.F.C.C.

Cert. No.	Call	Confirmations 52 MHz.	144 MHz.
82	VK3AUN	102	—
83	VK3AKR	—	125

KEY SECTION

This column has been missing for the past couple of months because I have been overseas and so nothing was submitted to the editor. He was probably grateful as I am told there is very great pressure on space at present.

The Section is seeking members, because without members we cannot offer section activities to make membership more attractive (if you follow!). Full rules appeared in "A.R." for Nov. 1971. If you work c.w. at all consistently (and it is consistency, not prowess, which is required) you would qualify—so why not apply? Membership certificates will have been posted to most members during April, and I hope to get the first membership list published in "A.R." soon.

While I was in Copenhagen, OZ7DX, Vogg, drew my attention to the "Fairytale Award" which is a c.w. only award offered by E.D.R. To qualify VK stations must work one each of the call areas OZ1-OZ9, and at least three stations from the Odense district, by two-way c.w. For anyone interested, I have more complete details, and so has the award manager, OX7XG, E. Hansen, 14 Sophus Bauditz Vej, DK-5000, Odense, Denmark.

Till next time, 73, Deane VK3TX.

SILENT KEYS

It is with deep regret that we record the passing of:—

VK7GH—G. L. Hall
VK7KB—Dr. I. R. Pearson
W3ZM—H. D. Helfrich

DIVISIONAL NOTES

VICTORIA

The principle activity this month is the Geelong Hamfest on Saturday, 13th, and Sunday, 14th May. The Hamfest includes events for the whole family. On the Saturday a social evening has been arranged whilst numerous events take place on the Sunday. While the OMs are taking part in the various fox hunts a bus tour has been arranged to show their families around Geelong.

Bookings can be arranged by contacting Terry Leith, VK3ZXY, on Melb. 329-6333 (bus.) or Melb. 37-1267 (home), or Bob Wookey, VK3IC, on Geelong 052-212674.

Also during May, the Divisional general meeting will take place on Wednesday, 3rd May, and the V.h.f. Group will meet on Wednesday, 17th May. All are welcome to attend both these meetings which are held in the Divisional rooms at 478 Victoria Pde., East Melbourne. 73, Gil VK3AUI.

QUEENSLAND

The inaugural meeting of the Sunshine Coast Amateur Radio Club was held on Tuesday, 27th January in Nambour on the Sunshine Coast. Election of office-bearers resulted as follows:—

President, John Purdon, VK4PU; Vice-President, Ken Chiverton, VK4VC; Secretary, Wayne Shaw, VK4WE; Treasurer, Bill Rayn, VK4WR; Public Relations Officer, Norm McRae.

A spokesman for the club said that the meeting was successful with 20 persons attending, 12 of whom were licensed Amateurs.

EVENTS CALENDAR

May 3—VK3: Divisional Meeting; Rooms.
May 13/14—VK3: Geelong Hamfest.
May 17—VK3: V.h.f. Group Meeting; Rooms.

OVERSEAS MAGAZINE ABSTRACTS

This month our review takes a different form, comments being limited to one article in each of two magazines.

"Ham Radio," January 1972, carries an extremely interesting and informative article titled "Phase Locked Loop RTTY Terminal Unit". This is a new design, solid state AFSK demodulator and selector magnet driver with features most wanted by RTTY operators.

"QST," January 1972. "The Macromatcher"—an r.f. impedance bridge for co-axial lines. A simple instrument designed for the measurement of complex impedances in the frequency range 3.5 to 30 MHz. —VK3ASC.

HAMADS

Four lines FREE for members only.

See Jan. 1972 "A.R." page 23 for complete details.

FOR SALE

Gove, N.T.: Inoue 700 solid state rx, tx and 240v. a.c./12v. d.c. p.s.u. speaker unit. Cables and manuals. 1969 model. Spare tx tubes. As new. Air freight free to Darwin. Going Yaesu way. $450. Write VK8KG, OTHR. No phone.

Dapto, N.S.W.: T.C.A. (1674) 25w. 2 FM Transceiver (12v. transistor supply), 2 ch. switching (B, 4), dynamic mike, $75. T.C.A. (1674) 12w. 6 FM (52.525 MHz.) (needs a.c. p.s.u. and mike), $20. VK2AFF, 24 Barellan Ave., Dapto.

Melbourne, Vic.: HA600 solid state all band rx to 30 MHz., FET front-end, variable BFO, AM, CW, SSB, S meter, $95. VK3AO, OTHR. Phone (03) 288-2326 evenings.

Sydney, N.S.W.: Creed 7B Teleprinter, $25. Philips low-band FM, $10. Carphone 6v. pwr. supply, $5. 12K speaker, $2. Mono turntable, $1. VK2AAB, OTHR. Ph. (02) 48-4051.

Exmouth, W.A.: Exchange near new Drake R4B for Eddystone 940 or 830/7, or sell $675. VK6ZDZ OTHR.

Glen Waverley, Vic.: AM Tx, Geloso 4/102 Exciter, 807 PA, CW, modulator, and PSU, $35. VK3ZU, Phone (03) 560-5136.

Sydney, N.S.W.: Complete set IF and RF coils for AR88D. Brand new in orig. packing, orig. cost $30. Offers? VK2AXJ OTHR. Ph. (02) 798-9021.

Melbourne, Vic.: National NCX-5 Transceiver, incl. AC Power Supply, good cond., $390. 40 yds. Co-ax. RG8U, new, $15. Wetter, 78 Eley Rd., Box Hill South, 3128.

Sheppartcn, Vic.: Yaesu FL200B Transmitter, good condition, $160. Yaesu FR50 Receiver, 5-band, d/conv. rx, $150, or both units for $300. VK3IC, OTHR. Ph. 058-214647.

Kyabram, Vic.: 4-band linear, 10-15-20-40 metres, pair 572B valves, maximum legal power, $80. VK3TG, OTHR. Ph. 058-521636.

Sydney, N.S.W.: Swan 500C Transceiver, AC and 12v. mobile PSU, matching spkr. box, desk mike, all mint condition, $425. VK2AOW, OTHR. Ph. (02) 449-3538 AH.

Melbourne, Vic.: Acitron DC-DC P/S type 3003, 400w. outputs: all voltages required to operate most h.f. transceivers. Handbook, $40. A.W.A BS50 hi-band FM base station, $70. VK3AOT OTHR. Ph. (03) 277-8295.

Glen Waverley, Vic.: Eddystone 888A Amateur-band Receiver, 160/10 mx, as new, $160. K109 SWR Meter, band new, $15. VK3OM, OTHR. Ph. (03) 560-9215.

Garran, A.C.T.: Heathkit SB102 Transceiver, as new, little use; with AC or DC PSU and original manuals, $500. Alternate PSU $60. VK1AN, OTHR. Ph. (062) 81-5905.

Melbourne, Vic.: Yaesu Musen FR100B Receiver, FL200B Transmitter, both in A1 condition, $435. H. Cliff, VKHC, OTHR. Ph. (03) 49-1017 bus., (03) 45-2536 AH.

WANTED

Cavendish, Vic.: AR88 Receiver. Instruction Handbook No. 19 Wireless Set. C. Gracie, P.O. Cavendish, Vic., 3408.

Melbourne, Vic.: Control Unit to suit (and backing plate if possible) for ARN6 Radio Compass. Keyboard to suit either Creed or Model 15 Teletype machine, any condition. Write/phone VK3AOB. 76 David Ave., E. Keilor. Ph. (03) 337-4902.

Kilaben Bay, N.S.W.: Data for Cossor Cathode Ray Tube type 89J, will compensate for any effort. VK2ZEK, 204 Kilaben Bay Rd., Kilaben Bay, 2283.

Golspie, N.S.W.: Crystals, 80 and 40 mx, purchase any types, any frequency. VK2BDT, OTH "Glenelg," Golspie, 2580.

Melbourne, Vic.: Communication Rx, Trio, Lafayette or similar. Ph. 467-3121 bus. hrs.

Melbourne, Vic.: Yaesu FRDX400 Receiver in good condition. Ph. (03) 46-4200 or write VK3AUN, OTHR.

Marble Bar, W.A.: Quality Transceiver. Cash. Cox, Headmaster, Marble Bar, W.A.

Canterbury, Vic.: Vinten MTR13. VK3HE, OTHR. Ph. (03) 83-2820.

Adelaide, S.A.: Windmill Tower, triangular, minimum height 40 ft. Please state all relevent details and price to VK5AS, Gary Hambling, 9 Hoover Rd., Henley South, S.A., 5022.

Concord, N.S.W.: Pre 1930 Wireless Sets and other ancient wireless bits such as Horn Speakers, Magnetic Detectors, Bright Emitter Valves, Spark Sets, etc. VK2AAH, OTHR. Ph. (02) 73-2369.

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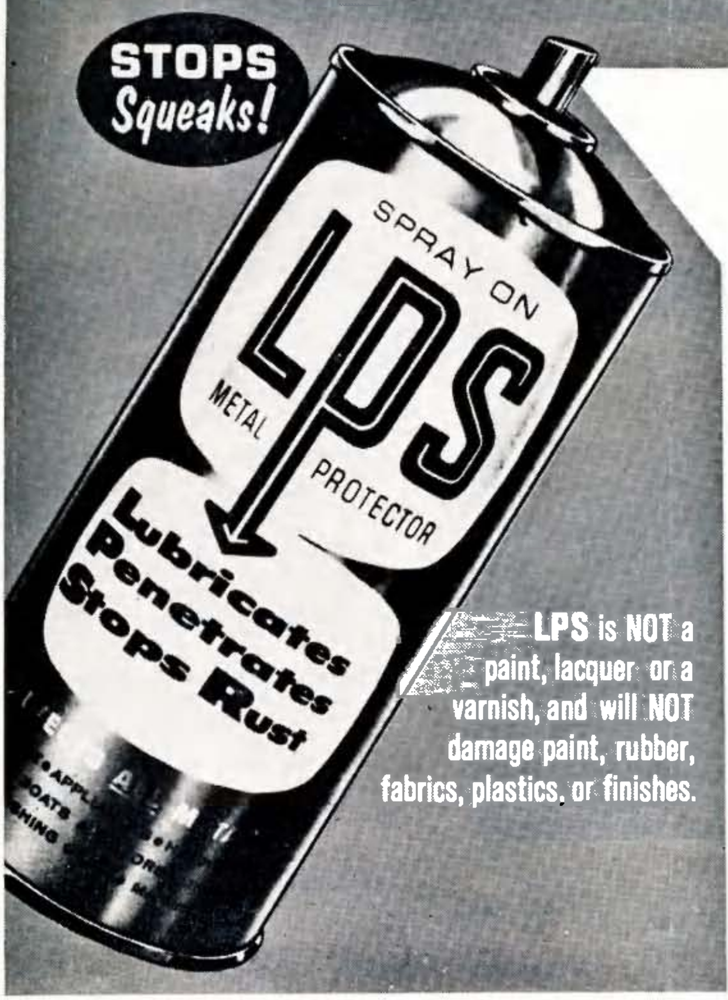

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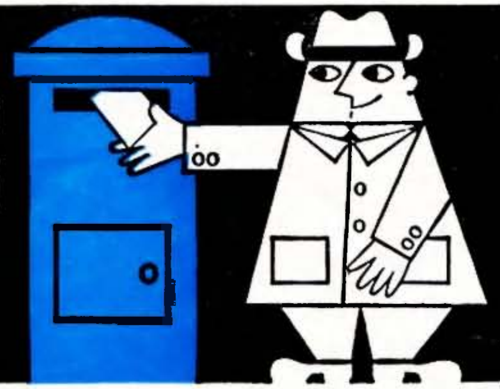

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D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
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MODEL SK120: 20K O.P.V.
D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 1¾".
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MODEL F75K: 30K O.P.V.
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A.C. V.: 10, 50, 250, 500.
D.C. mA.: 0.05, 10, 250.
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Inbuilt Signal Injector.
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MODEL TP5SN: 20K O.P.V.
D.C. V.: 0.5, 5, 50, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 5, 50, 500.
OHMS: 0.5 MΩ in 4 ranges.
PRICE: **$15.00** + 15% sales tax.

MODEL 500B: 30K O.P.V.
D.C. V.: 0.25, 1, 2.5, 10, 25, 100, 250, 500, 1,000.
A.C. V.: 2.5, 10, 25, 100, 250, 500, 1,000.
D.C. mA.: 0.05, 5, 50, 500; 12A.
OHMS: 1 Ω to 8 MΩ in 3 ranges.
PRICE: **$25.00** + 15% sales tax.

MODEL MVA5: 20K O.P.V.
D.C. V.: 5, 25, 50, 250, 500, 2,500.
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D.C. mA.: 2.5, 250.
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MODEL TS-60R: 1K O.P.V.
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5U4G/B	1.61	6H6G/T	0.50
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6AL5 (EAA91)	1.39	6SJ7	0.75
6AM5 (EL91)	2.37	6SL7GT	3.18
6AM6 (EF91)	2.28	6SQ7	3.18
6AN7A (ECH80)	1.90	6U7G	0.75
6AN8	3.06	6V4	1.10
6AR7GT	2.28	6V6	3.64
6AU4GT/A	1.84	6X2 (EY51)	2.40
6AU6	1.61	6X9 (ECF200)	2.09
6AU7	2.87	6Y6G	3.18
6AU8	3.06	6Y9 (EFL200)	2.30
6AV6	1.35	12AT7 (ECC81)	0.75
6AW8A	1.93	12AU6	1.78
6AX4GT	1.84	12AU7A (ECC82)	1.72
6B8	3.88	12AX7 (ECC83)	1.95
6BD7 (EBC80)	1.30	12BE6	2.02
6BE6 (EK90)	1.68	12SN7GT	3.18
6BH5	1.61	16A5	2.15
6BV7	1.61	16A8 (PCL82)	2.46
6BW6	2.25	17Z3 (PY81)	2.25
6BW7	2.23	30	0.50
6BX6 (EF80)	1.61	KT66	6.20
6BZ6	1.61	KT88	7.05
6CA7 (EL34)	3.58	6146 (QV06-20)	7.29
6CM5 (EL36)	2.65	OA2/150C2-4	1.46
6CO6 (EF92)	2.59	QV03-12	2.34
6CO8	1.86		

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amateur radio

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CONTENTS

COVER STORY

Does this piece of equipment look vaguely familiar? It used to be a rather battered looking transceiver of early vintage. An article describing the transformation will be published in a future issue of "A.R."

(Photo: B. A. Bunning)

QSP

"Suitable Alternative Reasonably Available"

The Executive of the W.I.A. has been working on the problem of obtaining duty free entry of items of Amateur Radio equipment. Their investigations showed that a surprisingly large number of items are manufactured in Australia, and it is therefore impossible to obtain exemption from Customs Duty (or "by-law" entry). However, the possibility of gaining by-law entry for s.s.b. transceivers appeared to remain open to us. Although numerous (and mouth-watering) models are available in the U.S.A., Japan and elsewhere, a single unit only of Australian manufacture has ever reached the local market, and the price tag for this exceeded $1,100. The stated criterion for by-law entry (re-iterated by Mr. Chipp in a speech to the House of Representatives on April 11 this year) is that "no suitable alternative is reasonably available" from Australian sources.

Mr. Chipp emphasised the importance of the four words "suitable alternative reasonably available". On this basis, the $1,100 machine clearly is not "reasonably available" to virtually all possible end-users (i.e. Radio Amateurs). Mr. Chipp stated that the "end-use" did have a bearing on the discussion as to whether by-law entry would be permitted. He illustrated the point by discussing the case of a hypothetical request for by-law entry of a concert grand piano where upright pianos only were made in Australia.

If the Bandywallop Symphony Orchestra wanted to import, duty free, a concert grand piano for their next hay-shed concert, they may well find that they have to settle for an upright. However, if a pianist of international repute wanted to import a concert grand for a major performance, a case for by-law entry may well succeed.

The moral of this story should not be lost on the Radio Amateur. However, another local manufacturer now claims to be virtually ready to supply an s.s.b. transceiver at a reasonable price and with an acceptable delivery time.

If this is so, obviously a by-law application for an s.s.b. transceiver will not succeed, but of course Australian Amateurs will have the benefit of being able to buy an Australian product, presumably designed around their particular requirements. If, on the other hand, deliveries are not forthcoming within a reasonable time, or if the price proves unreasonable, your Executive will again press the matter of by-law entry with the Customs Department.

Dr. J. R. GODING, VK3DM,
W.I.A. Executive Member.

PROJECT AUSTRALIS

N.A.S.A. news is that A-O-C will now fly with Nimbus-E weather satellite scheduled for launch in November. Further details will be given as soon as possible from the Project Australis Group.

EX-G RADIO CLUB

From various sources comes news of the "Ex-G Radio Club" extension of activities in Australasia. This club, affiliated with the R.S.G.B., was founded for Amateurs born or naturalised in the U.K. but domiciled abroad. The ex-G net operates every Sunday on 14347 kHz., plus or minus QRM, from 1900 hours Z, but in June to August only on first and third Sundays. Details may be obtained through Laurie Kelsall, VK2AKV, ex G3PO, QTHR. A local net on 80 metres is being arranged.

TOPICAL TOPIC

There was the computer which refused to work until it was given at least two circuit breaks a day. (A.R.N.S.)

RECEIVER LICENSING

The R.S.G.B. "Radio Communication" mentions a U.K. Statutory Instrument which reads, inter alia, "on and after 1st April, 1971, there is hereby exempted from the requirement of a licence the installation and use of wireless telegraphy apparatus used only for the reception of messages sent by telephony or telegraphy from licensed amateur stations provided that the apparatus shall be open to inspection and testing by an authorised person."

THOUGHT!

Success in (Morse) code transmission and reception is not measured by the brilliance or speed of the sender, but in the accurate receipt of the message. ("Break-In" April)

EQUIPMENT

Have you seen the W.I.A. tie? In blue or maroon terylene, the tie is a good buy at $2.75; from Divisions or Executive Publications. Incidentally, do you sport a W.I.A. badge? Another good buy at only 80c each—full member or associate, pin mounting on lapel.

EXAMINATIONS—G SCENE

Only 54.22 per cent. of the 1,699 candidates who took the 1971 R.A.E. managed to score a "pass". These comments in the "Short Wave Magazine" for March 1972 continued with questioning why it was one of the poorest results on record in the U.K. reflecting a decline over the past three or four years.

With the examination fee being a minimum of 30/- (say, $3.30) one would think that candidates would properly prepare themselves for the exam.

AN APPROACH TO U.H.F. S.S.B.

R. K. GRAHAM, VK2ZQJ*
(ex VK6ZDS, VK5ZSD)

● A moment's reflection at the conclusion of the 1971-72 Ross Hull Contest would have revealed to even the most sceptical diehard that s.s.b. had finally arrived on the 6 metre band. After somewhat more than a decade, s.s.b. transmissions held a most marked numerical supremacy over other modes.

S.s.b. on the other v.h.f./u.h.f. bands has, however, been a somewhat different story. The 2 metre band has always had its s.s.b. adherents and the number of stations using s.s.b. has been increasing, albeit slowly. S.s.b. transmissions on 432 MHz. and 1296 MHz., however, have never been common. A recent head count revealed not more than perhaps ten stations with 432 MHz. capability (disregarding video) and certainly not more than five stations with active thoughts of s.s.b. on 1296 MHz., let alone equipment; numbers which are small but not insignificant when considering the number of stations active on these bands.

As the state of the art capability for s.s.b. on 432 MHz. was demonstrably reached in Australia in 1963,[1] one ponders the reasons for the lack of further development of s.s.b. activity. One immediate problem was appreciation of the concept of s.s.b. transmissions on 432 MHz. and 1296 MHz., another and probably more significant problem has been the relative dearth of literature describing s.s.b. equipment for these frequencies. A search of the literature revealed the curious situation that, with the exception of a recent article in "Ham Radio,"[2] published articles have either described low power exciters or linears with kilowatt capability,[1, 3, 4] and drive requirements to match.

The equipment to be described resulted from one approach to high power s.s.b. capability on u.h.f. A few preliminary observations would be in order. Crystal oscillator stability was of paramount importance and must be given adequate consideration, v.f.o. requirements were no more demanding than current h.f. band practice dictates. The transistorised v.f.o. described in "A.R." could be recommended.[5] Forced air cooling for the QQ series tubes was desirable and essential for 4CX series. As high stage gains with linear amplifiers at u.h.f. could not be achieved, a string of linears with all the attendant problems became inevitable. At 432 MHz. the QQE03/20 and 6/40 series valves have stage gains of less than 6 dB. and the 4CX series 10-13 dB.[6, 7] 2C39, 3CX series tubes approach 6 dB. gain at 1296 MHz.[8, 9] 3CX series valves were mechanically difficult at 432 MHz. and were not considered in the work described here.

* 4 Tiranna Place, Oyster Bay, N.S.W., 2225.

432 MHz. S.S.B. TRANSMITTER

See Fig. 1. The impedance inverter oscillator[10] followed by a buffer amplifier was found to be a most stable and satisfactory circuit, the E180F was conventional and the 12BY7 or similar ensured sufficient drive to the tripler and eventually the final. See ref. 11 for circuit parameters. The mixer circuit used in the original equipment was derived from ref. 12. Both signals were fed into the control grid, the 14 MHz. s.s.b. via a push pull grid circuit and the 418 MHz. via a capacitive divider. Acceptable suppression of the 418 MHz. signal could not be achieved if injection was via the cathode. A circuit which has been claimed to give good performance with control grid injection of the mixing signal and cathode injection of the s.s.b. signal has been described in ref. 2—see also 13.

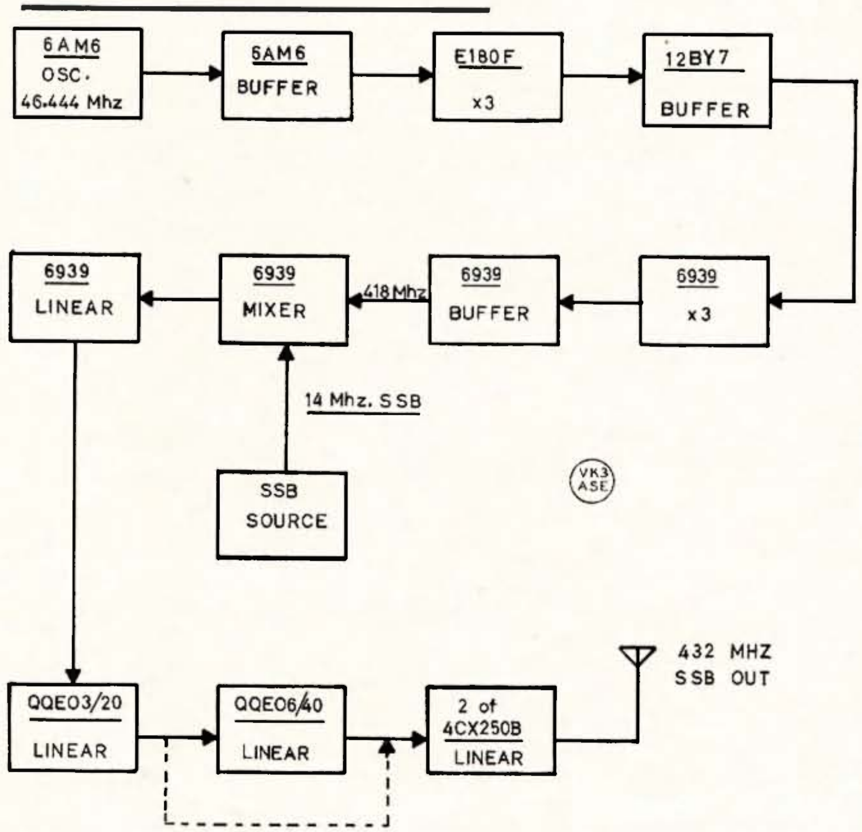
The 2/5 linear was conventional, bias was around 3v., screen regulation was not required. The 3/20 linear was confirmed as being significantly more efficient than a 6/40 for the same input.[6, 11] Bias was of the order of 20v., E_{sg} stabilised at 300v., E_p 450v., and I_p 20-100 mA., quiescent to full carrier.

The grid circuit was similar to that described for a 576 MHz. transmitter,[15] the basis of the design being outlined in ref. 6. An alternative technique was described in "QST";[16] appropriate correction for the velocity factor of the cable used for the balun loop must be made. Output from the 3/20 was sufficient to drive the final to an input of the order of 250w., however the 3/20 was over run, efficiency has been claimed to be no more than 40%[9] and air cooling was desirable. The grid circuit of the 6/40 was as indicated in either ref. 15 or 16, E_p was 700v., E_{sg} stabilised at 300v., I_p 30-170 mA. The 3/20 easily drove the 6/40 into grid current. Plate circuits for the 3/20 and 6/40 were quite conventional.[11, 16]

The Final

Several articles have described the use of a pair of 4CX series valves at 432 MHz., all were essentially similar.[3, 4, 17, 18] An important point for success was the use of an electrical three-quarter wavelength grid circuit. Such a circuit was found to be significantly more efficient than the more conventional half wavelength grid circuit.[3, 18] Neutralising was not re-

FIG. 1—— 432 MHZ SSB TRANSMITTER



quired and filament voltage was maintained at 6v.,[2,7] satisfactory only if the duty cycle was low. Output of the 6/40 was adequate to drive the final to grid current. The efficiency of the final was, however, a moot point. Figures between 40% and 55% have been claimed.[18] Correct phase drive relationship was essential[18] and individual screen current monitoring was useful.[12] However, if old tubes were used, monitoring the latter tended to confuse the issue as tubes ex commercial service under static test generally showed a wide variation in I_{SG}, given the same test parameters with similar I_P for a fixed E_G and E_{SG}.

The article by Meacham[12] details the art of setting up external anode linears.

1296 MHz. S.S.B. TRANSMITTER

See Fig. 2. With the advent of varactors, tripling to 1296 from 432 MHz. has become relatively simple and the type of circuit described in the A.R.R.L. V.h.f. Manual[19] could be made in an afternoon. For the same input, an MA4060 had the same order of output as a 3CX100A5 tripler with 20w. plate input. However, with higher drive power and plate voltages over 500v., the valve tripler was paramount. Many designs for triplers have been described.[9, 11, 20]

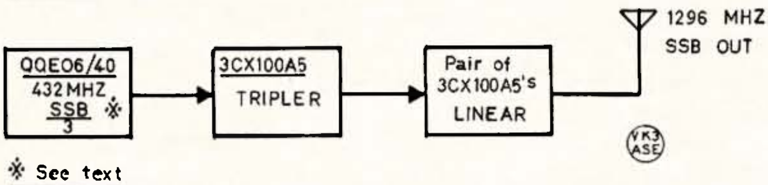
The pair of 3CX100A5 described in "QST" some years ago,[8] has been popular for discussion in VK, but very few, if indeed any, have been heard on air. There were several reasons for failure with this design. The original "QST" article was not particularly explicit as regards the mechanical arrangement of the anode cavity tuning, this omission was corrected in a later article in "Ham Radio".[21]

The 1296 MHz. drive requirement was high and the setting up procedure complex due to the limit on grid current. The pair of tubes could be driven to maximum grid current, 120 mA. through 50 ohms, with less than 10w. of r.f. However, when plate voltage was applied, the drive impedance appreciably increased, concommitantly the grid current would drop to around one-fifth. This effect could only be seen if separate plate and cathode current meters were used. It was necessary, therefore, to use sufficient drive to tune up the cavities and then with E_P on, increase the drive, taking care to remove drive before or simultaneously, removing plate voltage. High plate voltage was essential for success with this final and the minimum would be 750v., 1,000v. being more desirable. The 6/40 linear previously described with a carrier input of around 80w. gave sufficient output to drive a 3CX tripler[3] (E_P 500v., plate input 50 watts), which in turn would drive the final to 220w. input, loaded grid current being of the order of 40-50 mA. Stage gain was measured at 5½ dB. and output by slide rule, in the vicinity of 50w. To drive the final to 600w. input, the absolute s.s.b. limit of the tubes, would seem to require a tripler to drive a single tube straight to drive the pair.

An s.s.b. signal tripled in voice spectrum had a quite fascinating sound to it, and was for all practical purposes undemodulatable, the use of an s.s.b. spectrum divider[22, 23] would enable serious work on 1296 MHz. s.s.b. This device would, of course, permit 432 MHz. capability from a 144 MHz. s.s.b. source. The more conventional approach of mixing suitable signals to give a product on 1296 was considered but rejected for reasons outlined in ref. 24.

The only difficulty with s.s.b. on the u.h.f. bands is the association of the concept of s.s.b. with u.h.f. It has taken of the order of a decade for s.s.b. to become the dominant mode on 6 metres. If more u.h.f. exponents took serious cognisance of the tropospheric path loss-distance curves[19] or considered the possibilities of meteor scatter,[25, 26] then the conversion to s.s.b. would be just that much more rapid.

FIG 2 — 1296 MHZ SSB TRANSMITTER



* See text

REFERENCES

1. "Amateur Radio," Nov. 1963, 15.
2. "Ham Radio," Jun. 1971, 6.
3. "UHF Communications," Aug. 1967, 88 (German ed.).
4. "QST," Feb. 1966, 11.
5. "Amateur Radio," Jun. 1970, 9.
6. Data and Application Notes for QQV03/20A and QQV06/40A, Mullard Ltd., TP343, May 1958.
7. S.T.C. Ltd., Valves Application Report, MS/123 Edition 1, Sept. 1963.
8. "QST," Jan. 1968, 17.
9. Jones, F.: "VHF for the Radio Amateur," Cowan Publishing Co., 1961.
10. "Amateur Radio," May 1967, 5.
11. R.S.G.B. "The Radio Communication Handbook," 4th Ed., 1968.
12. A.R.R.L. "SSB for the Radio Amateur," 4th Ed., 1965.
13. "73 Magazine," Dec. 1965, 28.
14. U. T. Cobley, et al.
15. "Amateur Radio," Nov. 1962, 6.
16. "QST," Jul. 1969, 30.
17. "QST," Aug. 1964, 47.
18. "QST," Feb. 1970, 44.
19. A.R.R.L. "The Radio Amateurs' VHF Manual," Ed. E. P. Tilton, 1965.
20. R.S.G.B. "VHF-UHF Manual," Ed. G. R. Jessop, 1969.
21. "Ham Radio," Aug. 1968, 8.
22. "VHF Communications," Aug. 1971, 172.
23. "QST," Oct. 1970, 32.
24. "VHF-er," May-June 1966, 6.
25. "Amateur Radio," Aug. 1971, 11.
26. A precis of the results of the random M/S schedules carried out principally by VK5QZ and the author during Dec. 1971 is available to interested persons.

VHF TRANSEQUATORIAL PROPAGATION

PART TWO

*ROGER LENNED HARRISON,**
VK2ZTB, ex-VK3ZRY

CLASS II. TEP—CAUSES AND CHARACTERISTICS

The characteristics of Class II., or evening-type TEP, are generally well known, but the mode of propagation is not yet known or completely defined. Several different explanations have been put forward based on the correlation observed between night-time TEP observations and the occurrence of equatorial spread-F.[7, 11, 14] Experimental results, when applied to the various theories, have shown them to be incorrect, but it is well established that there is some definite connection between spread-F along the paths considered and the occurrence of Class II. TEP.[7, 10, 11, 14]

The higher frequencies propagated by Class II. TEP offer some interesting possibilities to the communicator.

There is a maximum occurrence between 2000 and 2300 LMT with a pronounced peak somewhere in this range for different seasons and particular paths. This means that just about every circuit has an individual peak occurrence time for different seasons but it will be somewhere between 2000 and 2300 LMT.

This coincides well with the occurrence of equatorial spread-F but the duration of TEP signals is usually less than the duration of spread-F.[7, 10] It has not yet been established why this is so. Class II. TEP has been observed to last until the early hours of the morning, but only rarely. The occurrence of Class II. TEP openings is greatest during the equinoxes,[7, 10-12, 14] as is spread-F—this is more pronounced than in the case of Class I. TEP. These openings are fewest during the winter solstice[7, 10, 11, 14] over the magnetic equator, which occurs during December-January for the Asian and African sectors and June-July for the Americas.[7]

Start times for openings via Class II. TEP are less dependent on path geometry than for Class I. TEP as also are the times of duration. Class II. is much more tolerant of asymmetrical path geometry than Class I.

Usually contacts are dependent on:—

(a) Appearance of equatorial spread-F at an appropriate geomagnetic latitude.
(b) Season of the year, i.e. proximity to the equinoxes.
(c) Sunspot number.

Path Characteristics

Path lengths for Class I. TEP are generally from 3,000 km. to 6,000 km.[7, 10-12, 14] and terminals are quite often asymmetrically and obliquely situated with regard to the magnetic equator.[7, 11] Some very long night-time paths have been observed,[7, 11, 16] but these can be explained by the occasional continuance of the Class I. TEP mode after sunset[11] or another mode of propagation assisting in extending the range of signals. Again, sporadic-E is likely to be the reflector at the lower end of the VHF range. Tropospheric ducting could extend the range in a similar fashion at the higher frequencies, but little work has been reported in this direction. Nielson mentions Es in this regard in his paper.[12]

You have probably noticed that the possible, and observed, ranges of the two types of TEP overlap. Thus there is a zone where stations (or circuits) will experience both modes, and zones where stations will only experience one or the other. The area between 20° and 30° geomagnetic latitudes [see Figs. 2, 3, 4 (crosshatched to the left)] is common ground for both Class I. and II. TEP. Stations located in these areas will encounter both modes from time to time with perhaps a gradual transition from Class I. to Class II. (evidenced by an increase in flutter fading after 2000 hours) or a signal dropout of up to an hour's duration.[11]

Stations north and south of about 30° geomagnetic latitude will tend to see only afternoon-type TEP while those stations closer than about 20° to the geomagnetic equator will tend to see only evening-type TEP.

The westward movement of contacts via Class II. TEP is not generally noted as it is for Class I. TEP. The irregularities that occur in the base of the F-layer, are certainly known to move westward, but their longitudinal "spread" is usually considerably wider than for the equatorial anomaly. As Class II. TEP appears to depend to a large extent on these irregularities, the westward movement may be masked by their longitudinal width and the tolerance to asymmetrical paths that is noted.[11, 11]

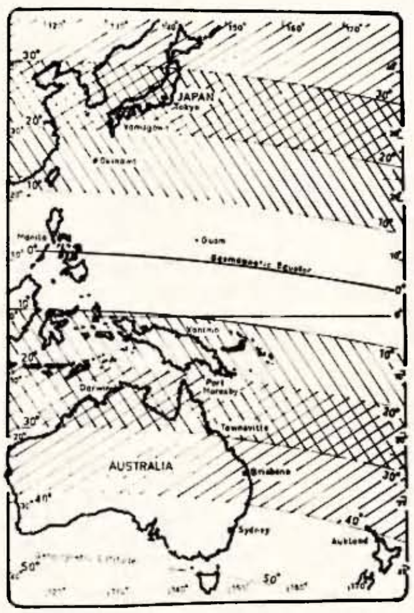


Fig. 2.—Australasian sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

Seasonal Characteristics

There is a marked dependence of Class II. TEP on the equinoxes and sunspot number. The same dependendce is noted for equatorial spread-F.[10-12, 14]

Class II. TEP has a maximum number of occurrences which lags the sunspot maximum by a year or so—as is noted for Class I.[11, 16] The reasons for this are not yet clear, but further research should elucidate the causal mechanisms.

Similarly to Class I., contacts can be had almost every night around the equinoxes[1, 2, 7, 10, 16] during peak occurrence years. There is a rapid drop off in the number of occurrences after this time, few contacts being noted during the solstices and the years spanning the sunspot minima. Observations carried out using oblique sounders and beacon transmitters also bear this out.[10, 12]

Signal Characteristics

The most surprising and exciting aspects of Class II. TEP signals are the high frequencies that it will support and the high signal strengths that are recorded.

Beacon transmissions on 102 MHz. from Darwin have been recorded in southern Japan on many occasions. but, as yet, there have been no reports of higher frequency signals. No upper frequency limit has been proposed for Class II. TEP as the mechanism by which it is reflected or refracted in the ionosphere is not yet known. Here is an opportunity for enterprising Amateurs who would like to try for some exotic DX on 144 MHz.—and make a contribution to a body of scientific knowledge on a phenomenon about which we know little. Unfortunately, 144 MHz. contacts might have to wait till the next sunspot maximum. But don't let me discourage you from trying.

Generally speaking, high signal strengths are experienced having a considerable amount of flutter. The flutter rate is mostly between 5 and 15 Hz. and a power spectral density graph shows that Doppler shift is mainly between ±40 Hz. This means that, at times, A3 (DSB or SSB) signals will be seriously degraded.[12] The effect on wideband systems (FM or PM) would be much less, but TV would suffer owing to the spread of time delays experienced.[12]

* Ionospheric Prediction Service Division of the Bureau of Meteorology, 162-166 Goulburn Street, Darlinghurst, N.S.W.

Paths whose terminals are magnetic conjugates (have the same angle of magnetic dip but the opposite sense, i.e. 25°N and 25°S) experience the higher frequencies more often and with greater reliability. The signal strength for these paths is higher than for the less favourable asymmetric paths and path lengths are generally shorter.

As Class II. TEP is probably supported in some way by field guided ionisation,[12] the closer a ray can be launched to tangency with the magnetic field, the more favourable are its characteristics, i.e. higher frequencies will be supported, higher signal strengths will be guaranteed and greater reliability will be obtained than for less favourable rays.

Many people refer to Class II. TEP as transequatorial scatter. This is quite wrong for a number of reasons. Scatter propagation involves incoherent reflection from tropospheric or ionospheric irregularities. Signal strengths are weak and have a considerable flutter component. Transmitted and received angles of elevation from the ground are much greater than for a field guided mode and signals are not necessarily received over a great circle route. Ranges for scatter propagation are much less than for Class II. TEP. It appears that the considerable flutter component often observed on evening-type TEP leads to a confusion involving the modes of propagation. Class II. TEP is dependent on many factors (season, sunspots, geomagnetic latitude, etc.) that seem to have no bearing on true scatter modes.

CURRENT RESEARCH

The Ionospheric Prediction Service Division is currently conducting research into TEP, particularly the evening-type or Class II. Equipment is being set up to examine the signal characteristics of VHF beacons located in Japan and Korea as part of this research which is aimed at elucidating the propagation mechanism of evening-type TEP and eventually predicting its occurrence. The ionosonde located at Vanimo, New Guinea, is ideally situated to study the equatorial ionosphere. It will be equipped with an interferometer system to assist in studying the irregularities that cause spread-F. It is hoped that, by September 1972, experimental short-term TEP warnings broadcast on an HF transmitter will be operative, giving 30 to 40 minute warnings of possible openings.

Fig. 3.—The American sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

Fig. 4.—The African-Mediterranean sector of the world showing terminal zones for Class I. TEP (20 deg. to 40 deg. geomagnetic latitude) and Class II. TEP (10 deg. to 30 deg. geomagnetic latitude).

The Amateurs Can Help

Reports of TEP from Amateurs and other observers are welcome and should be sent to:—

Mr. Roger Harrison,
Amateur Observer's Reports,
Ionospheric Prediction Service Div.,
162-166 Goulburn Street,
Darlinghurst, N.S.W., 2010.

Reports should contain as much of the following information as possible:—

(a) Date.
(b) Time (note whether local or GMT).
(c) Frequency or band.
(d) Signal strength.
(e) Fading characteristics.
(f) Location of your station and call sign (with location if possible) of stations heard or worked.
(g) Other observations, i.e. was sporadic-E noticed at the time; if so, to what areas? Did the signals start in one area and move to another or not? When were signals first noticed and when did they disappear?

Printed report forms for the assistance of observers can be obtained from me at the above address.

Eventually, it is hoped that TEP will be included in the normal predictions issued by I.P.S.D.

CONCLUSION

Armed with this information, and making reference to the maps in Figs. 2, 3 and 4, any keen VHF man in the right location can work some quite exotic DX.

Relatively simple equipment gives good results with TEP, most people, who have worked this mode, running less than 20 watts input. Antenna requirements are also minimal; many people using a 3 or 4 element Yagi and some only a dipole or ground-plane antenna.

Run-of-the-mill receiving set-ups involving a converter to tuneable IF or converted carphone give good results as signals are usually quite strong. AM, FM, PM, DSB, SSB, CW or FSK (RTTY) can be used with the advantage going to CW, SSB and FM or PM.

Predicting TEP on a daily basis is not yet possible, but keeping a watch on a suitably located beacon will indicate when the band is open. When the I.P.S.D. TEP warning service comes into being a powerful tool will be available to assist Amateurs (and others) in taking advantage of the existing possibilities afforded by Class II. TEP.

Suitable beacons are generally listed in various Amateur journals ("QST," "Amateur Radio," etc.) but a suitable beacon service is not available in many places. Perhaps this could be investigated by the Amateur Societies in the areas where such a service does not exist.

ACKNOWLEDGMENT

This article was published with the kind permission of The Director of the Commonwealth Bureau of Meteorology.

The author would like to thank Dr. L. F. McNamara, head of the Low Latitude Research Section of I.P.S.D., for his help and advice.

REFERENCES

1. Tilton, E. P., "The World Above 50 Mc.," "QST." May 1947, page 61.
2. Tilton, E. P., "The World Above 50 Mc.," "QST." October 1947, page 56.
3. Tilton, E. P., "Long Distance Communications over North-South Paths on 50 Mc/s.," Proc. 2nd Meeting Mixed Commission on Ionosphere, Brussels, 1951, page 119.
4. Ferrell, D. P., "Enhanced Transequatorial Propagation following Geomagnetic Storms," "Nature," 167, 1951, page 811.
5. Yeh, K. C., and Villard, O. G., "A New Type of Fading Observable on High Frequency Radio Transmissions Propagated Over Paths Crossing the Magnetic Equator," Proc. I.R.E., 46, 1958.
6. Yeh, K. C., and Villard, O. G., "Fading and Attenuation of High Frequency Radio Waves Propagated Over Long Paths Crossing the Auroral, Temperate and Equatorial Zones," Journal of Atmospheric and Terrestrial Physics, 17, 1960.
7. Southworth, M. P., "Night Time Equatorial Propagation at 50 Mc/s, Final Report from an IGY Amateur Observing Programme," Stanford Electronic Labs., Final Report, Contract AF-19-604-5235, May 1960.
8. Villard, O. G., Stein, S., and Yeh, K.C., "Studies of Transequatorial Ionospheric Propagation by the Scatter Sounding Method," Journal of Geophysical Research, 62, 1957, page 399.
9. Bowles, K. L., and Cohen, R., "Studies of Scattering Phenomena in the Equatorial Ionosphere based upon VHF Transmissions Across the Magnetic Equator," Some Ionospheric Results obtained during the IGY, ed. W. J. G. Beynon, Elsevier Publishing Co., 1960, page 192.
10. Gibson-Wilde, B. C., "An Investigation at Townsville into Anomalous Long-Range Transequatorial VHF Propagation (1961-1966)", Research Report Number 2, Physics Department University College of Townsville, June 1967.
11. McCue, C. G., and Fyfe, D. F., "Transequatorial Propagation: Task, Bridger Introductory Review," Proc. I.R.E.E. (Aust.), 26, Jan. 1965, page 1.

(Continued on Page 15)

ELECTRICAL MEASURING INSTRUMENTS

LECTURE 15A

C. A. CULLINAN,* VK3AXU

● Continuing the series of lectures by C. A. Cullinan, VK3AXU, at Broadcast Station 3CS for students studying for a P.M.G. Radio Operator's Certificate.

It is most important that all candidates for P.M.G. Radio Operators Certificates have knowledge of the use of the more common electrical measuring instruments as well as some knowledge of their principles of operation.

Possibly it is for these reasons that occasionally a question about the use or construction of one or more instruments appears in the P.M.G. examination questions.

Therefore it is the purpose of this lecture to give an outline of the construction and operation of electrical measuring instruments which a candidate should know something about.

Unless stated otherwise all instruments referred to in this lecture are for use on d.c. or a.c. at power line frequencies.

Instruments making use of electronic techniques are not discussed.

* * *

Electrical measuring instruments are either indicating, graphic (recording) or integrating.

The indicating types are read directly on a scale.

The graphic types are basically those in which the normal pointer is replaced with a pen which records on a continuously moving circular chart or a paper strip so as to give a permanent record of the electrical quantity being measured at any time. The chart or paper strip may be marked in time such as seconds, minutes, hours, days, months or years, depending on the needs of the user. Sometimes this type of instrument will have a pointer and scale, in addition to the pen, so that an easy reading may be obtained at any time of the quantity being measured at that time.

Integrating instruments are strictly **meters** as they integrate an electrical quantity or power with time.

However, over the years it has become common practice to refer to just about all electrical measuring instruments as meters and to avoid confusion this term will be used in this lecture.

All electrical measuring instruments have one thing in common. The fundamental principle is that an electrical quantity to be measured is converted into mechanical motion which is calibrated in terms of that electrical quantity by means of a registering device.

* 6 Adrian Street, Colac, Vic., 3250.

This may consist of a mirror which reflects a beam of light on to a scale, a pointer which moves over a calibrated scale, a pen which draws a chart, registering dials, or numerals, in a digital display.

In this lecture we are concerned with four types of electrical measuring instruments. These are:—

(a) Current detecting or measuring instruments,
(b) Potential difference measuring instruments,
(c) Power measuring instruments,
(d) Energy measuring instruments.

These consist of instruments depending upon:—

(1) The magnetic properties of a coil carrying a current.
(2) Heating effects of currents in conductors.
(3) Induction effects.
(4) Electro-static effects.
(5) Electrolytic effects (not discussed).

Class 1 includes all types of galvanometers, electro-dynamometers, and magnetic balances.

Instruments may be classified according to their mode of operation, their method of damping, their method of control, and their standard of accuracy.

Taking these in turn we have:

Methods of Operation

Electro-magnetic:—
Moving coil instruments, polarised moving iron instruments, induction instruments, and dynamometer instruments.
Electro-thermal:—
Hot wire expansion instruments.
Thermo-E.M.F. instruments.
Thermo-bimetallic instruments.
Electro-static:—
Electro-static voltmeters.
Electro-static watt meters (not discussed).
Electrometers (not discussed).
Electro-chemical (not discussed).

Methods of Damping

Air damping, liquid damping, and eddy-current damping.

Methods of Control

Spring control, gravity control.

Standards of Accuracy

With regards to the grading of instruments the terms "precision" or "industrial" are replacing the older terms of "sub-standard", "first grade" and "second-grade".

Many current measuring instruments are concerned with the measurement or detection of very small currents, thus involving the use of instruments having the highest sensitivity. The most sensitive current measuring instruments are **galvanometers** and there is a large variety of types.

Galvanometers are used mainly in laboratories, but sometimes are found in radio stations, particularly where the staff does design and construction of equipment, therefore it has been considered desirable to include some information about galvanometers in this lecture.

D'ARSONVAL GALVANOMETER

In the simple form of this galvanometer a coil having many turns of fine wire is suspended between the poles of a permanent magnet. The suspension is of two strips or "hairs" of very fine phosphor-bronze. It is usual for this type of galvanometer to be used in the horizontal position only and the coil is held vertically, one "hair" being above the coil and the other beneath it. These "hairs" also act as the leads to the coil.

A small mirror is attached to the suspension and a light is arranged to shine on the mirror. A graduated scale is placed some distance away from the mirror, which reflects the light on to the transculent scale, usually as a spot or fine vertical line of light. If the scale is placed sufficiently far away from the mirror then a very small movement of the mirror will cause a considerable movement of the spot of light as the distance from the mirror to the scale is equivalent to a lever, it is in fact an optical lever.

The zero position of the coil is with its axis at right angles to the lines of force in the magnetic field.

Current in the coil creates a magnetic field which interacts with the field of the magnet to produce a torque or twisting action, thus causing the coil and mirror to rotate against the very small restoring torque of the suspension "hairs".

To damp the coil movement the coil may be wound on a metal former which may be of silver or copper. As the coil moves when current flows through it, currents are induced into the former by the motion and produce a torque which is proportional to velocity and opposing motion, therefore achieving a damping action. Another method of damping is to place a resistance across the instrument terminals but this reduces the sensitivity.

Galvanometers of the highest sensitivity can detect currents as small as 10^{-9} ampere.

There are a number of ways of expressing the figure of merit of a galvanometer. One of these by Prof. Ayrton, is as follows. Standard conditions, scale distance 1,000 millimetres, scale divisions 1 milli-metre long, periodic time 10 seconds, and resistance 1 ohm. Thus the figure of merit can be stated as the deflection in millimeters per micro-ampere.

The galvanometer described above may be obtained in a variety of ranges of sensitivity and resistance of the coil.

One great use for such a galvanometer is as a null detector in a Wheatstone Bridge such as that described in Lecture No. 4. For this use the light spot is adjusted to take up a position in the centre of the scale when no current is flowing in the coil, this being'the case when the bridge is exactly balanced.

It will be noticed that in the galvanometer it is the coil which moves, thus the instrument is known as a "moving-coil galvanometer.

A rather specialised form of galvanometer is that used in the motion picture industry to record sound, photographically, on motion picture film by the system known as variable area recording.

The galvanometers used are usually of the moving-iron type in which the armature causes the galvanometer mirror to vibrate through a mechanical link. These galvanometers are air-damped, are tuned to approximately 9.5 kHz. and are not critical to temperature changes. It is possible to obtain a very flat frequency response from 50 Hz. to 9.5 kHz. and many systems do much better than this. There are quite a number of varieties of this type of galvanometer.

This type of galvanometer is a refinement of the moving magnet type in which a magnet, usually a magnetised indicating pointer is deflected by a current flowing in a coil which surrounds the magnet. This type was usually employed in railway signalling work, as well as for some systems of telegraphy.

A vibration galvanometer is used for the detection of very small alternating currents. It uses light, undamped components whose natural period of vibration can be adjusted over a fairly wide frequency range.

Alternating currents of about 10^{-8} ampere at frequencies up to 2 kHz. can be detected with a vibration galvanometer.

Another type is known as a ballistic galvanometer and is used to measure a quantity of electricity rather than current.

There are some other types which should not concern us, however the **reflecting dynamometer wattmeter** may be of interest. In this instrument current is fed through the suspension to the coil which generates a magnetic field which inter acts with that of a fixed coil, the system being constructed as to be astatic. The suspension has a mirror attached to it to deflect a beam of light.

This instrument can be used to measure current or voltage as well as being a very accurate wattmeter. It can be calibrated with a.c. or d.c. and the difference will be less than 0.1%. As wattmeters some of these instruments have an accuracy of 0.05% over the range of 5 watts to 2.5 kw.

Galvanometers are usually somewhat fragile instruments and must be treated with care.

The D'Arsonval galvanometer has been described in some detail as this leads to the direct current meter which uses the basic idea of the galvanometer (a coil of wire which moves in a magnetic field) and d.c. meters are referred to as D'Arsonval types.

THE D.C. METER

The "Aerovox Research Worker," Vol. 19, No. 9, contained an exceptionally good article on the d.c. meter by the Engineering Department of the Aerovox Corporation and because of its excellence it is used here with acknowledgment to the "Aerovox Research Worker".

"Although the d.c. meter is a standard tool around the laboratory, service bench or 'ham shack,' its usefulness may be greatly enhanced by a better understanding of the principles underlying its construction and applications. Despite the fact that the judicious use of electrical instruments is an unfailing hallmark of the skilled electronics tchnician, there is a tendency on the part of many to accept the meter at its face value without ever gaining an intimate knowledge of its internal functioning. Actually a complete familiarity with the capabilities and limitations of the d.c. meter can be gained only through a study of its electrical and mechanical characteristics.

"This paper will discuss these characteristics and point out certain precautions to be observed in the use of such measuring instruments. The moving-coil, permanent-magnet type known as the D'Arsonval meter forms the basis of about 90% of the meters in common use, being used to measure current, voltage and resistance with different auxiliary circuitry.

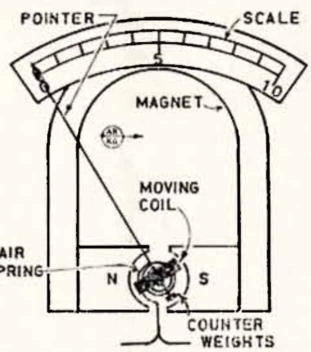


FIG. 1.

"Fig. 1 illustrates the usual form of this arrangement. The current-carrying coil is wound on a light-weight frame or armature which, in turn, is supported between sapphire-jewelled pivot bearings which allow it to rotate freely. The electrical connections to the coil are made through spiral hair-springs at each end of the armature. These fine alloy springs perform several vital functions. Besides providing the current-carrying path between the armature and the stationary parts of the meter, they provide the counter-force against which the meter torque or rotational force acts, as well as supplying the restorative force which returns the pointer to zero when current ceases to flow.

"The coil thus mounted is immersed in a strong magnetic field which is usually provided by a permanent magnet. The stability and permanency of this magnet are of importance, as well as the uniformity of the magnetic field produced between its poles. The pole tips are usually semicircular in shape to fit closely around the moving coil. The uniformity of field is greatly improved by the use of a cylindrical core of soft iron mounted in the centre of the armature so that the moving coil revolves around it. The indicating pointer is affixed to the armature at one end and a system of small adjustable counterweights is used on the tail-piece and cross arm of the pointer to balance the complete armature assembly. The angular movement of the moving coil assembly is restricted by a set of cushioned stops.

"The completed assembly is extremely delicate and precise. It is interesting to note that most of the components serve several purposes. For instance, the armature frame not only provides the form upon which the current-carrying coil is supported, but is also a closed-loop conductor in which eddy currents are induced which oppose the motion of the armature and so provide **damping** of the meter movement. Excessive overswing or oscillation of the pointer is thus avoided.

The Current Meter

"Essentially, the D'Arsonval meter is a current measuring device. The flow of current through the moving coil sets up a magnetic field around the coil which interacts with the fixed field produced by the permanent magnet to cause rotation of the coil. The turning torque developed is proportional to the strength of the permanent magnet. The number of turns in the coil, and the amount of current flowing in the coil. The pointer deflection which results is determined by the strength or counter-torque of the spiral springs. At any given meter deflection, the torque produced by the interaction of the current in the coil and the magnetic field is exactly equal to the counter-torque of the hair springs and an equilibrium results.

"Since in any given meter design the current in the coil is the only variable, the deflection of the pointer is directly proportional to the amount of current flowing. The scale graduations in properly designed d.c. meters of this type are therefore linear.

"The amount of direct current required to deflect the pointer to the highest graduation on the scale is called the **full scale sensitivity** of the meter. Instruments are manufactured in a wide range of sensitivities ranging from amperes down to a practical limit of about 20 microamperes. In addition to the above, high-sensitivity instruments are available with sensitivities of ½ microampere for full scale deflection. Such high sensitivities are achieved by the use of powerful permanent magnets, light-weight multi-turn coils, and very delicate hair-springs.

"Meters having sensitivities of one milliampere or less may be used for measuring any larger values of current by the proper use of **shunts**. If a conductor having a resistance equal to the internal resistance of the meter is connected in parallel with it, the current will divide equally between the two paths and hence twice as much

(Continued on Page 17)

1. **GREATER MOISTURE PROTECTION**

IRC's resistance element is a carbon composition film thermally bonded to a glass substrate. This exclusive IRC design permits up to 1½ times more moulding protection around the resistance element, and the moulding process, developed by IRC, results in superior moisture, electrical and mechanical characteristics.

When tested to MIL-R-11 moisture resistance requirements, IRC's ½ and 1 watt fixed composition resistors exhibit resistance changes of less than 3%. Five times better than the 15% MIL allowance. Under more stringent conditions of 75°C, 100% RH for 120 hours, resistance changes are typically less than 5%.

2. **BETTER SOLDERABILITY**

IRC's exclusive tin/lead alloy electroplating process assures a lead with a smooth, uniform surface.

The alloy used on the resistor leads was chosen, not only for its superior solderability, but also for its excellent shelf life. *Volume procurements can be made without concern for long term soldering degradation.*

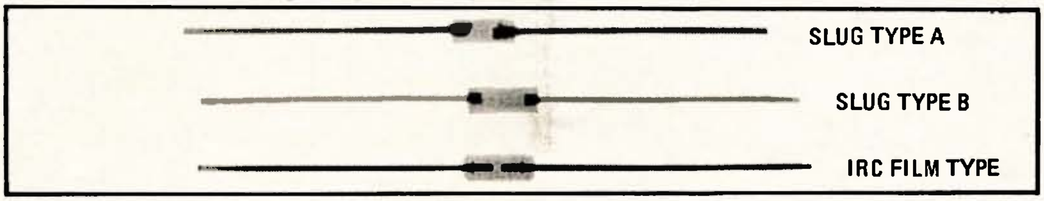
IRC resistors are also available with special weldable leads. Contact factory for specifications, minimum quantity requirements and prices.

3. **STRONGER LEAD ASSEMBLY**

Because the IRC method of construction allows a moulded jacket 1½ times thicker, the specially formed leads are deeply embedded in the moulding. The illustration showing the exclusive ribbed-shoulder leads explains how the leads are better designed to withstand twist or pull-out. The leads are firmly bonded to the element and the result is a complete assembly that is failure-free under MIL-R-11 shock, vibration and acceleration tests.

4. **BETTER HIGH TEMPERATURE CHARACTERISTICS**

IRC's resistance element is a carbon film that is bonded to a glass substrate at approximately 1000°F. This means the element has been conditioned to high temperature exposure.



As may be seen in the X-Ray photos, the talon leads go deep into the resistor body, conducting heat away from the 'hot spot' and out of the resistor.

Even after 1,000 hours at 100°C and full rated power, resistance changes are less than the 10% MIL allowance. After 1,000 hours at 150°C, no load, resistance changes are still well within MIL limits. At 200% rated power at 70°C ambient, resistance changes are typically less than 10% after hundreds of hours of operation. Resistance temperature coefficient is typically less than 0.064%/°C over the range of 25°C to 150°C.

5. **SUPERIOR HIGH FREQUENCY CHARACTERISTICS**

IRC's low mass resistance element assures inherently low shunt capacitance and, as a result, superior performance at high frequencies. As an example, in high frequency equipment this performance advantage results in better pulse shaping with less broadening and truncation, and faster response time.

IRC outperforms other brands to a significant degree.

6. **HIGHEST RELIABILITY AND QUALITY**

IRC's ½ watt and 1 watt BT resistors were the first resistors to be approved in Australia to the RCS112 British Armed Services Specifications. The tests needed to assure continuing performance to this specification and also *MIL-R-11 and IEC specifications have provided many millions of unit-hours of test data.

An extensive quality control programme has always been maintained in the manufacture of IRC resistors. All production processes are subjected to rigid test standards to assure a continuing high level of product performance in the field.

*MIL-R-11 = U.S. Armed Services specification for carbon composition resistors
IEC = International Standards for Testing of Electronic Components

AUSTRALIAN MADE

Manufactured in Australia by

IRH Components Pty. Limited

THE CRESCENT, KINGSGROVE, N.S.W. 2208. PHONE: 50-0111

1003

An Attenuation Marker

Postscript regarding RADIATION DANGER

(by the Technical Editor)

This article by VK4AT, which was published in the April 1972 issue, has, we understand, been the subject of considerable comment, much of it critical. It is agreed that criticism is justified, not necessarily because of the unusual approach to the subject of r.f. field distribution around antennas, but because the article was both vague and undesirably long. On these grounds it would probably not have been published under normal conditions, but was accepted while the Publications Committee was being re-organised under the management of the Executive rather than the VK3 Division.

We have received a further contribution from VK4AT on the same subject. For reasons mentioned above, and with apologies to the author, it is not proposed to publish it in full. However, we feel that some results of his experience should not be ignored, in view of the danger to which some experimenters can be exposed.

Briefly summarising: while experimenting along the lines described in the April issue, using a sodium vapour street lamp rather than a fluorescent tube, VK4AT suffered quite serious radiation burns to the arm and body. The r.f. power level involved was more than the few watts previously advised. At the time of exposure there was no sensation of pain, nor was there visible ionisation in the sodium lamp. The physiological effects appeared later. They were quite painful and lasted for several weeks.

On a second occasion (the exact experimental details are not clear) radiation of a different type was experienced. Again the effects were not felt for some hours, but caused burns to the skin and to one eyeball which took months to heal, fortunately, it appears, without causing permanent damage.

The warning is clear. High field strengths, particularly when ionisation is facilitated, are **dangerous.** Power levels need not be high to produce high field strengths when high Q resonators are involved. Some forms of laser action can occur unexpectedly. If you don't know the dangers and how to avoid them, don't risk finding out the hard way!

The face behind one of the biggest signals on 160 metres. Cedric Smyth, VK3ACH, at the controls of his well-heard mobile rig.

Commercial Kinks

Many thanks to all who have written with suggestions for future editions of this column. Without a doubt the FT200 heads the list, so if all goes to plan, the August issue should see the start of a series on this piece of gear. If you have any ideas, problems, or suggestions about FT200s let me hear about it right away.

Back to the present. This month some notes on the Trio 9R 59D series receivers and also alignment data for Swan transceivers.

TRIO 9R 59D RECEIVER

This receiver has been on the market here for around four years. In that time it has progressed from the DE to the DR and the current DS. Up to date, I have been unable to find out just what the difference is between these various models. Even the local agents don't know, or won't tell if they do. A close check of the circuits reveals only one change. The b.f.o. h.t. dropping resistor R28 has been reduced from 47K ohms in the early series to 2.2K ohms in the later ones. As yet 1 have not had a chance to try the change in my 9R 59DE, but it could increase the b.f.o. output and perhaps improve s.s.b. and c.w. reception.

As they stand, these receivers will do quite a fair job considering their price and will make an excellent receiver for the Amateur who works on 160, 80 and 40 metres.

However, a few slight modifications are worth while. Firstly get hold of a copy of April 1969 "A.R." In this David Rosenfield, VK3ADM, described some changes to the power supply section that are worth doing. If you have no copy of this, write to me and I will be happy to forward the circuits to you. These changes will improve the power supply regulation and allow a higher r.f. gain setting on s.s.b. and c.w. reception. David stated in his article that these modifications will also produce a lower hum level. I disagree with this. Most of the hum is induced directly into the output transformer from the power transformer. The only way to cure this is to move the output transformer under the chassis. A good place to mount it is on the back of the coil box. There are enough holes already here so you need not drill any.

While on the subject of hum, I wonder how many Amateurs have invested in a pair of stereo headphones to use on their transceiver or receiver and have been disappointed with the results? Generally the first reaction is where did all the hum come from. Well, of course, it was there all the time, but now you can hear it much better. The answer, reduce the sensitivity of the phones with a series resistor of around 200 ohms. A quarter watt rating is large enough and it can be fitted inside the plug. All the hum will now have gone and you need not wind the audio gain down from the normal speaker setting.

Back to the Trio. When using the set in the s.s.b. position the a.g.c. is removed from the 6BA6 r.f. stage. Better a.g.c. action can be obtained on sideband if the set is modified to allow for a.g.c. on the r.f. stage at all times. But first there is a catch. With a.g.c. on the r.f. stage you will get a marked improvement on 160, 80 and 40, but pulling of the h.f. oscillator might occur on 20. This will give an effect of frequency variation with modulation on s.s.b. signals. If you would like to try it first remove the white connection going to the function switch. Next find the tie strip near the 6BA6 r.f. stage which carries the a.g.c. connection. This can be identified by a one megohm resistor which runs from it to the grid connection of the tube via a 47 ohm stopper resistor. Connect a short jumper lead across to the a.g.c. point on the printed circuit board.

We will leave the 9R 59D at that point but if readers are interested in more modifications, let me know, I have quite a few more.

SWAN TRANSCEIVER

Filter Alignment for Models 350, 400, 350C, 500 and 500C

My thanks to Swan Electronics and to Ted VK3TG for passing on the information.

Equipment required: r.f. watt meter, audio generator.

Schematic symbols for the normal and opposite sideband carrier oscillator trimmer capacitors as listed for the various models:

	Models 350	400	350C
Normal s.b.	C1402	C1507	C1405
Opposite s.b.	(opt.)	C1506	(not avail.)

	Models 500	500C
Normal sideband	C1406	C1403
Opposite sideband	C1405	C1402

Alignment, allow 15 minutes to warm up. Load the unit up on the 20 metre band as you would for normal operation. Key the p.t.t. and balance out the carrier with the carrier balance control. Feed 1500 Hertz from the audio generator into the mic. input. Adjust the gain of the audio generator and the mic. gain until the watt metre reads output. Ten or fifteen watts is sufficient. Adjust the first i.f. transformer slug with a plastic hex. alignment tool for maximum output. The first i.f. transformer is Z801.

Adjust both slugs in Z1301 (designated Z1401 in the Swan 400) for maximum power output. Increase the gain of the audio generator until the watt meter reads 80 watts output. Sweep the audio generator down to 300 Hertz. Adjust the normal sideband carrier oscillator trimmer for a reading of 20 watts. Switch the sideband selector to the opposite sideband and adjust the carrier oscillator trimmer for 20 watts output.

That's all for this month. Next issue will have information on vox units for some of the popular transceivers.

—VK3OM

V.H.F. PROPAGATION

(Continued from Page 7)

12. Nielson, D. L., "A Review of VHF Trans-equatorial Propagation," Stanford Research Institute (unpublished).
13. Eccles, D., and King, J. W., "A Review of Topside Sounder Studies of the Equatorial Ionosphere," Proc. I.E.E.E., 57, June 1969, page 1012.
14. McNamara, L. F., "Range-Spreading and Evening-Type Transequatorial Propagation," Physical Science, Vol. 234, Nov. 22, 1971.
15. Ratcliffe, J. A., "Sun, Earth and Radio—an Introduction to the Ionosphere and Magnetosphere," World University Library, published 1970.
16. Jamieson, E., "VHF," "Amateur Radio," January 1970 to June 1971.

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	320/344	VK4VX	296/296
VK6RU	318/344	VK5AB	296/314
VK4KS	311/326	VK2APK	293/300
VK3AHO	310/326	VK4FJ	286/307
VK4UC	303/303	VK4TY	284/288
VK6MK	303/324	VK4PX	280/281

New Members:

Cert. No.	Call	Total
130	VK3JF	104/104
131	VK4LZ	110/110
132	VK3SO	104/104
133	VK3AKR	125/125

Amendments:

VK5WV	110/110	VK4NQ	124/124

C.W.

VK3AHQ	310/325	VK3NC	273/300
VK2QL	305/328	VK6RU	266/288
VK2APK	289/297	VK3YD	263/282
VK4FJ	289/315	VK4TY	259/272
VK3YL	288/305	VK3TL	254/260
VK3XB	285/300	VK3RJ	251/265

Amendments:

VK3KS	247/254	VK3LV	121/121
VK3JF	194/201		

OPEN

VK6RU	318/344	VK4VX	304/304
VK4SD	315/330	VK4UC	303/303
VK4KS	312/331	VK6MK	303/324
VK2VN	311/330	VK2EO	301/325
VK2APK	307/319	VK2SG	298/304
VK4TY	306/321	VK4FJ	297/323

New Members:

Cert. No.	Call	Total
139	VK3SO	108/108
140	VK3JF	205/212

Amendments:

VK3XB	291/306	VK4NQ	136/136
VK4PX	287/292	VK3LV	126/126

STOP RUST OUTDOORS TWO YEARS . . . OR MORE!

Lubricates Penetrates Stops Rust

DRY YOUR ELECTRICAL SYSTEMS
with LPS — the NON-GREASY ONE

Displaces Moisture Fast!

TECHNICAL INFORMATION

Physical Properties:

LPS 1

Less than 0.0001 inch non-greasy molecular film with capillary action that spreads evenly and easily to seal out moisture at very low cost.

Rust Inhibitor: Protects **all** metals from rust and corrosion.

Water Displacing Compound: Dries out mechanical and electrical systems fast.

Lubricant: **Lubricates** even the most delicate mechanisms; non-gummy, non-sticky; does not pick up dust or dirt.

Penetrant: Penetrates to loosen frozen parts in seconds.

Volume Resistivity per ASTM D-257: Room temperature, ohm/cm.; 1.04×10^{12}.

Dielectric Constant per ASTM-877:
Dielectric Constant 2.11, Dissipation Factor: 0.02.

Dielectric Strength per ASTM D-150:
Breakdown Voltage 0.1 inch gap, 32,000 volts.
Dielectric Strength volts/inch, 320,000 volts.

Flash Point (Dried Film), 900 degrees F.
Fire Point (Dried Film), 900 degrees F.

TESTS AND RESULTS: 950 degrees F.

Lawrence Hydrogen Embrittlement Test for Safety on High Tensile Strength Steels: Passed. Certified safe within limits of Douglas Service Bulletin 13-1 and Boeing D6 17487.

Mil. Spec. C-16173 D-Grade 3, Passed.
Mil. Spec. C-23411, Passed.

Swiss Federal Government Testing Authority for Industry: Passed 7-Day Rust Test for acid and salt water. Passed Weiland Machine Test for Lubricity as being superior to mineral oil plus additives.

LPS Products conform to Federal Mil. Specs. C-23411 and/or C-161730

HOW LPS SAVES YOU TIME AND MONEY

1. LPS PROTECTS all metals from Rust and Corrosion.
2. LPS PENETRATES existing rust—stops it from spreading.
3. LPS DISPLACES moisture on metal—forms fine protective film.
4. LPS LUBRICATES even the most delicate mechanisms at extreme temperatures.
5. LPS PENETRATES to free rust frozen parts, nuts, bolts, etc.
6. LPS PREVENTS equipment failures due to moisture (drives it out).
7. LPS LENGTHENS LIFE of electrical and electronic equipment—improves performance.
8. LPS RESTORES equipment damaged by water contamination and corrosion.
9. LPS PENETRATES AND PROTECTS plated and painted metal surfaces.
10. LPS PROTECTS metals from salt atmosphere, acid and caustic vapours.
11. LPS LOOSENS dirt, scale, minor rust spots and cleans metal surfaces.
12. LPS ELIMINATES squeaks where most everything else fails.

LPS

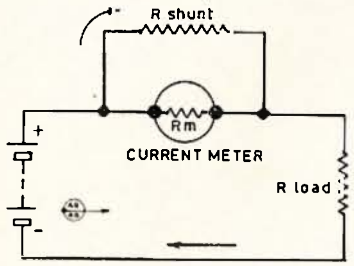
Sole Agents:

ZEPHYR PRODUCTS PTY. LTD., 70 BATESFORD ROAD, CHADSTONE, VIC., 3148. Phone 56-7231

MEASURING INSTRUMENTS

(Continued from Page 10)

current will be required to give full-scale deflection of the meter. If a shunt is chosen which has one-fourth the resistance of the meter coil., the currents through the parallel resistances divide in the ratio of 4 to 1, and since only **one-fifth** of the total current flows through the meter, it's full-scale indication is multiplied by a factor of five.



$$R\ shunt = \frac{Rm}{N-1}$$

Rm = Internal meter resistance.
N = Desired scale multiplying factor.

USE OF SHUNT RESISTANCE TO EXTEND CURRENT METER RANGE

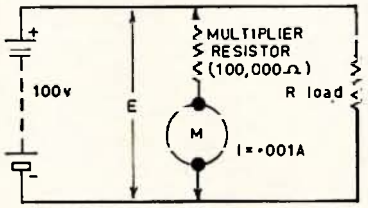
FIG. 2.

"Fig. 2 shows the connection of a shunt to a direct current meter and the equation commonly used to determine the shunt resistance required to extend the scale by a factor N. The internal resistance of the meter may be determined from the published characteristics of that type, or by measurement. In multi-range instruments, it is usual to select shunts which multiply the scale calibration by multiples of ten for ease in reading.

The D.C. Voltmeter

"The same basic movement which is used to measure direct current is also employed in voltmeters. In this case, resistance is added in **series** with the meter in the manner shown in Fig. 3. Such external **multiplier resistors** may be used with a high sensitivity milliameter or microameter to measure voltages ranging from millivolts to kilovolts. The meter is still performing its original function as a current measuring instrument, but in this case it is measuring the current which an unknown voltage causes to flow in a known resistance. The voltage is therefore determined by Ohm's Law (E = IR) and the meter scale may be calibrated directly in terms of voltage.

"Meters for voltmeter applications are classified according to 'ohms-per-volt' ratings, i.e. the number of ohms which much be contained in the voltmeter circuit for each volt which the meter is to indicate. For example, to limit a voltmeter using a one-milliampere basic movement to full scale deflection when 10 volts is impressed, the total resistance of the circuit must equal 10,000 ohms, by Ohm's Law. A total of 15,000 ohms would be required for 15 volts full scale, etc. Thus a 0.001 ampere meter, one milliampere full scale, is rated at '1,000 ohms-per-volt'.

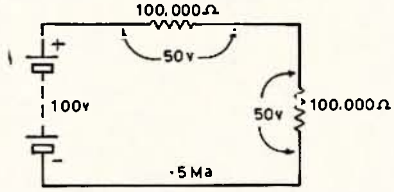


E = IR = 100v

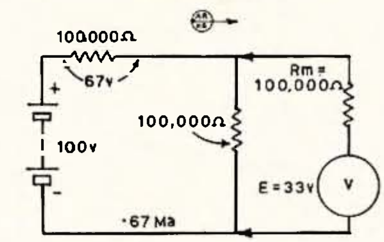
USE OF D.C. METER AS VOLTMETER

FIG. 3.

"The same meter can be made to read 500 volts full scale by using a 500,000 ohm multiplier in series with it. In such cases, where the required multiplier resistance is very large compared with the internal meter resistance, the latter is usually ignored since the error introduced is much less than the reading accuracy of the meter. However, if it were desired to make a 1,000 ohms-per-volt meter read 1 volt full scale, it would be necessary to include the meter resistance in the total value of 1,000 ohms required. If the internal resistance of the meter is 100 ohms, the correct value of the multiplier would be 900 ohms since a 10% error would be introduced if the meter resistance was neglected.



UNDISTURBED CIRCUIT CONDITIONS



CIRCUIT 'LOADED' BY VOLTMETER

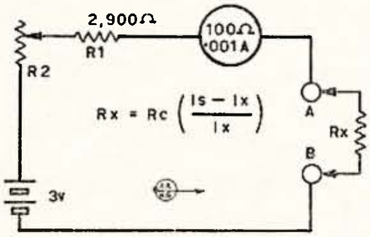
FIG. 4.

"Since the voltmeter is always connected across the voltage drop being measured, it is important to use an instrument having a total resistance which is large compared to the circuit to which it is connected. Otherwise serious inaccuracies result since a low resistance meter 'loads' the circuit being measured so that the voltage drops indicated are not those which exist in the undisturbed circuit. A simplified example of such misuse of the voltmeter is illustrated in Fig. 4. To reduce such errors, basic meters having full-scale sensitivities of 50 microamperes (20,000 ohms-volt) or 100 microamperes (10,000 ohms-volt) are used in high quality voltmeters.

The Ohmmeter

"Just as the D'Arsonval current meter is used to determine voltage when the current and resistance are known, it may be used equally well to read resistance by indicating the current which flows when a known voltage is impressed across an unknown value of resistance.

"Such an instrument, calibrated directly in ohms, is called an 'ohmmeter' and is widely used in a variety of circuit types of which Fig. 5 is a typical example. In this circuit, a battery or other source of voltage is provided which is capable of producing a full-scale deflection on the meter when the test terminals (A and B in Fig. 5) are shorted. Variations in battery voltage and other circuit constants are compensated for by adjustment of a rheostat (R2).



Rx = Unknown Res.
Rc = Circuit res. (A & B shorted)
Is = Meter current (A & B shorted)
Ix = Meter current (Rx in circuit)

TYPICAL OHMMETER CIRCUIT

FIG. 5.

"If an unknown resistance is inserted between the test terminals, the meter deflection will be reduced proportionately. The meter scale can, therefore, be calibrated directly in terms of the external resistance required to limit the meter current to that value. When the unknown resistance is equal to the internal resistance of the ohmmeter circuit, the meter will read half-scale. The formula used for the calibration of this simple ohmmeter type is also shown in Fig. 5. For the measurement of extremely low or high value of resistance, more complex ohmmeter circuits are employed.

Meter Accuracy

"Meters rated at better than 1% accuracy fall into the 'prevision laboratory' category and should be used only only in protected, 'well behaved' circuits **requiring** such high accuracy. They are usually of the 'portable' type which are used with the needle in a horizontal position for greater accuracy and have mirror-scales to reduce **parallax** errors in reading.

"In the accuracy range below 1% are the great majority of 'general utility' or 'panel' meters which are the 'work horses' of the electrical instrument family. They are usually mounted in test equipment panels and switchboards in a vertical position. The average accuracy of this class of meter is about 2%.

"The accuracy rating of all d.c. meter types is usually given in terms of the percentage of full-scale reading to which the meter is guaranteed. An angle range meter reading 100 volts full scale and rated at 1% accuracy would thus read within 1 volt of the correct value at any deflection. At 10 volts this meter could, therefore, be in error by as much as 1 volt, or 10%. Good engineering practice dictates that meters be used at a minimum of one-third full-scale deflection for this and other reasons.

(to be continued)

VK-ZL-OCEANIA DX CONTEST, 1971 RESULTS

AUSTRALIA

Phone Section

Call Sign	80	40	20	15	10	Total
VK1BC	470	1380	400	950		6800
1AOP	215		3270	365		3850
1GB			3070			3070
VK2APK	1020	3695	9480	4240	55	18490
2XT	235	615	11220	3025	285	15380
2EB			3480			5570
2ABC			5570			3480
2RX		185	808	705		1740
2CM			1550			1550
2BAZ	225		620	385	200	1430
2AFA			1030	165		1195
VK3SM	400	190	2735	160		3485
3ARY			1990			1990
3QV			1440			1440
VK4LT	475	210	8885	2080	3235	14885
4VX			12235			12235
4SF			6420			6420
4PJ	345		3190	1490	1255	6280
4RF	275		3085	290		3650
4XY			3325			3325
4AK			2920			2920
4XJ		55	1330	2525		3570
4QA		1045		245		1630
VK5BW	335	720	7400	490		8945
5NO			4480	1765		6245
5SW						3690
5WV			3465			3465
VK6CT	910	4240	7690	6345	3840	23025
6HD				11755		11755
6TU			375			375
6NA				250		250
VK7GK	1515	1805	10300	2175		15795
7JV		1935	4295			6230
7KH			1055			1055
VK9GN	380	1395	12225	7080	4020	25200
(includes 100 pts. on 160 mx)						
9RY				6630		6630
9LV	535	220	4500	1070		6325
9KS			6265			6265

C.w. Section

Call Sign	80	40	20	15	10	Total
VK1AOP	515	635	1425	480		2540
VK2APK		4390	8400	4825	1075	19205
2BRK		4970				4970
2GR	530	895	1035			2460
VK3KX	380	2090	5395	3590	925	12380
3MR			10010			10010
3OP	1565	4930				6550
(includes 55 pts. on 160 mx)						
3FC	65	390	550	300	55	1300
VK4VX			8835			8835
4KX	680	265	1330	3735	1455	7465
4RF	735	510	1785	1250		4280
4AK			2050			2050
4KI			1730			1730
4XY				1260		1260
VK5NO			3565	4645	980	9190
VK6HD	2475	5365	8315	7365	4105	27625
6CT	1705					1705
VK7GK	1150	3715	7800	2630	565	15860
7LJ		390	1405			2030
7RY		475		55		900
VK8HA		165	1800			1965
VK9HL		3855	3795	3486	275	7550
9GN						3855

NEW ZEALAND

Phone Section

Call Sign	80	40	20	15	10	Total
ZL1AGO	1730	2250	8430	4610	1245	18465
(includes 200 pts. on 160 mx)						
1BKX	570	1360	8980	4545	2680	18335
(includes 200 pts. on 160 mx)						
1AMN	1320	165	7595	4125	885	14520
(includes 430 pts. on 160 mx)						
1AVO			13345			13345
1AKY	165		4815	4465	1300	10800
(includes 55 pts. on 160 mx)						
1AIZ	1190	1385	4980	2260	900	10715
1AAS			8165			8165
1AMM			4545	3075		7620
1BHQ	1360					1360
ZL2GJ	275	600	4085			4960
2AWH	2885					2885
ZL3NS			9300			9300
3RK		1885	3310	540		5735
3ABC			1590			1590
ZL4MY			2280			2280

C.w. Section

Call Sign	80	40	20	15	10	Total
ZL1BN	1065	3135	4500	1350		10050
1AFW	1065	1025	3665	1770	480	8005
1AIZ	730	2250	2815	1535	165	7495
1AMO		7065				7065
1BDN			6395			6395
1AMM		965	3860	13750		6200
1ARV			5150	300		5450
1BHQ	1580					1580
ZL2ON	55	2520	6370	1590		10535
2CD	1025	2350	5190	1790		10355
2AWH	1650					1650
ZL3GQ	2115	4805	6805	3140		16865
3IS						4100
3ABC	480	160	870			1510
3CP			785			785
ZL4FX	1170	3285	6570	1170		12195
4AT			5595			5595
4BO		4910				4910

AUSTRALIAN AND N.Z. LISTENERS

	Phone	C.w.
L2949	Log not Scored	
L3042		3965
L4104	7150	
L5112	3355	
L6112	3845	
ZL149	9476	

OVERSEAS

* Multi-operator stations.

Phone Section

Japanese Phone

JH1ARJ	10745	JA5DDF	1030
JA1ADN	7644	JA6EFT	161
JH1UDO	3048	JA6CRA	10
JA1KVT	1776	JA7MA	4698
JA1SKE	1155	JA7AD	4439
JA1CRW	852	*JA7YFY	888
JH1CJC	460	JA7FC	682
JA1BUI	352	JA7KXD	638
JA1ILN	240	*JA7YOJ	248
JA1MYW	72	JA7GAX	30
JR1THE	58	JA7KTY	72
JR1CIJ	30	JA7HYS	9
JA2IYJ	10912	JA8ARA	3894
JA2KLT	4970	JA8BXD	2080
JA2HGA	420	JA8DIV	580
JH2AKH	140	JA8SW	560
JH2DBQ	5	JA8FDB	92
JA3AAW	5635	*JA8YCO	24
JA3MVI	2688	JA9AG	10556
JA3FD	114	JA9BKW	45
JH3CRT	104	JA0BBB	1272
JA3OGE	100	JA0DOK	550
JH3ACC	60	JA0HXH	70
JA3XYC	28	JA0FMB	60
JA4BEX	8073	JA0KOH	30
JA4ERX	390		

European Phone

DL8NU	10860	OH3NJ	176
DL8PC	2340	OH2BME	12
DK3SE	1800	OH6RH	8
DJ4KD	1328	OH7OV	8
DL7PR	825	OH1XA	2
DM2AYK	561	OK1MPP	2480
DM4SPL	24	OK3MM	800
EA3JL	24	OK1MGM	84
F9RM	1056	ON5KL	1408
F6API	80	OZ1LO	2412
G3SSO	4225	OZ4IA	126
G8WS	814	OZ4PM	50
G2DC	520	OZ3PO	18
G6XL	468	OZ7BQ	15
HA5KDQ	1730	PA0JMH	174
LA5QK	156	SM0ATN	324
LA9OI	140	SM3BUS	130
OH2BO	4997	SM7ABL	48
OH2BBR	3544	SM6CDG	12
OH2SX	1164	SP3DOI	3078
OH3WF	1030	YU1SJ	1155

North and South American Phone

K0QHD	414	WB6JOD	2176
W2FCR	1598	W6DQX	1168
W3GM	6090	W7NQ	897
W3TV	2730	KG4EQ	312
W3YHR	369	PY4AP	936
W4ORT	4776	PY3APH	698
K5SNI/4	1368	*VE7VP	998
W4WSF	630	VE3GCO	639
K5MDX	7807	VE6AYU	217
K5LVZ	80	XE1LLS	1794
W6HX	13431	YV5CK	1030
W6DGH	2562	YV1ACI/5	576

U.S.S.R. Phone

European S.S.R.			
UA1CS	2338	**Kaliningrad**	
*UK6LAZ	1968	*UK2FAD	70
UA4CZ	1632	**Byelorussia**	
UW1AR	913	*UK2WAF	787
UA4RZ	876		
UW6LC	550	**Turkoman**	
UA4QM	450	UH8BO	252
UA3GM	340		
*UK3YAB	336	**Kirghiz**	
UK4WAB	108	UM8FZ	1892
Asiatic S.S.R.		**Moldavia**	
UW9AF	5150	UO5BZ	96
*UA9IF	1276		
UA0MI	1068	**Lithuania**	
UW0IQ	715		
UA9FU	306	*UK2BBB	7400
UA0ABC	270		
UA9MT	182	**Latvia**	
UA0DG	108	UQ2HO	140

World-Wide Phone

CR7FR	150	OD5BA	196
EQ2BQ	3990	VS9MF	370
FM7AJ	296	PY3APH	8
HI8LC	72	YJ8BL	23200
HS1ACH	1638		

Oceania Phone

KH6RS	65231	KH6IJ	10140
KG6ALY	24310	KR6AY	1933
KH6GMP	19560	9V1QJ	1030
KG6JAR	14120	VR1AA	29274

Overseas S.w.l. Section

Phone

BRS26431	4420	JA4-6600	570
BRS32525	3192	JA4-4665	588
DM3501/L	360	LA-M5605	279
DM-EA5323/M	160	LZ-2K36	18
DM2703/A	140	NL-455	40
DM4835/O	140	OK1-18197	5
DM4939/B	48	OK1-15835	20
I3-13395	1736	ONL-1090	1090
I1-12387	168	ONL-383	396
JA01320/1	4218	OZ-DR1529	2048
JA1-4876	3036	UB5-073-389	5360
JA1-13603	1079	UL7-0238	1378
JA1-7777	580	UA9-158-8	1020
JA1-11166	558	UA3-123-118	510
JA8-2108/1	16	UA4-09543	144
JA3-7604	70	W3-12836	504

C.w. Section

Japanese C.w.

JA1KVT	8930	JA3AAW	2975
JA1ILN	7524	JA3DXD	626
JA1ADN	7030	JA4BJO	11914
JA1NPV	6734	JA4BEX	7200
JA1FGB	5313	JA4DZ	6
JA1SR	4480	JA5DQN	342
JA1JKG	4339	JA4AQR/5	45
JH1AWI	2828	JA5MG	36
JA1AFF	2047	JA6FFV	387
JE1CTM	1040	JA6EHG	144
JA1KNZ	572	JA7MJ	5511
JH1BYL	234	JA7FC	5115
JA1QGT	78	JA7AD	3822
JH1HTK	72	*JA7YFY	1691
JA2LA	3675	JA7BVA	884
JA2TH	3588	JA7KXD	630
JA2DNA	2736	JA7GAX	416
JA2MYA	960	JA7JQG	261
JA2HGA	612	JA8GR	18
*JA3YAW	6368	JA9YBA	11230
JA3KM	4185	*JA9CWJ	342

European C.w.

DL8NU	4452	OH5UX	2024
DM2BJD	3354	OH3MK	193
DJ4KD	1938	OH3MF	192
DM4YEL	1617	OH7NW	70
DL7NS	320	OH3NZ	60
DM3UE	84	OH7OV	8
DM2BVE	40	OH2BME	2
DM3SUH	18	OK1KOK	3068
DM2ATL	12	OM0BOB	1491
DM5SDL	12	OK2QX	976
DM2AOL	10	OK3MM	854
F9YZ	324	OK1MGW	370
F8TC	288	OK2BBJ	360
F6API	48	OM0BCI	70
G5RP	1520	OK1KYS	50
G2DC	1224	OK1KZ	48
HA5KFZ	1560	OK2BBI	40
LZ1SS	410	OM0BDE	40
LZ1AG	209	OK3AS	30
LZ2EE	216	OK2BGR	14

European C.w. (continued)

OK1MSP	6	SM0BYG	780
OK1AQW	2	SM6ARH	288
ON4XG	418	SP9EFP	1660
OZ1LO	3960	SP3DOI	1168
OZ4PM	975	SP9ABE	812
OZ1W	560	SP8HR	40
OZ3PO	252	SP6DMJ	36
OZ2X	180	SP3AUZ	12
OZ7BQ	40	SP5ATO	12
OZ5ME	2	YO7DL	594
PA0VB	96	YO2QY	418
PA0JMH	56	*YU1EXY	418
		YU1NOL	189

North and South American C.w.

W1EVT	4530	W6DQX	1600
W2LWI	2852	K6SDR	1547
W3GM	4676	*W6DGH	945
W3TV	144	WB6JOD	825
W4ORT	2496	W6MAR	814
WB4SPK	256	W6RGG	217
W4WSF	27	K6TG	60
KS5TFG	1980	W7NQ	162
W5OB	1159	W8KIT	2208
WA6EPQ	16176	W8VSK	825
W3NU/6	9844	W9JA	1323
K6QZ	8246	PZ1AH	440
K6OC	3756	YV5CKR	702

Oceania C.w.

KH6RS	52272	KG6JAR	9944
KH6IJ	10180	KR6AY	8510
		VR1AA	24381

World-Wide C.w.

CT2AZ	2	VU2UR	2
PY4AP	936		

U.S.S.R. C.w.

European S.S.R.

UA1DZ	5220
*UK6LAZ	4032
*UK1AAA	2664
*UK4WAB	870
UW1CX	852
UW6LC	624
*UK3YAB	611
UA4HC	540
UV3TA	363
UW3HV	210
UA4WAE	198
UW3EH	171
UA3AAE	160
*UK4CAA	120
UA3RH	114
UA4PU	100
UA3VA	84
UA3RJ	56
UA3TA	18

Asiatic S.S.R.

UA0FBA	5220
UA0ZS	2770
UW9PT	2070
UA0ZI	1919
UA0CAV	1818
UW9WL	1548
*UK9CAE	792
UV9CU	693
UA0OOO	638
UA9NN	616
UW9AT	380
UA0LJ	360
UK9HAC	360
UA9MEW	240
UA9TS	160
UA0ABC	90
UA0CAX	72
UA0LL	54

Kaliningrad

UK2FAP	720

Ukraine

*UK5WAZ	1305
*UK5IAZ	590
UY5OQ	243
*UK5MAG	182
UB5VAA	133
UB5TQ	126
UB5OE	112
UB5VK	32

Byelorussia

*UK2WAF	1078
UC2WP	280
UC2XX	90
UC2WJ	48

Azerbaijan

UD6CN	372
UD6AM	286
UD6AS	40

Georgia

UF6QAB	144

Armenia

UG6JJ	140

Turkoman

UH8BO	840

Uzbek

UI8OJ	65

Tadzbik

UJ8AB	120

Kazakh

UL7GW	704
*UK7GAA	540
UL7CH	168
UL7TA	119
UL7CT	2

Kirghiz

UM8FZ	990

Moldovia

UO5AP	44

Lithuania

UK2BBB	2080
UP2BV	315

CHECK LOGS

DM2CCM	OH1XX	SP3CDQ	UA3FF
DM3XUE	OK1AII	SP5ARN	UA3OG
JA5FTP	OZ3Q	SP5BSV	UW4NH
K4PR	SM5CVC	SP6DXB	ZL2AI

Overseas S.w.l. Section

BRS6604	40	JA4-4665	90
DM2968/L	704	JA7-3147	660
DM2703/A	108	LZ2A123	120
HE9EVI	560	W3, M. Caditz	4775
JA2-1885	624		

OVERSEAS POINTS/MULTIPLIER SUMMARY

PHONE—	80 mx	40 mx	20 mx	15 mx	10 mx	Totals		Points
KH6GMP	5/1	8/1	361/11	604/7	—	978/20	equals	19560
JA1ARJ	—	5/2	177/13	106/12	19/8	307/35	equals	10745
JA2IYJ	—	15/2	231/14	80/9	26/3	352/31	equals	10912
DL8NU	—	2/1	13/5	350/13	45/7	410/26	equals	10660
W6HX	12/3	48/8	159/12	125/11	23/3	363/37	equals	13431
VR1AA	59/8	65/8	395/13	105/9	73/4	697/42	equals	29274
YJ8BL	68/9	65/11	352/12	94/8	—	580/40	equals	23200

C.W.—	80 mx	40 mx	20 mx	15 mx	10 mx	Totals		Points
KH6RS	81/9	300/10	303/13	327/10	78/6	1089/48	equals	52272
JA4BJO	21/7	38/10	125/12	62/12	13/5	259/46	equals	11914
DL8NU	2/1	24/8	111/12	20/6	2/1	159/28	equals	4452
WA6EPQ	25/6	71/9	26/8	29/7	—	151/30	equals	4530
UA1DZ	6/2	36/9	108/11	22/7	2/1	174/30	equals	5220
VR1AA	61/9	89/10	172/10	204/10	41/4	567/43	equals	24381

Coming Round the Bend

(The abbreviations in this poem are the customary telegraphic contractions used to save time, when working.)

I well remember Charlie Teede,
Who used to work the races;
No need, indeed, to ask for speed,
He'd pace it with the pacers.
Lord help the man who "broke" him once
Or questioned his "creations";
On him a flood of scorn was turned,
The atmosphere with brimstone burned,
And Pitman, green with envy, squirmed
At his abbreviations.

"Te field got wl awa to ti
& as ty settld dwn
Te Shicer 1st t bk te ll
ws flwd bi Jo Brown.
In close proxim. ws Tired Tim,
Tn cme Arbtratn,
Bhnd te bunch ws Cntr Lunch,
Gd Luck and Hi Taxatn.
Ty whizzed alng (and so did Charles)
Wthout te least cessatn.

"C r t b te topwt jumped
& got on trms wi Shicr,
Wo tn & tre hs bundl dumpd
Wh labld him a twicer."
I scrambled after Charlie
Like a trailer round a bend,
Then gave OK—but queried:
"'C R T B' u send.
Now what is that in aid of?
Enlarge a bit my friend."

The sounder nearly hit the roof
As Charlie scorched the line.
"U ort t be on te rabtproof
Or up at Doodlekine.
Chasin poddies rnd te yd
Shd b ur chf pastime.
T tnk u cndt wrk tt out
It nrly mkes me slk,
Ani ole gin or rousabt
Cd write it wi a stik.

Fanci a man wo calls hmslf
A tgst askg tt!
A record O S vacuum
Is located neath ur hat.
D'u want it in oils bi Lambert?
Or carvd on a marbl stone?
Ole "Winja" Mortill cd tke it
& ud nvr hr a moan;
Not spelt out li Ive dun fr u
By cut dwn t te bone.

"Wl I mst sa its te bst dspla
Of ignrce Ive hrd,
O all te sqrtrs in W A
Ur crtnli te "bird"
& ani hrsh remks Ive mist
Ty all cn b inferd
'C R T B'—its knwn bi rote,
Wt wd u ha me snd?
Its cmg rnd te bnd—u goat
COMING ROUND THE BEND!"

(Origin unknown, submitted by VK2ACV.)

1972 ROSS HULL VHF CONTEST RESULTS

Due to an error, VK7KJ was shown under Section (b), whereas he should have been listed under Section (a).

☆

OVERSEAS MAGAZINE ABSTRACTS

"73 MAGAZINE"—FEB. 1972

Tuning Mr. Morse's Key; A Solid State High Frequency Regenerative Receiver; Headsets and Ham Radio; The Perfect CW Signal; Tips for Raising Your Code Speed to 20 w.p.m.; Why Not Try QRP?; VHF Dummy Load Wattmeter; An Experimental Sweep Oscillator; Who Can't Learn the Code?; The Greater Dipper; CW DX on ½ Watt; 20-60w. 1-4 Band Tx; A Look at Oscillator Kits; The Saga of Mikes and Earphones; Quick and Easy PNP/NPN Transistor Sorter; Self Contained Reflected Power and CW Monitor; Using and Improving the TEN-TEC Transceiver Modules.

"VHF COMMUNICATIONS"—FEB. 1972

Portable SSB Transceiver 144 MHz. with FM Attachment, Part 1, Circuit Description and Specification; Calculations for a Linear VFO; A Digital Calibration-Spectrum Generator, Part 2, 1.001 MHz. Accessory and Power Supply; Modifying a 27 MHz. Walky-Talky to 2 Mx; An Integrated AF-Amplifier and Voltage Stabiliser; A 9 MHz. IF-Module for Frequency Modulation; Transistorised Linear Amplifier for 2 Metres; Circulators and Isolators; Index to Volume 3 (1971).

"CQ MAGAZINE"

February.—Putting the Heath HW-17 and HW-17A on Two Metres FM; New Transformers for Old; FM STO Oscillators; Quicker and Better Low-Pass Filter Design; Twin Bisecting Loop Antenna.

March.—Antenna Basics; The K7GCO DXer 20 Metre Vertical; Improved 20 Metre Performance from the EICO; 753 Transceiver; FM Repeater Directory; Tips for Increasing CW Copying Speed; Crystal-Stable Tunability in Two Metre Mobile.

April.—A Converter for 225 MHz. FM; Riding on a Moon Beam; Inexpensive Antenna Tuner Coils; Designing Phased Vertical Arrays; Do-It-Yourself Operating Desk; FM Marker Generator, Timer, 220 Plan.

"QST"—FEB. 1972

The Crud-O-Ject; Some Notes on a 7 MHz. Linear-Loaded Quad; High Frequency Atmospheric Noise; Measuring Phone Patch Levels Accurately; Hybrid Quacker Box; The VE-2HN Digital CQer using Nand Logic; An Experimental Receiver for 75 Metre DX Work; Reviews of the Antec Universal Transmatch Model UT-1, and Heath Model IB-102 Frequency Scaler.

"BREAK-IN"—MARCH 1972

History of Manawatu Branch; Film Review, A Ham's Wide World; A Two Metre FM Transmitter; A 144 MHz. Converter; AGC for the Swan 260; Two-Band Single Support Mobile Aerial; A Simple 432 MHz. Tripler; A 432 MHz. Head Pre-Amp.; A 432 MHz. Crystal Locked Converter; Radio Society Members Provide Vital Link in Probing Atmosphere.

"SHORT WAVE MAGAZINE"

January.—Design for a Three-Band CW Transmitter; Digital AFSK Oscillator; The RF Ammeter and Radiated Power.

February.—Going VHF/MM; RTTY Converter Considerations; Regulated Power Supply Unit for Bench Work; Electronic Morse Code Generators, Part IV.

"RADIO COMMUNICATION"

February.—Some Thoughts on Mixer-type VFOs for the 2 Metre Band; the TAD100 as a Tuneable IF System; 160 Metres with the FT-101; RFI Forum; A Clipper Filter for Transistorised Exciters.

March.—A Mixer for 70 MHz.; Curing Interference to Relay TV; A Multi-vibrator IF Sweep Generator; 160 Metres with the FT-101; Portable Operation with Ground Planes.

—VK3ASC.

VHF

Contributing Editor: ERIC JAMIESON, VK5LP,
Forreston, South Australia, 5233.
Closing date for copy 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK3	144.700	VK3VE, Vermont.
	144.925	VK3ZQC, Moe South.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.300	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
	145.250	ZL2VHP, Palmerston North.
	431.850	ZL2VHP, Palmerston North.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

Some alterations and additions to the beacon list this month. Firstly, a frequency change for VK6VF at Bickley from 52.006 to 52.300. This change will be helpful as the area around the former frequency becomes very congested during DX openings, and should strong signals be emanating from the Eastern States, then the beacon could well be smothered for some time. I also received a letter from Selwyn ZL2TGT advising of the installation of two new beacons at Palmerston North, each with the call sign of ZL2VHP. The 144 MHz. final runs 6 watts output from a QQE03/20, while the 432 MHz. beacon runs 3 watts output from a QQE06/40. The antenna in each case is a turnstile, and keying 1 kHz. f.s.k. The present site of the beacons is temporary and is 50 feet a.s.l. Shut down of the beacons is automatic if the power output drops or the keying fails. Selwyn goes on to mention he believes their 432 MHz. beacon to be the first in operation in Australasia. If this applies to unattended operation this is probably correct. However, VK6 operated a beacon on 435 MHz. as required for some years, and an experimental beacon was tried in VK5 some years ago also on that band, so they have been tried before.

Selwyn also is looking for any VKs who are prepared to correspond with him re the coming launch of AOC (Oscar 6) 144-28 MHz., to exchange ideas and possibly arrange for some skeds through the instrument. If you are interested write to Selwyn Cathcart, ZL2TGT, 406 Featherston St., Palmerston North, N.Z.

HIGH POWER 144 MHz. FROM VK4

Very pleased to hear from Malcolm VK4ZEL recently and to learn he has just finished a new 4CX250B p.a. for use on 144 MHz. and plans to run the legal limit on 144 MHz. into a 20 element beam at present under construction! He is interested in operating skeds to the Southern States. Finds it difficult, because of work, to be available at night during the week, but should be okay week-ends. Available most mornings between 0800 and 1000. He is also looking to create some activity north of Brisbane to places such as Bundaberg and Maryborough, about 160 air miles. Modes of operation for the present will be a.m. and n.b.f.m., but construction is soon to start on s.s.b. gear for 6 and 2 metres.

The news contained in the above paragraph certainly will be welcome in the southern States, particularly VK5. There seems every prospect for improvement in propagation for the next few years, permitting long distance tropo contacts on 144 MHz. and we have been looking for someone in VK4 to set the ball rolling. So when the DX pounds through next year on 6, remember to keep an ear on 2, Malcolm may be there. However, despite all this, he is still very keen to work any VK4 country stations on 2 metres, and would welcome skeds.

Other points from Malcolm's letter indicate that 6 metres opened every day to VK7ZGJ from 24/12/71 to 15/1/72. Good openings to VK6 on 26/11. ZL1AVZ also worked. JA DX started in Brisbane about 3/3/72 for two hours from 1230. During week days some JAs worked, mostly by VK4ZHW mobile and John VK4ZJB from his favourite hill top. Best opening 23/3 with JAs working VK2, 3, 4, 5 and 6. An interesting point from his letter is that quite a few Amateurs are constructing equipment for tuneable use on 2 and 6 metres, with a corresponding drop in interest from Channel B and an upsurge on 52.525 MHz. f.m. Thanks for your letter Malcolm, good to hear something from VK4, please write again and assure all the southerners you will really be there when 2 metres opens up next December!

NEWS FROM PORT MORESBY

Nice letter from Rex VK9ZAP this month with news from a little heard area, VK9. Rex advises he has his s.s.b. gear working, is running about 300w. p.e.p. output to a 6 element yagi on 52 MHz., using an FT101 and home-brew transverter. On 22/3 he worked Bob C21AA in Nauru and KH6HK in the Marshall Islands. C21AA operates transceive s.s.b., v.f.o. controlled with a Drake TR6. Bill KH6HK operates a.m. on 51.997 and tunes our band for contacts. The same day, Rex worked VK8ZCJ in Darwin. On 26/3 five JA stations worked and VK8VF beacon heard. All openings occurred around 2100 (Interesting—VK-5LP). Channel 0 from Melbourne and Brisbane were being heard regularly from mid-December and still being heard every second or third night even in April with signals varying from 3 to 9 plus.

Rex advises a second active 6 metre station there now in Peter VK9ZMN, running 5w. a.m., while David VK9AH will soon be on the band also with low power. Rex's main calling frequency is 52.010 and he leaves the receiver running on that frequency. He is also interested in the possibility of establishing a beacon in Port Moresby, and carrying out some investigations.

T.E.P. REPORT

Ross VK4RO summarises trans-equatorial propagation reception this year from his location as follows: After a very good summer DX season on 6 metres, T.E.P. was not expected at all. So far it has been better than the 1970 season and from VK2 reports this is confirmed. The first JA was contacted on 20th February with 5 x 5 signals, and JAs have been heard on 6 metres on most days since. Contacts were made to VK2 (Sydney area) on 19th and 26th March around 1200, and to VK5 on 9th at 1930.

On 22nd March, Bob C21AA on Nauru was contacted at 2105 at 5 x 8 s.s.b. He had just contacted Rex VK9ZAP, and he later worked other VK4s. At 2220 on the same day, Bill KH6HK on Marshall Is. was worked 5 x 9 a.m., after he had contacted many VK4s south of here (Ayr). He reported hearing the c.w. beacon VK8VF on 52.195 MHz. 5 x 9 during the evening. Later at 2240 C21AA and KH6HK heard working each other on c.w. During these contacts the JAs were still there, and the next day they reported hearing VK4 signals at 0030.

The band openings here have been observed as follows: 50 MHz. a.m. (50.2 and 50.3 a.m. nets) heard first around 1300 to 1400. 50.5 MHz. JA1IGY carrier only 9 (trouble with keyer)—from about 1400 until about 1700 to 1900 with slow QSB, sometimes quite deep. From then until about 2000 it closes or only weak 50 MHz. signals heard. At 2000 the evening openings commence with the usual fast QSB (flutter), sometimes making a.m. unreadable, but not so with s.s.b.

144 AND 432 MHz.

Geoff VK3YER reports that the large high pressure system over southern Australia during April resulted in some good openings on both bands, particularly to VK7, in fact, on the 19th April the VK7 2 metre beacon was audible all day around S7. Of interest was a 2 metre five-way QSO on 26th March with widely separated stations, VK3ANP (Wangaratta), VK3AKR (Mt. Waverley), VK3AMH (Ballarat), VK3AMK (Frankston) and VK2ZEO (Deniliquin). All were s.s.b. except for VK2ZEO. Peter notes also that Ian VK3ALZ is building a new quad-yagi, 33 feet long, and which would be even longer if he had a larger backyard!

V.H.F. CONTESTS

Once well supported, today they are losing their appeal. Some people in responsible circles are becoming worried at this state of affairs, one in particular being Peter VK4PJ, Federal Contest Manager. Peter has written to me seeking information as to what is wrong at present. I will outline a few thoughts on the matter and would be pleased to have constructive criticism at what I say, or what Peter has said, or anyone else for that matter, but let's get the discussion going.

Ross Hull Contest.—Some former keen participants say it is now too easy with a seven-day and 48-hour periods for scoring. They thought it was better when the Contest ran for a month and the total score for that period decided the winner. Okay if you had a month's holiday at the time, and could get around the XYL for that period to allow you to operate. Plenty of people don't have holidays at Christmas, often a few days off or at the most a week or so. Therefore the 7-day period should suit them. And for a super-human effort, 48 hours continuous operation is not impossible. Whichever way you have it, not all will be satisfied.

Channel 0 has been blamed for lack of operation in at least two centres, Brisbane and Melbourne. No doubt it has spoilt things for a lot of people, but more and more are getting back on the band in various ways from those areas as times and techniques progress. Give a good opening to VK5 from VK3 and there will be plenty of stations to work. Melbourne boys can readily supplement their scores by the large amount of 144 MHz. activity to be found there, plus working into VK7. Brisbane boys seem to be lacking here, very few reports come to hand of any concerted activity on 2 metres. Granted Victoria's population density and short distances help a lot, but it shows what can be done.

In some areas there are problems peculiar to the geographical location. My own is a case in point. Very, very noisy 11 kv. power lines next to the antenna on a hot summer's day will put S9 plus power leak on all bands from broadcast to 144 MHz.—so I close down. These are often the days of greatest DX activity. I know others suffer in much the same way. And going in the opposite direction, have some stations a considerable advantage due to geographic isolation? If some restrictions were placed on 6 metre scoring would these operators be penalised through having no alternative operation such as 144 MHz.? Lots of questions such as these remain to be answered.

Notwithstanding all the above, the crux of the problem is not the level of participation, which generally appears to be good, but the distinct lack of interest when it comes to sending in the log. I personally believe the time allowed for logs to be sent in from the last Ross Hull Contest as too short. Those stations which amassed a large number of contacts would welcome a rest away from log entries for a while. If all contests were standardised to the extent that if a contest finished say on 15th January, then log entries would need to be posted not later than 15th February, something easy to remember, and giving a little more than a month in which to complete the job. Human failings being what they are, there will be those who miss the date through their own fault. Let's hear from those of you who are interested.

Remembrance Day Contest.—Main problem here of course is that there is really no incentive unless you live in an area of high population (Amateur-wise) density. You could almost burst your lungs out and get a contact with a couple of operators in Melbourne (from Adelaide) on 144 MHz. and what value would it be, 1 point per contact!! In the same time one could work 8 or 10 stations in Melbourne on 40 metres for one point per contact, and with a few other States thrown in for good measure with more points still. Most contest operators like a sporting chance of chalking up a fair score if he is prepared to spend quite a few hours at it, but he soon becomes discouraged when no matter what the effort, the score is still 1 point. Some incentive scoring for v.h.f. is needed, with bonuses for extra bands worked. What ideas have you on this one?

John Moyle National Field Day.—It's almost the same with this Contest, the v.h.f. operator working on 52 MHz. and up does not stand much chance—I know, I've tried it on many occasions. Best time I have had was last Contest when VK5AWI set up a large multi-operator station and all bands were available from 160 metres to 144 MHz. The v.h.f. station included in that set-up did well, but they really worked hard for their scores, whereas it was a pushover for h.f. operators. Portable to portable on v.h.f. is still only worth the same as portable to portable on h.f. Your thoughts again please.

That should be enough on the subject of v.h.f. participation in contests for this time, otherwise the Editor will be getting out his blue pencil; hope this doesn't occur as the Federal Contest Manager and I feel this is a matter which needs airing in the V.h.f. Notes, where it is likely to be read by the more interested.

That's all for this time. Closing with the thought for the month: "We don't mind youth having its fling. But we do object to some of the things they're throwing." 73, Eric VK5LP. The Voice in the Hills.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

TEN METRE CONVERTER WANTED

Editor "A.R.," Dear Sir,

I was wondering if a ten metre converter could be described in "A.R."—a simple xtal locked unit with 7 to 9 MHz. output. I have tried to get one ready built, have had an ad. in "A.R." also over W.I.A. broadcast, but no luck. Even had chaps ring me to find out if I had any luck. I tried to get one from stores in ZL. Same answer. "Sorry we cannot supply". Have enquired from N.Z.A.R.T., no go.

If they are that hard to come by perhaps the circuit of a good one either solid state or valve would be very helpful. It's only an idea, maybe one of the VK3 members could design one for an item in "Amateur Radio".

Hope my letter may be of interest to you.

—I. Bailue, VK2TN.

[Can anyone help VK2TN—preferably with an article for "A.R."—Ed.]

"ATTENUATION MARKER"

Editor "A.R.," Dear Sir,

The "Attenuation Marker" described in the April issue of "A.R." appears to have strong possibilities and I believe every Ham shack should have one or maybe two.

Would you please advise whether the VK3 Division will be putting up a kit for the marker, especially for v.h.f. operation, as I am of the opinion that the markers would be useful at gigglehurts frequencies. It is suggested an opportune time for release of the kits would be April 1, 1973.

Permission to publish this letter is granted.

—S. G. Svensen, VK2CAS.

"20 YEARS AGO"

The Editorial page of the June 1952 issue of "Amateur Radio" dispensed much timeless advice. To quote a few paragraphs from it would be very worthwhile. "To obtain that coveted A.O.C.P. study is necessary, whether be it at home, one of the Institute's Divisional Classes, a local Radio Club, or a Commercial College. Self discipline is a must if you expect to be successful". Note that only the A.O.C.P. was mentioned because the Limited Certificate had yet to come. "Create a habit of study. Piecemeal attempts at study may eventually get you your ticket—but you may be too old to enjoy being a Ham for long". That's worth thinking about.

Leading the technical articles was an article by Hans Albrecht, VK3AHH, "How to Use Dry Rectifiers". The use of selenium or copper oxide rectifiers was almost unknown amongst Australian Amateurs, although several well respected pieces of disposals gear used them. Who could ever forget the type 3 Mark 2. The circuits that Hans presented in his article look very familiar. The voltage doubler, the bridge, plus the full-wave and half-wave; identical in appearance to our modern power supplies using silicon diodes. Hans Albrecht was a prolific writer of articles for "A.R." during the early 1950's.

Ken Wall and John Jarman continued part eight of "Television Made Easy" with a run down on t.v.i.; something we were going to learn about just a few short years later.

That famous poor man's antenna, the G8PO, rated a short article. It seemed that no one could agree on the best method to feed these things, no doubt they could have made good use of an s.w.r. meter of the type we find so useful nowadays.

Field days were not popular in 1952. The Contest Committee reported only 12 entries and stated that they considered it hardly worth continuing the Contest; winners were VK2ASW, VK4HR and VK4KS.

"Fifty Megacycles and Above" reported a new record on the 288 MHz. band; VKs 5MT, 5KC and 5RO used mod. oscs. and super regens. to cover 106 miles.

A report on the 1952 Federal Convention included a photo of the delegates at work; looking rather younger than the last time I saw them—Max VK3ZS, George VK3XJ, Charlie VK3AUP, Arthur VK4FE, Bob VK7OM and George VK3AG. Little mention was made of business discussed, but one of the visitors to that Convention sounds familiar: Arie Bles, PK4DA, of Sumatra, who was on his way to the U.S.A.

—VK3OM.

DX

Contributing Editor: DON GRANTLEY,
P.O. Box 222, Penrith, N.S.W., 2750.
Times: G.M.T.

My apologies for the absence of notes in the last issue. I was travelling around the State in the course of my job at the time and just could not make the deadline.

Many thanks to those who have written in this month, particularly Hank VK2BHL and Geoff VK2AHK, who have taken a lot of trouble to send information which is of great interest and value to anybody trying to compile a page of this nature.

There is evidently plenty of good DX to be found. I have not been active for quite a while due to other commitments, but if the list of calls worked by VK2BHL is anything to go by, then there is little excuse for empty logs. Some of the stations worked together with QSL information, are listed as follows: 1C8TRA, FG7TD, 9Y4VV, VP2MZ (C/o. Bethel P.O., Monserrat), LX1BR, KP4DOK (Box 568, F.P.O., New York, 09555), 3A0FY/M (via F9UW), OD5CS (W3HNK), PZ1CI (Box 395, Paramaibo, Surinan), 3A2EE (F0DH), JW1EE (W2GHK), TT8AC (W4SPX), and many more. Although I don't compile the complete lists which are sent for my use, they are used to assist other sources, who in turn assist me with up to date information.

Geoff VK2AHK has been quite busy on all bands and I note the following on 10 metres, which I believe has been doing some strange things in the latter weeks of March. SV0WOO, 9J2HI, 5Z4NH, ZS5FE, ZS2AG and TG4SR were worked on this band, while VU2, ZE8, 6D4, 7Q7, ZS6, ZS3HT (QSL to WB2NQR), CR6, ZS2, A2CAB (QSL to W2RHK), 9J2 were worked on 15 metres. His list on 20 metres shows that there are plenty of good pickings to be had on this reliable band, even if it is being riddled by commercials. GC2, BV2, CT2, ZB2CG (via G3LQP), HC4CC (Box 32, Manta, Ecuador) (hope you get a card from him Geoff. I've been chasing HC for 20 years and have not scored a card as yet—Don), C31FA (QSL to G3VUI), FM7WR (Box 444, Fort de France), plus W9IGW/CE0 on San Felix.

The last mentioned station was part of an operation lasting four days over the first week of April, they operated on all bands, finally going QRT on April 14 after a very good period of operation. All QSLs should go to K3RLY.

The prefix block A3A to A3Z was allocated to the Kingdom of Tonga by the I.T.U., and the appearance of the new call signs caused something of a flutter as they hit the air. Most of us are becoming immune to these weird prefixes, but our friends the American gentlemen still go berserk when something different appears in the prefix, or should I say those of them that are desperate for something new appear in the most devastating dogpile that one could be excused for thinking that Clipperton Island had been activated. Anyway, the Tongan boys have now settled down to a more mundane period of operating, and with the initial pressure off, then maybe some of the regular DX chaps can get a go. Bill VR5FX was one of the early ones to appear with the new call, and is still doing fine business and keeping manager George ZL2AFZ busy. A35LT is quite active, his QSLs go to VK6WT.

There have been quite a large number of special prefixes on the air during April. Here are some with details included where possible. FL0QQ, no details, but QSL to F2QQ. HD1RF, manager is WA8TDY, or you may QSL direct to him, R. Farrow, Box 15, Quito, Ecuador. USSR50 is the net control for operations relating to their commemorations between Feb. and the end of June. He is on every Wednesday at 0845z.

Several 9H3 calls appeared in the first two weeks of April, Joe 9H3RUM being QRV from the Royal University of Malta, whilst 9H3D was a special operation by SM7DNL, cards for this one should go to SM7DXX. JT0AE is a new prefix, and this chap, whose manager is OK1AQW, hopes to be on 160 in June.

WG2SFC and WP6JPL were busy from the Goddard space centre during the Apollo 16 mission, which has just concluded.

Last prefix of interest is DX0PAR, the PARA commemorative station, cards for which should go to the DU QSL Bureau.

Some news from Swan Is., to the effect that Dave KS4BY is QRV, as is Leo KS4BH whose manager is K3RLY; however, KS4BA who gave his manager as WA2AAJ is a pirate, and the quoted manager has never heard of him.

Of interest is a station signing UPOL-19, he is a floating ice station and it is suggested that his cards go to UW3HY. His c.w. frequency is 14020, whilst he can be found on 14209 s.s.b., often at around 0700z.

Currently George and his wife Eva, WA2BAV and WB2AQC, are travelling through West Africa on a DX-pedition which will just be completed as I write these notes. They had hoped to operate from many countries on the African continent, and it would be wise to QSL to their home address.

More from the Apollo 16 mission. WB4ICJ is the Kennedy space station, if you worked them, send 50c for a special certificate. WG3SFC QSLs via WA3NAN; WC4BCC goes to K4REL, and WM3ARW goes to WA3ATP. Another special station from U.S.A. was WJ4AZF active at the Norfolk Azalea festival during the last week of April. W4OPM will handle the cards, and asks for IRC.

YJ8BL is usually about during the Pandoras Box net, 14278, however he has a sked with manager W6NJU on 14240 s.s.b. on Sundays at 0600z, he asks that the breakers contain themselves until after the sked ends—maybe this is too much for some.

A number of silent keys are reported in Geoff Watts DX news sheet over the past few weeks. G2TP, Clifford Andrews, 9th April; W8BAH, Harry Tummonds, Founder and Secretary of Amateur Radio Editors Association. Finally, VP9AX, Reggie Pitman, died as the result of a heart attack on March 22.

From VP9 we note VE0NK/VP9 is Brian VE1DV and asks for his cards to go to that station's QTH. Many VP9 stations are reported active 14110, 14200-225 s.s.b. on Sundays 1400-1600. There is a very good award for working 100 VP9 stations with no time limit, no date limit—and wonder of wonders—no charge. Apply to Awards Manager, Box 275, Hamilton.

FW0AB is reported on most nights at around 14250 on s.s.b., also down on 7080 s.s.b. at about 0800z. His manager is VE6TP.

Jerry 9L1JT is active on all bands, address for his cards is Box 1111, Freetown, Mike 9L1MF on 14200 at 1800z, his address is Box 376, Freetown, whilst 9L1VW has been heard on 15 and 10, manager is W9FIU.

AWARDS

In the interest of space I will abbreviate these as much as possible.

Ten O Award.—Issued by the J.A.R.L., Box 88, Ueda City, Nagano, Japan, 386.

JY Award.—Silver Award 5 stations, prefixes 1 to 9, and the gold award 10 stations on three bands. Full details later.

1971 W.A.E. RESULTS

C.w. section won for Europe by DJ8SW, and non-Europe by W1BPW; s.s.b. Europe DL4LK, and the remainder of the world by JY8BI. The Oceanic continent winner on phone was VK2APK.

160 METRE NEWS

It would appear that there is a lot of activity on this band. I have just read Stew Perry W1BB's bulletin which deals with top band only. I am amazed that there is so much activity in VK. At this QTH it is virtually impossible to hear much at this frequency due to local QRM. W1BB would like to hear from you; QTH Stew Perry, 36 Pleasant St., Winthrop, Mass., 02152, U.S.A., will find him.

At this point I guess the Editor is starting to hunt for space, so my thanks to all who have assisted, including those named in the text, my thanks to Albert Cash, Chuck Ferguson, Bernard Hughes of ISWL London, and their magazine "Monitor", and Geoff Watts DX news sheet. 73, de Don.

CONTESTS

June 10/11—R.S.G.B. Summer 1.8 MHz.
July 15/16—HK DX Contest.

AUST. VHF/UHF RECORDS

APRIL 1972

MHz.		Date	Miles
50/52	VK3ALZ to XE1FU	1/5/59	8418
144	VK5BC to ZL2HP	23/12/65	1957
432	AX5ZKR to AX7ZRO/7	15/3/70	482
576	VK5ZJL/5 to VK5QZ/5	28/12/69	195
1296	VK3AKC to VK7ZAH	17/2/71	273
2300	VK3XA to VK3ANW	18/2/50	9.0
3300	VK3ZGT/VK3ZGK/3 to VK3ZDQ/3	14/12/63	63
10000	VK5CU/5 to VK5ZMW/5	30/12/71	59.5

—D. H. Rankin, Federal Executive.

IONOSPHERIC PREDICTIONS FOR JUNE 1972

Here are the Predictions for June from charts supplied by the I.P.S.D. The charts compare similarly as for May, however, the M.U.F. is slightly lower, thus further reducing activity in the 28 MHz. band. 27 MHz. propagation is possible for the approximate times for May, at 28 MHz., and could prove of interest in this sparsely populated section of the spectrum, especially in VK areas.

SR and LR are short and long routes respectively.

27 MHz.—

VK1—JA	minus 2	1500	plus 2
VK3—JA	minus 2	1500	plus 2

21 MHz.—

VK1—8P (SR)	minus 1	0800	plus 8
8P (LR)	minus 1	0900	plus 5
VE1 (SR)		1200	
VE1 (LR)		1000	
W6		0700-1600	
VK0 (M)	minus 3	1200	plus 4
9G1 (SR)	minus 1	1700	plus 1
9G1 (LR)		700, 1700	
ZS6	minus 2	1700	plus 2
G (SR)		1800	
G (LR)		0800	plus 1
VK3—UA3	minus 5	1800	plus 1
VK0 (M)		1000-1500	
VK4(T)—KH6		0700-2100	
VK5—KH6		0700-1700	

14 MHz.—

VK1—8P (SR)		0600-2030	
8P (LR)		0400-1300	
VE1 (SR)	minus 2	1400	plus 2
	minus 2	2300	plus 3
VE1 (LR)	minus 2	1100	plus 5
		1900	
W6		1130-0430	
PY1	minus 1	0800	plus 4
VK0 (M)	minus 1	1800-	
		1800	plus 1
VK6		0900-1830	
9G1 (SR)		0900-1300	
		1500-1900	
9G1 (LR)	minus 5	1600	plus 4
ZS6	minus 4	1800	plus 3
G (SR)	minus 2	0900	plus 3
G (LR)		0700-1900	
VK3—VK8		0800-1830	
UA3		2000-1200	
VK0 (M)	minus 5	1300	plus 5
VK4(T)—KH6		1400-0200	
VK5—KH6		1200-0700	
VK6—W1	minus 2	2200	plus 3

7 MHz.—

VK1—8P (SR)		1500-2100	
8P (LR)		0800	
VE1 (SR)		1600-2100	
VE1 (LR)		0900	
W6		1600-2400	
PY1		0600	plus 2
		1500-2000	
VK0 (M)		1600-0800	
VK6		1700-1100	
9G1 (SR)		0300-0900	
9G1 (LR)		1600	
ZS6		2400-0900	
G (SR)	minus 1	0600	plus 1
G (LR)		1530	
VK3—VK8		1800-0900	
UA3		0200-0800	
VK0 (M)		1500-0900	
VK4(T)—KH6		1700-0300	
VK5—KH6		1700-0300	
VK6—W1		1900	plus 1

3.5 MHz.—

Reduce 7 MHz. by one hour.

Smoothed Monthly Sunspot Number Predictions for June: 51, July 49, August 47, Sept. 45.
—Swiss Fed. Observ., Zurich.

KEY SECTION

The members of the section at 1st May were:

VK2GS	VK3NR	VK4DP
VK2YB	VK3TX	VK5FM
VK2ANY	VK3XB	VK5NO
VK2BPN	VK3ZM	VK6WT
VK2BRK	VK3AJY	VK7LJ
VK3KX		VK7OM

There are also four applications from VK4 still being processed.

A lot of well known call signs are missing from our list—what about it fellas? We cannot invite DX to try and work a group with only 20-odd members. 73, Deane VK3TX.

SILENT KEY

It is with deep regret that we record the passing of—

VK2APN—H. C. St. John.

DIVISIONAL NOTES

VICTORIA

The Eastern Zone at their A.G.M. on 19th March voted office bearers for 1972-73 as: President, VK3ADB; Vice-President, VK3YGJ; Secretary/Treasurer (temp.), VK3ZNC; Publicity Officer, VK3BBB; W.I.C.E.N. Co-ord., VK3ZX; Zone Station Officer, VK3DY; Zone Councillor VK3UG.

SOUTH AUSTRALIA

The Swap and Shop was quite well attended last April, with many dropping in to see how it was going. How about bringing some gear along to the next in September? Put all those old projects aside for sale to brighten someone's spring.

The South Eastern Radio Group Convention at Mt. Gambier on the Queen's Birthday long week-end this June promises to be the best ever, with most of the usual attractions and a few foxy surprises. If you haven't booked accommodation yet, you had better be well equipped with a warm sleeping bag, since those frosty mornings are hard to take. The rumour that one fox will be hidden under the ice on the Mutton Chop lake must surely be false! 73, Bart VK5GZ.

NEW CALL SIGNS

FEBRUARY, 1972

VK1BD—T. W. Stewart, 50 Caley Cres., Narrabundah, 2604.
VK1RY—R. G. Henderson, 53 Hannaford St., Page, 2614.
VK1ZKI—R. J. Langdon, 4 Rowsell Pl., Weston, 2611.
VK2EE—C. E. Frederickson, 73 Gray St., Kogarah, 2217.
VK2HE—D. Gosben, 43 The Avenue, Newport, 2106.
VK2YC—C. G. Woolston, 21 Eulabah Ave., Earlwood, 2006.
VK2ZX—J. Mowatt, 8/31 Cornelia St., Punchbowl, 2196.
VK2AUY—A. C. Russell, Station: 55 Planthurst Rd., Carlton, 2218; Postal Box 1225, G.P.O., Sydney, 2001.
VK2BBV—L. R. Burston, 4 Hillside Cres., Glenbrook, 2773.
VK2BEP—E. J. Papesch, Blowhole Park, Kiama, 2533.
VK2BGD—K. A. Wallis, 54 Combined St., Wingham, 2429.
VK2BMG—A. E. Mathews, 162 Victoria St., East Maitland, 2323.
VK2BML—M. K. Morris, 69 Rous St., East Maitland, 2323.
VK2BVL—A. J. Wright, 211 Dalton St., Orange, 2800.
VK2BVT—G. E. Ulm, 23 Elizabeth Bay Rd., Sydney, 2000.
VK2ZJO—P. A. Jackson, 8 Eden Ave., Turramurra, 2074.
VK2ZKA—A. J. Smith, 151/3 Slattery Pl., Eastlakes, 2018.
VK2ZOU—W. E. G. Cockburn, Rm. C270, S.M.H.E.A. Camp, Talbingo, 2697.
VK2ZOV—E. Gauja, 58 Centenary Rd., Merrylands, 2160.
VK3EB—J. E. Falkner, 17 Burgess St., Hawthorn, 3122.
VK3AOW—M. S. Hodgson, "Pine Ridge," Sheffield St., Montrose, 3765.
VK3BGH—J. W. Williamson, 30 Latona Ave., Knoxfield, 3180.
VK3BSH—Swan Hill District Radio Club, Drill Hall, Gray St., Swan Hill, 3585.
VK3BSM—Mildura District Scout Radio Club, Sunrasia Area Training Centre, Mildura Airport, 3500.
VK3WIA/R5—Wireless Institute of Australia, 7 Suffolk Cres., Mt. Martha, 3934.
VK3ZER/T—E. J. Roache, Watson St., Murchison, 3610.
VK3ZPL—L. G. Offer, R.A.A.F. Base, Laverton, 3027.
VK3ZVG—R. G. Farnsworth, Block 606, Cardross, 3496.
VK4ZKE—K. C. Dalton, 68 Buller St., Everton Park, 4053.
VK5EX—H. A. Fisher, 113 Seventeenth Ave., Renmark, 5341.
VK5VI—B. T. Roberts, 75 Sampson Tce., Mitchell Park, 5043.
VK5ZJV—J. W. Ross, 3 Pellew St., Parafield Gardens, 5107.
VK5ZME—A. E. Morgan, 237 Peachy Rd., Smithfield Plains, 5114.
VK6AM—J. A. Moran (Sgt.), Sgts. Mess, R.A.A.F. Base, Pearce, 6085.
VK6DV—C. J. Dodd, 3 Liege St., Woodlands, 6018.
VK6ZHJ—H. W. S. James, 27 Strome Rd., Applecross, 6153.
VK6ZJC—R. J. Campbell, 99 Dundas Rd., Inglewood, 6052.
VK6ZJR—P. J. Ryan, Station: Brown's Range, Carnarvon; Postal: P.O. Box 98, Carnarvon, 6701.
VK7CIC—W. E. Dixon, 112 Nelson Rd., Sandy Bay, 7005.
VK8DP—D. H. Pelham, 32 Memorial Dr., Alice Springs, 5750.
VK9AM—J. Glenn, P.O. Box 6177, Boroko, P.
VK9ZMN—P. McNab, P.O. Box 2086, Konedobu, P.

LICENSED AMATEURS IN VK

FEBRUARY 1972

	Full	Lim.	Total
VK0	14	2	16
VK1	92	28	120
VK2	1383	527	1910
VK3	1326	676	2002
VK4	526	211	737
VK5	516	217	733
VK6	363	141	504
VK7	154	65	219
VK8	35	12	47
VK9	88	14	102
	4497	1893	6390 Grand Total

HAMADS

- A free service for individual members.
- Four lines of print free (200 characters/spaces); full charge at $6 (min.) per col. inch if exceeded or for repeats: includes name/address—use QTHR if correct in Call Book.
- Copy, please in typescript if possible, and signed.
- Excludes commercial-class advertising.
- Exceptions only by PRIOR arrangement.

For full details see January 1972 "A.R.." page 23.

FOR SALE

Glen Waverley, Vic.: A.W.A. Carphone MR3B, c/w Mosfet Preamp., trans. 300v. p.s.u., rock. arm. mic., ant. and co ax., Ch's A, B, C xtals, $65 o.n.o. VK3ZU (03) 560-5136.

Brisbane, Qld.: Trio 9R59DS h.f. Receiver, 0.55-30 MHz., bandspread 80-10 mx, added voltage regulator and xtal calibrator, excellent condition, $200 o.n.o. VK4ZJA, QTHR, Ph. (072) 70-1223.

Bridgewater, S.A.: Racal RA17 3rd i.f. tuning unit, input variable 2-3 MHz., output 100 kHz., $40. BC221 frequency meter, $40. ex-late VK2DQ. VK5MO, QTHR, Ph. 39-2084.

Melbourne, Vic.: Hallicrafters HT32 240v., 100w. p.e.p., $175. Type 3 Mark 2, no mod., little use, $25. VK3AOD, 55 Park St., Moonee Ponds (Ph. 37-5814) or Box 25, Ararat.

Highett, Vic.: 18AVQ Antenna with accessory for one-man installation, $55. BC221 complete with workshop manual, $40. VK3JI, Ph. (03) 630-7975, AH (03) 93-6505.

Melbourne, Vic.: Trio JR60 Receiver, $85. VK3BFW QTHR, Ph. (03) 85-4952.

Geelong, Vic.: SR-700A Comm. Amateur Rx plus a further five bands 600 kHz. between 4-30 MHz. 18 months old, as new, $350. G. Himolij, 118 Wilson Rd., Newcomb, Geelong, Vic.

Melbourne, Vic.: Mullard 5/7 Stereo Amp. and pre-amp./ wideband Tuner, 14w. r.m.s. total, $31.95 o.n.o. VK3ZIP, 1/42 Creswick St., Hawthorn, 3122. Ph. (03) 81-7221.

South Oakleigh, Vic.: Mobile P/S Topaz 12 to 600-300 and —120v. at 0.45a. Suit Swan, Galaxy, etc. Also Miniwhips 80-40-20. $65 the lot. VK3AOK QTHR, Ph. (03) 57-1107.

WANTED

Melbourne, Vic.: Heavy brass Morse Key. VK3BFW, QTHR, Ph. (03) 85-4952.

Canberra, A.C.T.: FT200, FTDX-401 or similar transceiver. Also FRDX-400 or similar receiver. Please contact J. Campbell, 6 Parer St., Scullin, A.C.T., 2614. Ph. (062) 54-1546.

Mt. Waverley, Vic.: Navy model R.D.O. receiver with plug-in tuning units TN-1B, 2B, 3B and 4B/Apr1. Any condition. Prices and particulars to VK3ZY (ex VK3AKR QTHR). Ph. (03) 277-4748 a.h.

Sydney, N.S.W.: Johnson Matchbox or similar. VK2AAY, Ph. (02) 467-1962.

Box Hill South, Vic.: 14AVQ or similar trap vertical antenna. Price and details to VK3AHG, QTHR, Ph. (03) 288-2024.

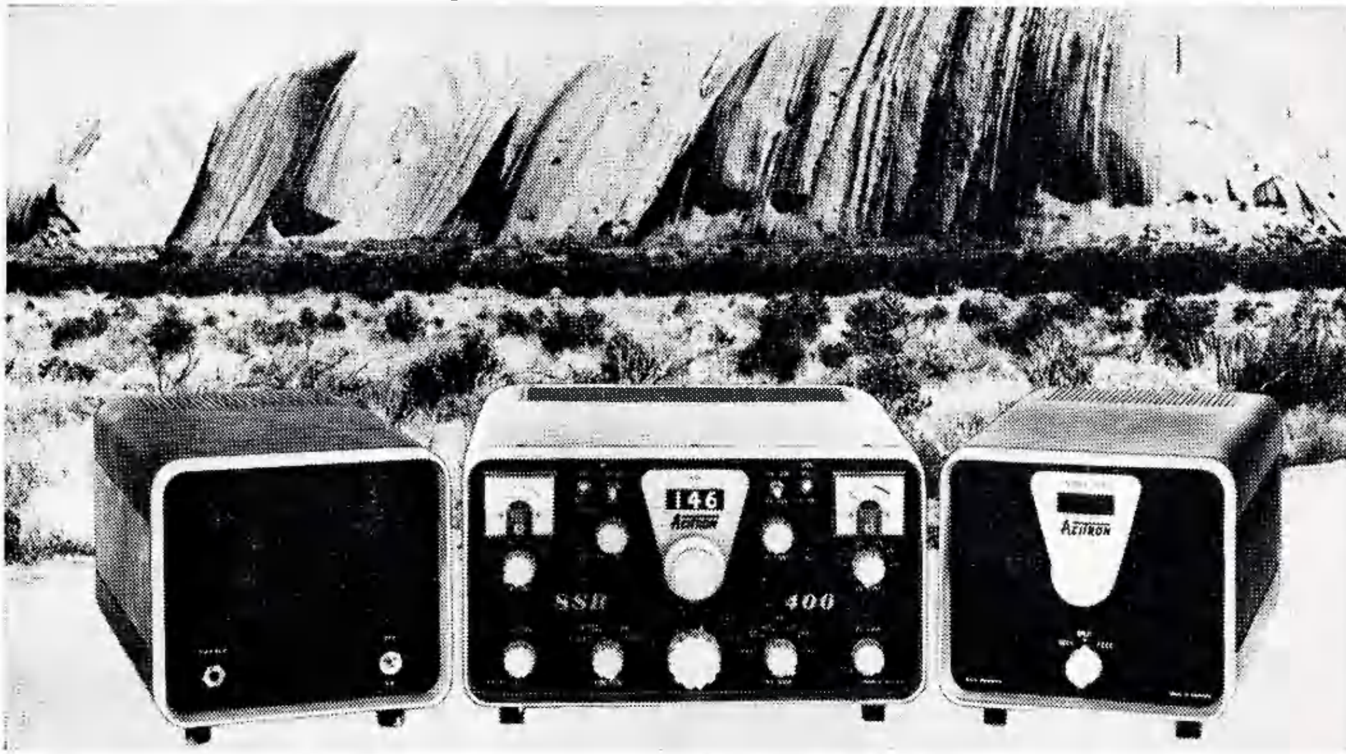
Sydney, N.S.W.: Carphone 146 f.m., ready to go on Channel B at least. Ph. (02) 871-7758 or 888-1333.

Glen Waverley, Vic.: Collins 75S1, S2, S3 or S3B. Must be mint. VK3OM, QTHR, Ph. (03) 560-9215.

Glenroy, Vic.: A.m. Tx. Prefer table-top model using Geloso v.f.o. Write/Phone Peter Simpson, VK3ZWG, Ph. (03) 306-5456.

Brisbane, Qld.: ID-11/APS-4 and ID-19/APS-3 Radar Indicator Units. VK4NS, QTHR, Ph. (072) 59-1945.

An SSB Transceiver with solid state digital readout, rapid tune-up system — and it's made in Australia.



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It features a solid state digital readout of frequency accurate to ± 50Hz and a patented tune-up system which permits tuning under large signal conditions with no danger of overloading the P.A. valve.

Silicon semiconductors are used exclusively, including dual gate MOSFET, linear and digital integrated circuits. A wide band driver stage provides the input to the P.A. valve which is a dual VHF tetrode.

Construction is on epoxy-glass circuit boards with gold-plated edge connectors.

VOX and AGC are included, and an effective noise blanker is available as an optional extra. Modes of operation are USB, LSB, CW and AM (receive only). A calibrated 'S' meter and receiver gain control are provided.

Specification

Transmitter Output Power: 400 Watts pep.
Receiver Sensitivity: 0.5µV for 10dB S+n/n.
Receiver Selectivity: 2.4kHz at 6dB down, 4.2 kHz at 60dB down.
Frequency Ranges (amateur bands): 1.8–2.0 MHz; 3.5–4.0 MHz; 7.0–7.5 MHz; 14.0–14.5 MHz; 21.0–21.5 MHz; 28.0–29.0 MHz; (additional bands) 3.0–3.5 MHz; 7.5–8.0 MHz; 14.5–15.0 MHz; 21.5–22.0 MHz.
Carrier Suppression: at least 50 dB.
Unwanted Sideband Suppression: at least 50 dB.
IF and Image Suppression: at least 50 dB.
Frequency Stability: Less than 100 Hz drift in any 30 minutes (after warm up).
Antenna Impedance: 50 to 75 ohms. *Audio Output:* 3 watts into 4 ohms.
Size: 12W x 6½ H x 12½ D inches. *Weight:* 19 lbs.
Price: $800.00 excluding Sales Tax.

Also available

Transmitter Test Set: A multi purpose instrument designed with the amateur in mind. It incorporates: Aerial switching, Internal 50 ohm load with overload protection, Single and two-tone oscillators, Power meter, SWR meter. Price: $90.00 excluding Sales Tax.
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DC Power Supply: Input: 12 volts dc (nominal). An external 4 ohm loud speaker is required. Price: $105.00 excluding Sales Tax.
Remote VFO: Utilises the transceiver digital readout. Permits split frequency working. Price: $80.00 excluding Sales Tax.
IF Noise Blanker: Permits reception of weak signals under conditions of high ambient interference. It is effective with ignition noise in particular. Price: $40.00 excluding Sales Tax.
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JULY, 1972

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1F5G	1.50	6DX8 (ECL84)	1.93
1R5 (DK91)	2.25	6EH7 (EF183)	1.84
1S2 (DY86)	1.77	6EJ7 (EF184)	1.84
1S4 (DL91)	3.64	6EM5	1.62
1S5 (DAF91)	2.13	6ES6 (EF97)	2.25
1T4 (DF91)	2.13	6G8G	3.06
1U4	2.13	6GV8 (ECL85)	2.05
5AS4	1.61	6GW8 (EC186)	2.05
5U4G/B	1.61	6H6G/T	0.50
5X4G	2.82	6K8	3.99
5Y3GT	1.38	6K8G/T	3.41
5Z3	2.82	6L6	5.85
6AB7	4.11	6M5 (EL80)	1.53
6AC7	0.50	6N3 (EY82)	1.32
6AG5	0.50	6N7GT	3.99
6AJ8 (ECH81)	2.37	6Q7G/T	2.94
6AK5 (EF95)	1.80	6S2 (EY86)	2.25
6AL3 (EY88)	1.84	6S4/A	2.82
6AL5 (EAA91)	1.39	6SJ7	0.75
6AM5 (EL91)	2.37	6SL7GT	3.18
6AM6 (EF91)	2.28	6SQ7	3.18
6AN7A (ECH80)	1.90	6U7G	0.75
6AN8	3.06	6V4	1.10
6AR7GT	2.28	6V6	3.64
6AU4GT/A	1.84	6X2 (EY51)	2.40
6AU6	1.61	6X9 (ECF200)	2.09
6AU7	2.87	6Y6G	3.18
6AU8	3.06	6Y9 (EFL200)	2.30
6AV6	1.35	12AT7 (ECC81)	0.75
6AW8A	1.93	12AU6	1.78
6AX4GT	1.84	12AU7A (ECC82)	1.72
6B8	3.88	12AX7 (ECC83)	1.95
6BD7 (EBC80)	1.30	12BE6	2.02
6BE6 (EK90)	1.68	12SN7GT	3.18
6BH5	1.61	16A5	2.15
6BV7	1.61	16A8 (PCL82)	2.46
6BW6	2.25	17Z3 (PY81)	2.25
6BW7	2.23	30	0.50
6BX6 (EF80)	1.61	KT66	6.20
6BZ6	1.61	KT88	7.05
6CA7 (EL34)	3.58	6146 (OV06-20)	7.29
6CM5 (EL36)	2.65	OA2/150C2-4	1.46
6CQ6 (EF92)	2.59	QV03-12	2.34
6CQ8	1.86		

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JULY, 1972
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The Editor reserves the right to edit all material, including Letters to the Editor and Hamads, and reserves the right to refuse acceptance of any material, without specifying any reason.

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CONTENTS

COVER STORY

Our Technical Editor, Bill Rice, VK3ABP, trapped by the photographer whilst doggedly working through one of the forthcoming articles.

(Photo by VK3YAZ and VK3ZU)

QSP

Required: $X \times 75c > Y \times 40c$

Mathematics and Amateur Radio do not appear to be a miscible combination but nevertheless arithmetic and simple mathematics must be of some concern to the Amateur in the technical pursuits of his hobby. The Federal Council in Convention at Easter got involved in some arithmetic juggling, too, but not of an electronic kind. The income versus costs for the production of YOUR magazine "Amateur Radio" were the topic and no amount of juggling could reduce the costs to a level under that of the income. Thus, the Council had to budget for a deficit for YOUR journal which means that the Institute may have to subsidise "Amateur Radio" from general funds.

Everyone knows only too well that costs have spiralled upwards in recent years—you don't need a far reaching memory to recollect when a four-penny stamp was all that was necessary for a 1 oz. letter to travel within Australia. Today it is 7 cents—over double. Tomorrow—? A far cry from the original "Penny Post" envisaged by Sir Rowland Hill. Ten years ago, the cover price of "Amateur Radio" was 2/- (20 cents). Today it is 40 cents—just double. But how much is "Amateur Radio" worth to YOU. 30 cents? 50 cents? or 75 cents? To overcome the budgeted deficit, a price in excess of that currently charged must soon be put into effect, but the magnitude of this increase CAN be reduced, but it will require that YOU, the member, must do something.

The administration and printing of the journal may be carried out by the Federal Council, but it belongs to YOU. Do YOU want to see further improvements in content and presentation? Are YOU prepared to do something about it? On past performance probably not, as apathy is a disease rampant within the general membership in recent years. YOU leave it to the President or the Secretary or one of the other willing few. YOU usually do so, so why should YOU change? If YOU don't really want "Amateur Radio" you needn't change—just let the magazine die. But are YOU really prepared to let THAT happen?

What then is required? $X \times 75c > Y \times 40c$, i.e. 75X to be greater than 40Y where X and Y are the numbers of subscribers to "A.R." in the future and now, respectively. The 40c and 75c are possible cover prices. The requirement can be satisfied if $X = Y$, i.e. the membership remains the same in the near future and it can even be satisfied if $X < Y$ (X smaller than Y), i.e. the membership drops off in the future. But the most desirable state of affairs is achieved if $X > Y$ (X greater than Y), a situation given by an increase in membership. If $X >> Y$ (X greatly exceeds Y), then the large increase of cover price from 40c to 75c may not be necessary. This is where YOU come in. Can you make $X >> Y$ by getting ONE more member subscription to "Amateur Radio" between now and the end of this year? Only ONE new member per member is necessary. Do YOU accept the challenge?

D. H. RANKIN, VK3QV,
Federal Vice-President, W.I.A.

OLD MAGAZINES

Mr. A. K. Ross (Ph. 92-4847, Melb.), at one time a member and working with radio back to 1925, has some old copies of "Radio and Television" and "Radio, Television and Electronics" for sale if any collector of these items is interested. Please ring him first for an appointment.

ZM

"Break-In" for May announced that ZM prefixes have been approved by their Post Office for use by Amateurs from 3rd June, 1972, to 2nd February, 1974, in celebration of the 1974 Commonwealth Games.

BAND PLANNING

You should not fail to read the Victorian Division Notes this month.

S.E.A. NET CONVENTION

The 1st Annual South-East Asia Net Convention at the Ambassador Hotel in Penang over the New Year holidays 1972 saw Paddy Gunasekera, 4S7PB, as the guest of honour. Others at this Convention, for which a special call 9M2TI/P was activated, included Fred Laun, HS5ABD; Big John, 9M2IR; Phil Wight, VS6DR; Keith Smith, VK9KS, and many others. The 2nd Convention is for 10th-12th November this year in Bangkok. ("Ohm" Mag., J/F '72)

INTRUDER WATCH

The R.S.G.B. recently received the new call sign GB2IW, primarily to receive and exchange Intruder Watch information. The IW organiser and sked manager is G3PSM and overseas skeds would be welcomed.

OVERLAND TEL-LINE

Issue No. 1 of the Australian Post Office News asks readers to give or loan morse keys, sounders and overland telegraph line relics for commemorative efforts and displays to mark the centenary of the line between Adelaide and Darwin completed at Frew's Ponds on 22/8/1872.

AUSTRALIAN CALL BOOK

The next edition of the Call Book is due to be revised for printing early in 1973. A decision has been made that this printing will be similar to the 1971 edition, mainly because a hard-working member of the Institute has been maintaining, free of charge to the W.I.A., a card index of all licensees. Without Ron's excellent records it would have been necessary to programe all the non-members into the EDP system preparatory to an EDP-offset printing of the Call Book. Just one of those ways in which non-members could cost the Institute a lot of money.

OUTPOST AND MARITIME RADIO SERVICES TO S.S.B.

A circular issued by the Australian Post Office public relations office in May reveals that in the change over to s.s.b. no new or replacement d.s.b. equipment will be licensed for the outpost service after 1st January next and for the maritime service (except 2182 kHz. distress) after 1st July next. Outpost control and maritime coast stations by then will be on s.s.b., but outpost stations will have till 31/12/77, ship stations above 4 MHz. will have till 1/1/78, and ship stations below 4 MHz. will have till 1/1/82 to effect the change-over. These plans are internationally co-ordinated by the I.T.U.

"A.R." FOR NEW MEMBERS

If you happen to be a new member, your first "A.R." will most likely come to you at the same time as your second issue. In other words, the two will be bulk posted together.

J.O.T.A.

A reminder that this year's Jamboree on the Air, the 15th, will be held over the week-end of 21st and 22nd October. It will begin at 0001 hours LOCAL TIME on the 21st and end at 2359 hours LOCAL TIME on the 22nd.

ONE LOOK AT THE FUTURE

The frontier of Amateur Radio is in the field of satellites. I urge those who have the responsibility for plotting the future course of Amateur Radio to look far ahead, lest the immediate problems within and outside our ranks occupy too much of our energies to the long-term detriment of Amateur Radio. (Address by A. Prose Walker, W4BW, Amateur and Citizens Division Chief, F.C.C.—courtesy "CQ", June '72.)

INTERFERENCE—NEW ANGLES

Some space is currently being given in the R.S.G.B.'s "Radio Communications" to interference problems and the "social blackmail" angle in having to get along with the neighbours. One writer said that t.v.i. can be dealt with, but suggested that the greater problem is posed by the transistor radio, radiogram, tape recorder "and of all things, the electronic organ". Could a station with a clean signal be restricted or closed for causing interference to unlicensed apparatus—such as the electronic organ or stereo amplifier? We have t.v.i. and b.c.i. What would this be—Hi-Fi?

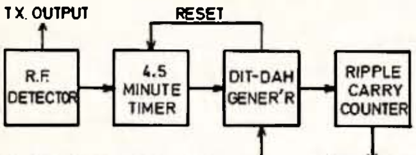
A SOLID-STATE AUTOMATIC REPEATER IDENTIFIER

R. F. DANNECKER,* VK4ZFD

The following is a description of the identifier used in VK4EI/R2, the repeater of the Gold Coast Amateur Radio Club. It was not originally intended to publish the circuit of this identifier as it is based on the W6FNO device described elsewhere. However, the number of requests received by the Gold Coast Amateur Radio Club warrants its publication.

The explanation of the operation of the device assumes a basic knowledge of digital logic and counting circuits.

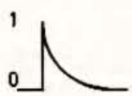
Fig. 1 shows a block diagram of the system. Figs. 2, 3, 4 and 5 show the detailed circuit of the keyer.



BLOCK DIAGRAM OF KEYER
FIG. 1

The prototype was built in an enclosed aluminium box and all connections fed in through feed-through capacitors. Circuit operation is as follows:

(1) Ref. Fig. 2. The transmitter r.f. output is rectified and used to switch the SE4002 hard on. This, in turn, switches off the 2N3641 with its emitter earthed. The 400 μF. capacitor then charges through the 5.6 meg. resistor until the voltage across the capacitor is sufficient to cause the 2N3641/2N3644 synthesised SCR to switch on. Then the 2N3644 with its emitter connected to +3.6v. is saturated. Components in its collector circuit cause a positive-going pulse to be generated on the C_D rail.

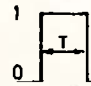


where 0 = 0 volts and
1 = +3.6 volts.

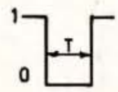
(2) Ref. Figs. 3, 4 and 5. The positive-going pulse on the C_D rail causes the 3 x MC790P ripple carry counter to be set to zero. Now the dit-dah generator receives an input from the dit rail of the diode decoding matrix.

Operation of the dit-dah generator is as follows. Consider a

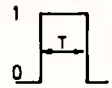
transition on the dit rail. This results in a negative-going pulse being applied to the dah-blank monostable which will not switch (for the moment consider 2a, 2b and 3b simply as inverters); however, a positive-going pulse is applied to the dit monostable and the output of the monostable is



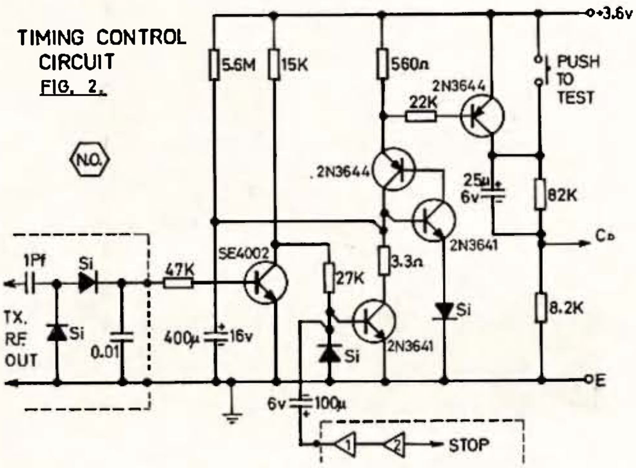
where T is determined by the time constant of the monostable. This causes a



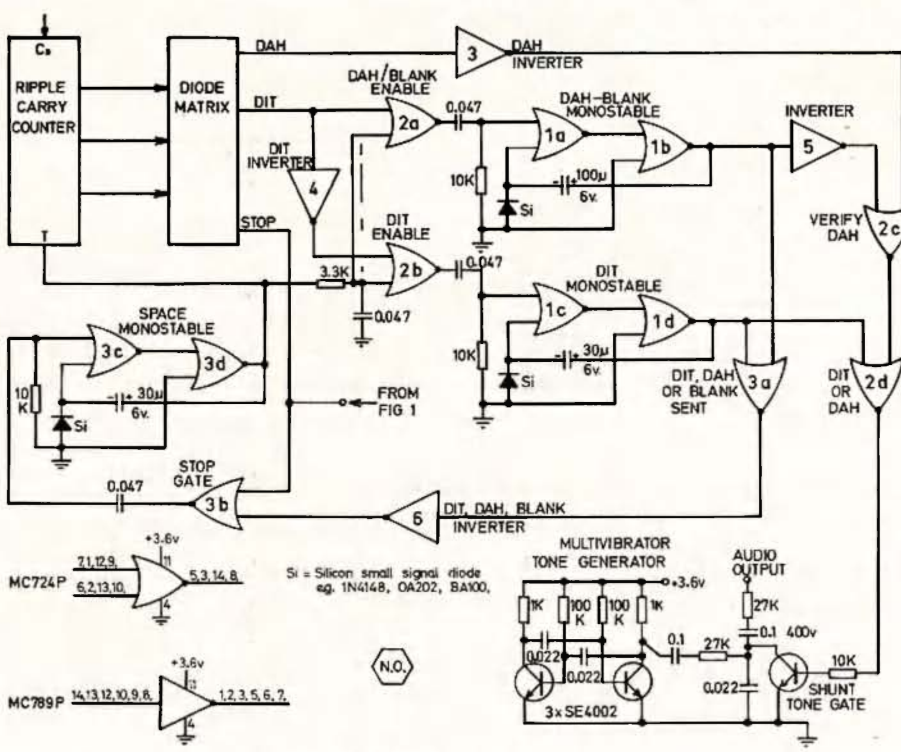
at the base of the shunt tone gate transistor which then produces a "dit" on the audio output. A positive-going pulse is also applied to the space monostable which produces a



output which is fed to the toggle input of the ripple carry counter. On the trailing edge of this pulse the ripple carry counter steps on to the next number. Now if a



TIMING CONTROL CIRCUIT
FIG. 2.



DAH-DIT GENERATOR FIG. 3

* 52 Pohlman Street, Southport, Qld., 4215.

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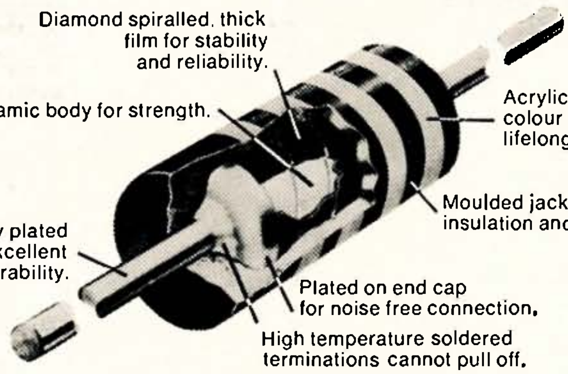

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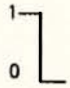
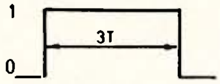
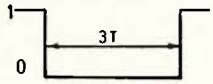


transition appears on the dit rail the dah-blank monostable produces a

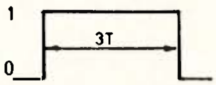


output.

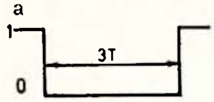
This results in a



on one of the inputs to 2c, the "verify dah" gate. If, during this period, there is a 1 on the dah rail, there is a 0 on the other input to 2c, hence a



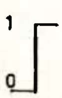
is produced at the output of 2c. This results in a



on the base of the tone gate transistor and a "dah" is produced at the audio output. If a 0 were present on the dah rail during this period, the output of 2c would remain at 0 and no output would appear on the audio (corresponding to a blank). In an identical manner to the "dit" case, once a "dah" or "blank" has been produced, the space monostable steps the counter on to the next number. The second input to 2a and 2b from the space monostable will cause one of the two monostables to operate (after the space is produced) it a number of consecutive "dits" or "dahs/blanks" is required. Hence the timing relationship for the output is:

	CHARACTER	TONE	PERIOD
Always followed by	DIT	YES	T
	DAH	YES	3T
	SPACE	NO	T
	BLANK	NO	5T

(3) In this manner, a sequence of characters as determined by the diode matrix is produced. When the desired sequence is completed the diode matrix provides a



output on the stop rail. This is fed to the dah-dit generator where it closes the stop gate, hence preventing the counter from being stepped onto the next number. It also produces a positive-going pulse on the base of the 2N3641 transistor in the timing circuit, switching it hard on and discharging the 400 μF. timing capacitor. A simple push-button test facility is provided.

(4) With the 400 μF. timing capacitor used in the prototype it was found that a 5.6 meg resistor gave a period of 4.5 minutes. However, due to the nature of electrolytic capacitors (use a low-leakage one), the value of the resistor may need some adjustment. Note that apart from these two components the keyer is completely digital.

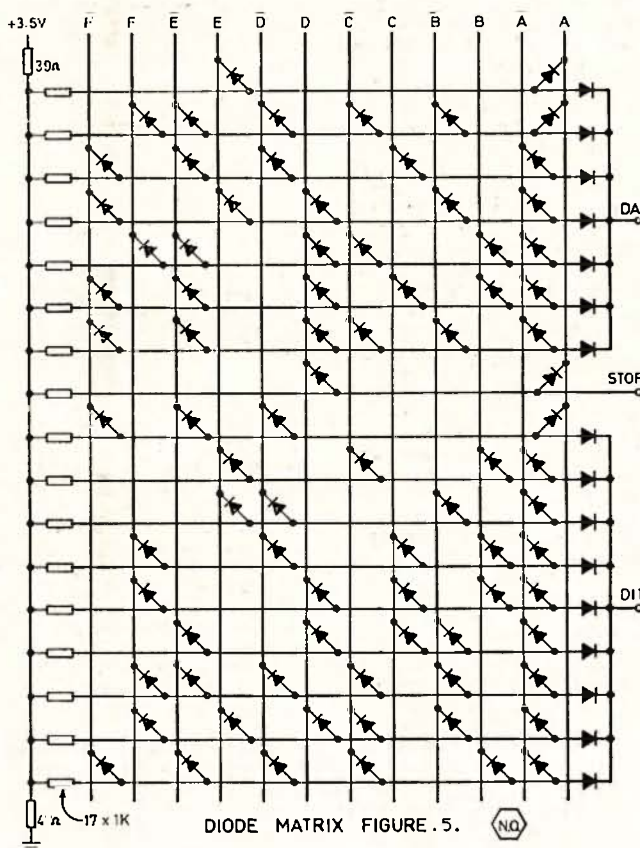
(5) Some discussion of the diode matrix is warranted. If one horizontal line of the matrix is inspected, it is found to be a diode AND gate. The output of this gate is a 1, only when the cathodes of **all** the diodes in it are connected to a 1. (Note that the additional diode on each gate, connected cathode to the dit or dah rails is necessary to prevent gates from interacting.) Hence each of the three output rails will be either a 1 or a 0 for each number on the ripple carry counter, determining the sequence of "dits" and "dahs" in the call sign.

Consider now the design of the matrix for VK4EI/R2. Since the spaces are automatically generated we may neglect them, so we have:

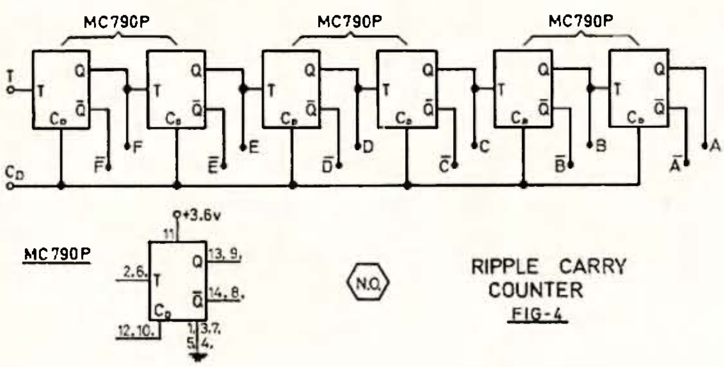
· · · — B — · — B · · · · — B · B · · B — · · — · B · — · B · — — —

Numbering each character from the left we have:

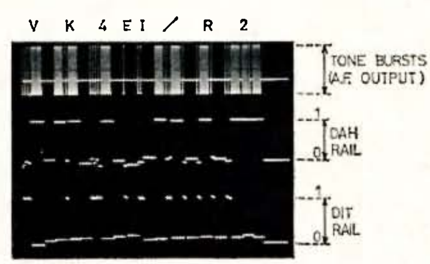
(Continued on Page 20)



DIAGODE MATRIX FIGURE. 5.



RIPPLE CARRY COUNTER FIG-4



WAVE FORMS IN KEYER FIG.6.

NEWCOMER'S NOTEBOOK

With Rodney Champness, VK3UG*

It is hoped that under this title many S.w.l's and newly licensed Amateurs can be helped along the road to becoming more proficient in the field of Amateur Radio.

Will you, the S.w.l. or new Amateur, help to make this segment of "Amateur Radio" successful—with your ideas on what you want to see discussed or described, by your constructive criticism, and by the questions which we hope you will ask.

In the past there have been very few items of interest published for the beginner, or newcomer, to this unique training pursuit and activity of Amateur Radio. Many articles are over the head of the beginner and for that matter many established Amateurs—much as they would hate to admit it.

At times circuits will be published which will either be complete in themselves or as part of a whole system. If you think you have a circuit or article that would suit this segment of "Amateur Radio" please send it in. Credits to authors are always given in "A.R." If you have circuits that you wish to be criticised please submit them, with a description of what exactly the device is intended to be and how it is expected to do it. If it is thought to be sufficiently of interest to all, it will be published along with an appraisal of its possible virtues and vices. Your name would naturally be omitted in this case.

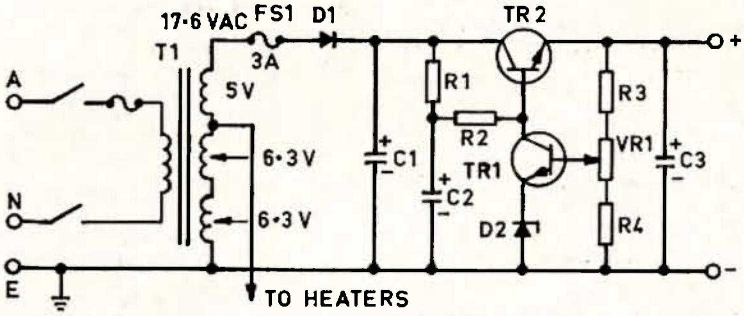
To give you an idea of the general level intended in this column, a simple 1.5 amp. transistor regulated power supply is now described.

TRANSISTOR REGULATED POWER SUPPLY

This power supply is no doubt very similar to many which have been described before in "A.R.," the only difference being extreme simplicity for what it will do. It was designed to run upwards of a 10 watt solid state f.m. v.h.f. transceiver. Because of a number of other circuit complexities not shown on this circuit, it was necessary to ground one end of the low tension secondary winding. The transformer is, in fact, an old valve type t.v. transformer. The two 6.3 volt filament windings are in series to give a 12.6 volt heater line for other equipment. The 5 volt winding was then connected in series with the 12.6 volts, giving 17.6 volts.

It would probably be thought that hum would be quite bad with only half wave rectification, but in fact no audible hum was observed. There is ripple across CI which is to be expected. The supply is filtered by R1-C2 and very little ripple appears in the output. The effective capacity of C2 is multiplied by the beta or amplification factor of TR2, which could be as high as 100. The effective dynamic filtering is therefore 1,000 x 100 which means C2 has been multiplied in effective value, as far as hum is concerned, to 100,000 uF., which is a lot of uF.

This regulated power supply has what is called a d.c. feedback circuit designed to maintain the output voltage as near as practicable to the desired voltage. The feedback circuit consists of R3, R4, VR1, TR1 and D2. The resistors and potentiometer form a voltage divider across the output, sampling a predetermined portion of the output voltage. Current flows through R1, R2, TR1 and D2 under most conditions of operation.



SIMPLE 1·5 AMP REGULATED POWER SUPPLY

T1—Power transformer as per text.
FS1—3 amp. fuse.
D1—3 amp. 100 PIV silicon diode.
D2—5.1 volt zener diode BZY88/C5V1.
C1—2200 uF. 25 volt working electrolytic capacitor.
C2—1000 uF. 25 volt working electrolytic capacitor.
C3—100 uF. 15 volt working electrolytic capacitor.
R1, R2—each 200 ohms (220 ohms), ½w. resistors.
R3—470 ohm ½w. resistor.
R4—1000 ohm ½w. resistor.
VR1—1000 ohm preset potentiometer, or normal shaft pot if variable volts required.
TR1—AC127 germanium transistor.
TR2—2N3055 silicon transistor.

D2, a 5.1 volt zener diode, does not conduct until approximately 5.1 volts are applied across it. With 5.1 volts across the zener, the emitter of TR1 is +5.1 volts above earth. For TR1 to conduct the voltage at the base of it will need to be about 5.3 volts. The collector voltage of TR1 will vary, depending on how much current is drawn through R1 and R2.

It is obvious that if the collector voltage on TRI varies, so will the base voltage of TR2. If the base voltage of TR2 is varied, so will the output voltage. It should now be apparent that the collector voltage of TRI largely controls the output voltage. The conduction of TR1 is determined by the proportion of the output voltage applied to the base.

Fair enough you might say, but how does this system control the output voltage? Take a typical situation, say, where the output is 10.6 vlots. VR1, the output volts potentiometer, will be set so that 5.3 volts are presented to the base of TR1. To maintain this output the collector of TR1 and base of TR2 will assume a voltage of 10.6 volts plus the drop in the base emitter junction of TR2 of 0.6 volt, which is 11.2 volts. All is in equilibrium at say a drain of 500 mA. Now suddenly the current increases to 1.5 amps., momentarily the voltage may drop to 10 volts. The base of TR1 will receive 5 volts so no current is drawn, the voltage immediately rises at the base of TR2 and it conducts more, so that the output voltage soon rises to nearly 10.6 volts again. Nearly is used on purpose—TR1 will receive not quite 5.3 volts which means that it does not conduct as much and therefore the voltage at the base of TR2 will be higher to allow for the increased drop across the base emitter junction, which may be, say, 0.1 to 0.5 volt more than before—depends a lot on how much current is being drawn and the type of transistor used as the series losser.

If the load is reduced, the voltage in the output will rise, so the converse situation arises and TR1 conducts more heavily, hence the voltage is brought down to normal. You can consider that TR2 is a rheostat which is electronically adjusted to give a certain output voltage under varying load conditions.

Under no load, or say 0.1 amp. load, the voltage across C1 may be 25 volts, the output voltage may be 10 volts. TR2 acts as a resistor then of 150 ohms. $E \div I = R$, $E = 15$, $I = 0.1$. Now with a load of, say, 1.5 amps., the voltage across C1 may only be 20 volts, with an output of 10 volts. TR2 this time acts as a resistor of 6.6 ohms. This change is done virtually instantaneously.

What happens if the current drawn greatly exceeds 1.5 amps.? R1 and R2 are selected so that when the base current of TR2 increases dramatically with a short on the output, the voltage drop across the resistors R1 and R2 increases greatly, which means the base of TR2 has quite a low voltage applied to it, therefore the output voltage is low. The exact value of R1 can be experimented with by inserting a potentiometer in series with it and adjusting it until with just over the designed maximum current drawn the output voltage begins to fall. TR1 and D2 would at this time not be drawing current and the supply would now be unregulated as excess current is being drawn from it. TR2 is now being starved for base current so the supply does in fact have a simple type of overload. If the overload exists for a second or two, the fuse will blow as well.

One final point about this particular supply. Do not put another electrolytic capacitor at the base of TR2 if you want long life out of the transistor under overload conditions. Why is this so? If a capacitor is placed at this

(Continued on Page 10)

* 24 O'Dowds Road, Warragul, Vic., 3820.

USING THE LM373*

RAYMOND MEGIRIAN, K4DHC

● About two years ago a new integrated circuit was announced by National Semiconductor and was labelled the LM373. Inside the little TO5 can were the makings of four gain stages, an a.g.c. section, a balanced mixer and a peak detector. At least that's what the poop sheet said, and circuits were shown for using the little jewel in various types of i.f. strips.

I was fortunate at that time to acquire an LM373 and promptly breadboarded an s.s.b. i.f. strip to see how it would perform. It performed amazingly well and I was sufficiently impressed to start planning a receiver designed around this new IC.

Although I didn't know it at the time, all the ingredients for a classic demonstration of Edsel Murphy's Law were gathering for the final curtain. The clincher came when word got around that the manufacturer had thrown in the towel. That's when Murphy struck and left me with a crisply burned collector's item.

Now, two years later, I once again own an LM373 and have been assured by the company rep. that these items are here for keeps and are available from distributors.

The present LM373 is basically the same as its predecessor, including pin connections, although internal circuitry is somewhat changed. The device will perform many diverse functions which make it adaptable to a.m., f.m., or s.s.b. i.f. systems by merely changing a few connections. In the application described here, the IC is used in a receiver capable of operating in either a.m. or s.s.b. modes. It was made small only because my hangup is miniaturisation. It is designed to cover 3.5 to 4.0 MHz. and an all-band converter will some day be used ahead of this "tuneable" i.f. If the cabinet had been about an inch larger, I might have gone all the way right from the beginning.

Let's take a look at this new device and see how it may be used to perform the functions of particular interest to the Amateur. Fig. 1 shows how the various sections of the circuitry are tied together internally and which points are brought out to pin connections. Note that the IC is divided into two separate areas having no common internal signal path. The upper portion, consisting of two gain stages and the a.g.c. section, is externally coupled to the remaining circuitry by the main selectivity determining device. This usually consists of a mechanical, ceramic, crystal or LC filter operating in the 50 kHz. to 15 MHz. frequency range.

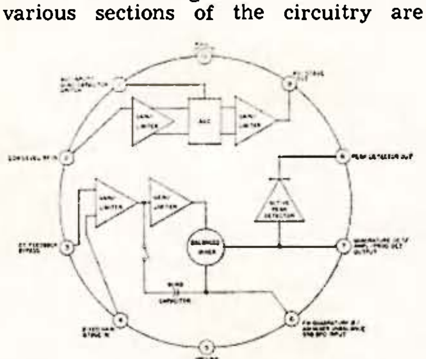


Fig. 1.—Pin connections and internal wiring of the LM373.

* Reprinted from "73 Magazine", April 1972

In order to better understand just how the various sections of the LM373 can be made to perform the desired functions, let's look at some block diagrams. Fig. 2 shows the connections used for operating in the a.m. mode. In order to disable the balanced mixer for this mode, an offset voltage is introduced at pin 6 by means of a resistor. A.g.c. voltage is taken from the output of the peak detector and connected to the a.g.c. input at pin 1 through an RC network with the desired attack/decay characteristic. An a.g.c. range of 70 dB. with operation down to 50 uV. r.m.s. input is possible with this circuit.

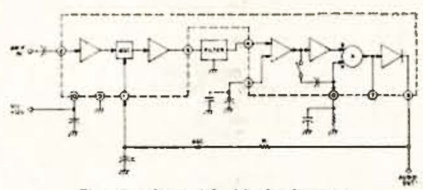


Fig. 2.—A.m. i.f. block diagram.

For s.s.b./c.w. operation, refer to the block diagram of Fig. 3. A b.f.o. signal of 25 mV. r.m.s. or greater is fed into the balanced mixer at pin 6, causing the mixer to act as a product detector. The peak detector generates an a.g.c. voltage derived from the audio fed to it from the product detector. This voltage is fed back to the a.g.c. section through the RC network.

A means of providing manual gain control for c.w. operation is also shown in the block diagram. So here we have an i.f. amplifier, a fast attack, slow release audio derived a.g.c. system and a double-balanced product detector all in one neat package.

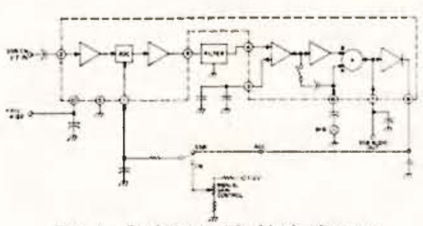


Fig. 3.—S.s.b./c.w. i.f. block diagram

Although I have not tried the LM373 in an f.m. receiver, some readers may be interested in this type of operation and Fig. 4 is the block diagram for an f.m. i.f. system. By grounding pin 1, the a.g.c. is defeated and all gain stages become symmetrical non-saturating limiters. This action also connects an internal quadrature capacitor to pin 6 which is also input A of the quadrature detector.

An LC network tuned to the nominal i.f. frequency is connected externally to pin 6. This network produces a frequency-dependent phase shift with respect to the signal at input B of the quadrature detector. A pulse duration modulated output is produced by the detector and integrated by the capacitor connected to pin 7. The Q of the quadrature network will influence both the output level and the distortion. For a given deviation, increasing Q will increase both output and distortion. At least a 50 mV. r.m.s. signal is required at pin 6 to ensure switching action of the detector and maximum output. Audio at a higher level may be taken from the output of the peak detector at pin 8.

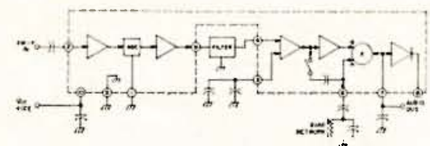


Fig 4.—F.m. i.f. block diagram.

In addition to the applications above, this versatile IC may be used in several other interesting circuits. These include s.s.b. generator with a.l.c., constant amplitude/amplitude modulated r.f. oscillator, first i.f. amplifier/second mixer and as a video amplifier with a.g.c., manual gain or gating. There are others, too, but unfortunately we can't cover them all at this time.

If you are mainly interested in using the LM373 in your own designs, Figs. 5, 6 and 7 are schematics for use in the various modes discussed above. Notice that in all circuits, a.c. coupling is used for signal transfer. D.c. paths in integrated circuits of this nature can cause excessive currents to flow, resulting in possible destruction of the IC.

The by-passing at pin 3 should be accomplished with a low inductance

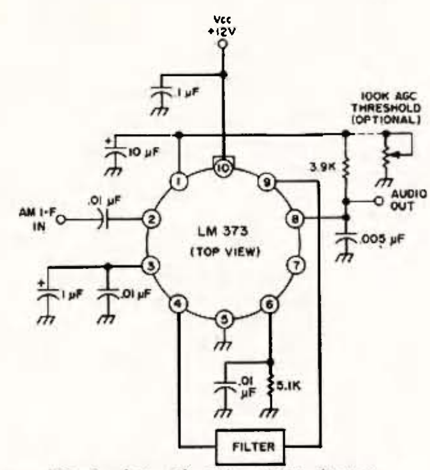


Fig. 5.—A.m. i.f. strip wiring diagram.

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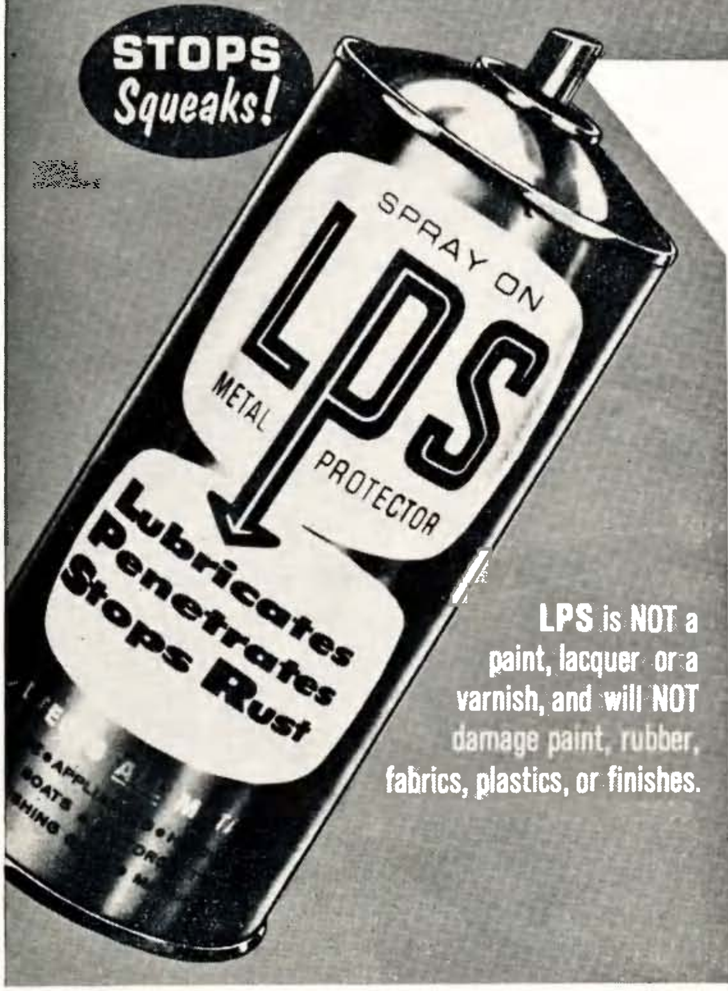

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high frequency capacitor and a larger tantalum for the low frequencies. You should also observe the usual rules of good layout practice and keep leads short when working with high gain circuits such as this.

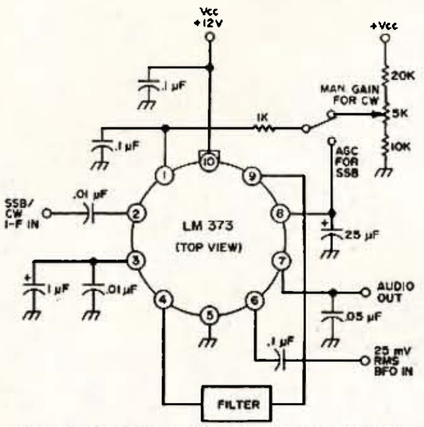


Fig. 6.—S.s.b./c.w. i.f. strip wiring diagram.

Fig. 8 is a schematic for the front end of the receiver I built using the LM373 in the i.f. system. The r.f. and h.f. oscillator stages both use an inexpensive 2N3819 plastic junction FET. The mixer uses a dual gate MOSFET. Another 2N3819 is used as a source follower to isolate the h.f. oscillator and prevent pulling. A small transistor type i.f. transformer couples the mixer to the LM373.

Fig. 9 is a schematic for the remainder of the receiver; including the i.f., b.f.o. and audio portions. In order to operate the i.f. system in both a.m. and s.s.b. modes, it was necessary to incorporate a 5-pole, 3-position switch, S1, to make the transfer. Two of the poles are used to switch the a.g.c. time constant components from a.m. to s.s.b. Another pole provides b.f.o. input to pin 6 for s.s.b. operation or an offset voltage for a.m. Pole number 4 selects audio output from pin 7 for s.s.b. or pin 8 for a.m. The final section applies voltage to the b.f.o. for s.s.b./c.w. reception. S2 is a small s.p.d.t. toggle switch used to go from manual gain control to normal a.g.c. when in the s.s.b./c.w. mode. The manual gain control is useful when listening to c.w.

A second i.f. transformer is used for the b.f.o. tank and is tuned by a d.c. voltage applied across a capacitor diode. I used a V47 but many ordinary silicon diodes will work satisfactorily in this application. Epoxy rectifiers are also a good bet. Depending on the frequency variation obtained, the 27 pF. series capacitor may have to be altered for proper tuning range. If range is insufficient, increase the value of the series capacitor. If b.f.o. range is greater than needed, a smaller capacitor may be used.

Operating voltage for the h.f. oscillator, the b.f.o. and its tuning diode is regulated by a zener diode. Almost any small zener in the region of 6 to 7v. may be used. The base/emitter junction of a silicon transistor makes an excellent zener and no doubt several can be found with 6 to 7v. breakdowns. With these critical circuits regulated, the main supply can be varied from 9 to 15v. without producing any noticeable change in the received signal other than

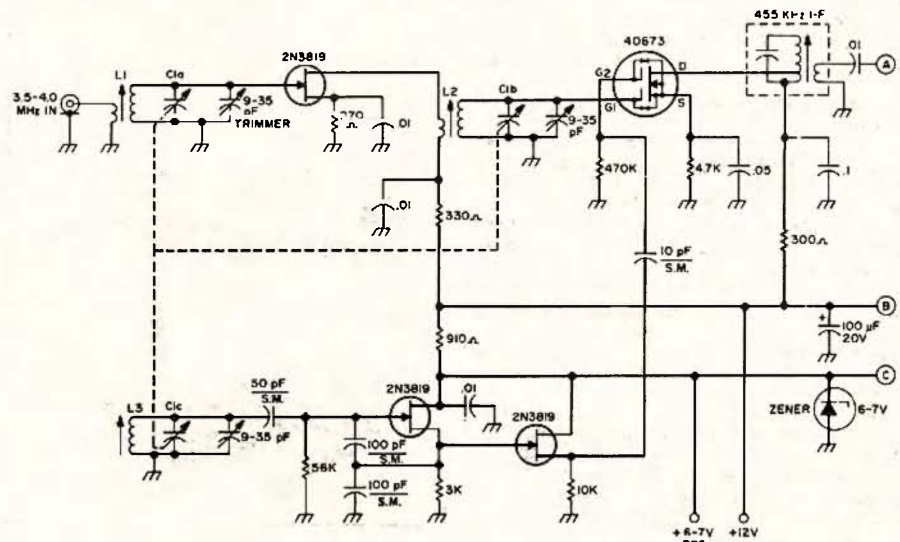


Fig. 8.—Schematic of the front end of K4DHC's Receiver.

Unless otherwise specified, all capacitors in uF., all resistors ¼ watt.
Coils wound on micrometals No. L45-2-CT-B-4 shielded forms.
C1a, C1b, C1c—Mitsumi No. 3C20, 3-gang, 20 pF. per section.
L1, L2—75 turns No. 34 a.w.g., enamelled wire; primary 8 turns same wire.
L3—60 turns No. 34 a.w.g. enamelled wire.

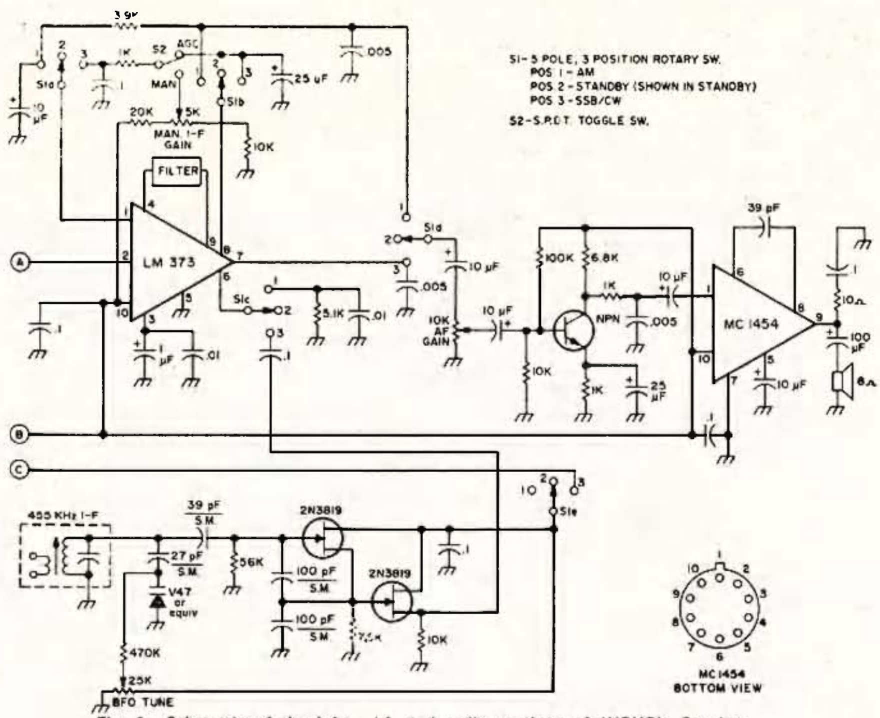


Fig. 9.—Schematic of the b.f.o., i.f. and audio portions of K4DHC's Receiver.

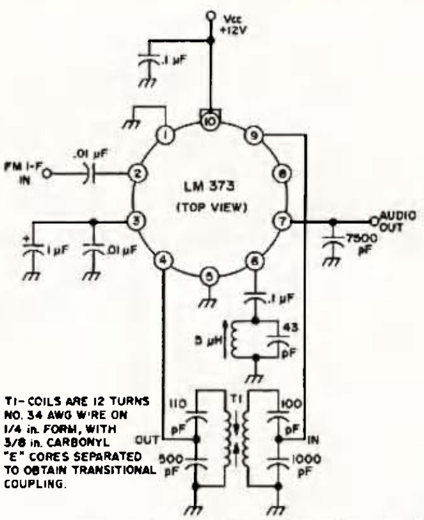


Fig. 7.—F.m. i.f. strip wiring diagram shown with transformer interstage coupling

audio output. A 2N3819 source follower further stabilises the b.f.o.

Because I wished to keep size to a minimum, I used a tiny 455 kHz. ceramic ladder filter as the interstage coupling device for the LM373. This filter, the Murata CFS-455J, has a 3 dB. bandwidth of 3 kHz. and is adequate for general use. I used a printed circuit board for assembling the receiver and arranged it to take either the ladder filter or a Murata SFD-455B dual section filter. This provides about 4.5 kHz. bandwidth at 3 dB. Because this is not a construction article in the strictest sense, and because some of the components dictated board layout not compatible with most junk boxes, a printed circuit layout has not been included.

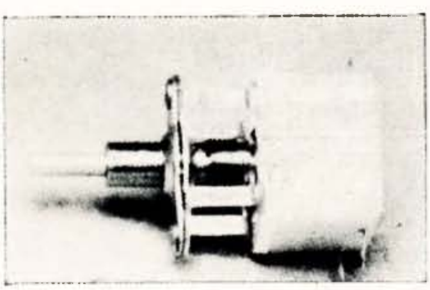
I incorporated an audio preamp. since I like to have a little reserve when it is needed. This stage can use almost any NPN audio transistor and is not at all critical. The transistor I used was an unmarked refugee from my junk box. A Motorola MC1454 IC power amplifier is used in the audio output stage. It is capable of 1w. of audio into an 8-ohm load. I've had excellent results with this IC and have used it in many projects. The small speaker built into the receiver does not do the audio justice, but does make the receiver self-contained.

At present a block of 8 pen cells soldered in series powers the receiver. No-signal current drain is about 28 mA., rising to 40 or 50 mA. on audio peaks at normal room level. At these levels it is not necessary to heatsink the audio amplifier.

Construction of the receiver is unorthodox in some respects because of my desire to keep it small. Since some of the ideas used here may be of interest to others, I'll go over the main points.

The front end tuning capacitor is a tiny 3-gang film dielectric type of 20 pF. per section. It is driven by an equally small 4.5:1 ball drive attached directly to the tuning capacitor. Unfortunately, a pointer was not available for this drive, but one was fashioned quite easily and can be seen in the photograph. The three trimmers, Erie style 538, were mounted on the capacitor and the whole assembly fastened to the front panel along with the other controls. This saved considerable board space and did not add anything to the space required behind the front panel.

An additional saving was achieved by mounting as many components as possible on the mode selector switch,



The three-gang miniature tuning capacitor with reduction drive attached. Home-made pointer is push-fit over the large (direct) shaft.

S1. Since panel area was scarce, I used a small diameter Japanese rotary switch having three decks with a total of nine poles and three positions. This is a Lafayette part number 99F61715 which lists for only 79c. Since it is a shorting type switch, it was necessary to use position 1 and position 3 of each section to avoid shorting circuits during transfer. An unexpected bonus resulted, however, when the middle position worked out fine for "Standby". Since the switch has many more contacts than required, unused lugs made convenient tie points for mounting the associated resistors and capacitors. With these savings, the printed circuit board for the entire receiver ended up being a 3" square.

K4DHC's miniature 75 metre Receiver utilising the LM373 in the i.f. system.

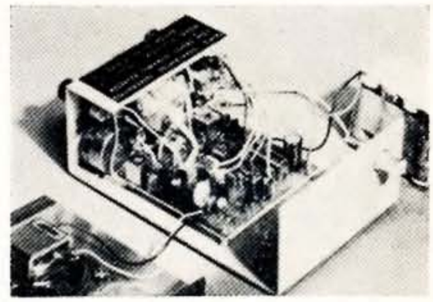
I think that most will agree that the principal limiting factor in shrinking equipment size, is front panel space. Half-inch knobs seem to be the smallest practical size, and even then you need finger room in between controls. The Ten-Tec cabinet I used is the smallest of their JW series. Actual panel space is $2\frac{1}{4}$" x $3\frac{5}{8}$". As can be seen in the photograph, there is not much room left over.

If you build up a copy of this receiver and use the specified coil forms, a suggestion may be in order. After alignment is completed, put a small ball of coil wax in the opening of the oscillator coil and melt it down with the tip of a small soldering iron. The bobbins in these coil formers sometimes do not fit tight and cause microphonics or instability in the oscillator output. The wax holds the bobbin tight and prevents any of these problems.

That covers the basic uses of the LM373 and may have set you to thinking about applying this versatile device to some of your own pet projects. It should be pointed out that the version discussed here is the limited temperature range LM373H in a TO5 can. Price is $US4.85 in small quantities. A 14-pin DIP version, the LM-373N, was to be made available at slightly lower cost but I had not checked on this at the time of writing.

Results to date using this i.f. system have been quite gratifying. The LM373 provides more than adequate i.f. gain at 455 kHz. and the a.g.c. acts without any noticeable pumping. Overall, the use of this device has drastically cut component count while providing excellent circuit performance.

If you are wondering about the weird nameplate on top of the receiver, it came about because I had to cover some bad scratches and it seemed the only way to do it. ●



Interior view of the receiver. The LM373 is just behind the i.f. transformer in the middle of the board. The 3 kHz. ceramic ladder filter is just to the right. The pen cell battery pack normally sits in the space between the board and back panel of the cabinet.

[For the local builders, the greatest problem will be to locate a small three-gang capacitor and this will probably limit the size of the receiver. A suitable unit will be difficult to locate and I have been unable to find anything really small.

The 40673 may be a problem, but the MPF121 seems to be a logical substitute to use.

All other components are readily available from local suppliers.

It would appear that a **white** coded miniature 455 kHz. i.f.t. would be most suited to use immediately following the dual gate mixer; be certain you use the correct tap. Any "coloured" i.f.t. could be used for the b.f.o., almost any NPN transistor could be used in the audio stage (SE1001).—A. J. Stewart, VK3AS]

NEWCOMER'S NOTEBOOK

(Continued from Page 6)

position consider the operation with a short circuit. The capacitor will have a reserve of energy which will maintain the base voltage and supply a large amount of base current. The transistor will momentarily pass a large amount of current with possible drastic results. The supply will not regulate quickly if this capacitor is there, in fact it will act very like an amplifier with a short circuit across the output. The supply must not only regulate at d.c. as it would if this capacitor were fitted, but regulate at a.c. as well to compensate for any rapid changes in load. TR1 and TR2 are a direct coupled a.c. and d.c. amplifier pair with R2 as load resistor. In theory, C3 should not even be necessary, but it is found that the regulating amplifiers are unstable if this capacitor is omitted.

If you would like to know much more about these types of power supply I would recommend that you contact the Editor of "The Australian EEB," Leo Gunther, VK7RG, and see if back copies

(Continued on Page 14)

ELECTRICAL MEASURING INSTRUMENTS

LECTURE 15B

C. A. CULLINAN, VK3AXU*

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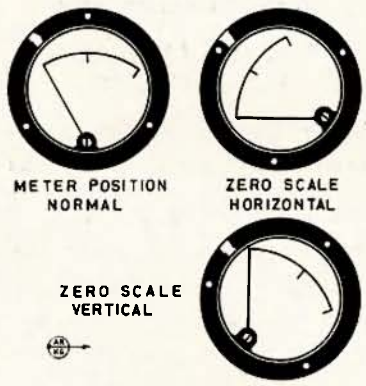
"(a) Stray magnetic field errors. Since the deflection of the meter depends on the strength of the permanent magnet, serious errors may be introduced by stray magnetic fields from other meters, current carrying conductors, magnets and other ferrous materials. Expensive meters are usually provided with adequate magnetic shielding. Some errors are also caused by mounting small meters in heavy steel panels. Meters especially calibrated for such mounting are usually so marked.

"(b) Balance errors. The delicate system of counterweights which balance the moving-coil assembly may cause 'zeroing' or reading errors if improperly adjusted. The balance of the movement may be checked by holding the meter in the three positions shown in Fig. 6. If the pointer does not indicate zero in each position, the movement is not perfectly balanced. Unbalance is most serious in vertical mounted meters.

"(c) Overload errors. Permanent damage or burn-out may be caused by repeated or heavy overloads of the meter movement. Excessive current through moving-coil types causes heating of the coil and springs. Heating of the latter results in 'annealing' or loss of spring tension which impairs accuracy. Overloads also cause needle 'banging' which may damage pointer or pivots.

"(d) Sticky movement errors. The meter movement may be prevented from moving freely by several mechanical defects. Chief among these is chipped jewels or damaged pivots due to rough handling. Sticking may be manifest in the failure of the meter to reproduce a known reading when approached from values above and below the known value. Light tapping of the meter case is frequently resorted to as a cure. Meter sticking is also caused by small magnetic particles which may be gathered by the magnet of a meter which is removed from its case and left unprotected."



TEST FOR MOVEMENT BALANCE
FIG. 6.

* 6 Adrian Street, Colac, Vic., 3250.

An exceptionally fine article on the moving-coil meter by K. A. Kimberley, VK2PY, appeared in the July 1970 issue of "Amateur Radio" and is well worth studying.

Moving-coil instruments measure the mean value of a current and therefore do not indicate on alternating currents with the exceptions noted earlier.

Moving-coil instruments are accurate and their volt-ampere requirements are very small since suitable torques may be provided by the use of strong fields. The usual scales are uniform over an arc of about 120 degrees, but by using specially shaped pole-pieces the arc may be extended to 270 degrees.

The development many years ago of suitable copper-oxide rectifiers, and more recently germanium and silicon rectifiers, together with the excellent torque and damping characteristics brought about the use of moving coil meters, with bridge-connected rectifiers, for the measurement of a.c. voltages and currents, calibrated in r.m.s. (root mean square) or effective values (both these expressions mean the same thing).

Such meters may have temperature and wave-form errors. As far as wave-form errors are concerned, the meter registers the mean value and is calibrated in r.m.s. values, and even with sinusoidal waves the rectifier itself may modify the wave-form. In voltmeters there may be an additional error due to the inductance and stray capacitance of the series multiplying resistor. In good a.c. voltmeters of this type non-inductive resistors, having very low stray capacitance within themselves, are used.

As far as ammeters are concerned the rectifier capacitance may affect the frequency response.

VU METERS

For many years the Broadcasting and P.M.G. Services have used special moving-coil rectifier meters for the measurement of programme levels. These are known as VU meters (volume units) and were designed in the U.S.A. about 1938 to overcome the problems that existed because of the lack of standardisation in measurements of programme levels between the various telephone companies, broadcasting and recording organisations.

dB. meters were in common use with such references as "zero" dB. being 1 milliwatt in 500 ohms, 6 milliwatts in either 500 or 600 ohms, or 12.5 milliwatts in 600 ohms. Then there were heavily damped (slow), lightly damped (fast), and peak-reading meters. With the latter the forward movement of the pointer was very fast, but the return was very slow.

Brief specifications for the VU meter are:—

Frequency response to be flat within 0.2 dB. from 35 Hz. to 10 kHz., and within 0.5 dB. from 25 Hz. and 16 kHz.

Harmonic distortion. The harmonic distortion introduced into a 600 ohm circuit by bridging a VU meter across it is to be less than 0.2%. When making harmonic distortion measurements on equipment at very low levels it is common practice to substitute a non-inductive resistor for the VU meter because the harmonic distortion in the VU meter may cause erroneous readings. (Many dB. meters will produce as much as 0.5% distortion.)

Temperature effects: The deviation in sensitivity with temperature to be less than 0.1 dB. for temperatures between 50°F. and 120°F. and less than 0.5 dB. for temperatures as low as 32°F.

Impedance: The impedance for bridging across a line must be 7,500 ohms. The instrument impedance is built out to 3,900 ohms and an external resistor of 3,600 ohms is added to make the total impedance 7,500 ohms. The external resistor is of the non-inductive type. A T type attenuator may be inserted between this resistance and the instrument if the meter range is to be extended.

Because sufficiently powerful magnets were not available in 1938 it is standard practice for the meter to indicate 0 on its scale when a 1,000 Hz. potential of 1.228 volts (+4 dB. above 1 milliwatt in 600 ohms) is applied to the meter and its external resistance of 3,600 ohms. Thus "zero" VU on the meter scale is +4 VU in practice. The actual reference is Odbm. = 1 milliwatt in 600 ohms.

There is a choice of two scales and the standards for VU meters also cover the dynamic and overload characteristics.

Unfortunately, shortly after the VU meter was standardised in the U.S.A. one network departed from the standards. Now-a-days we have all sorts

of amplifiers, tape recorders and meters which use so-called VU meters and bear little resemblance to the standard VU meter.

The Australian Broadcasting Control Board, in its Standards for the Technical Operation of Medium Frequency Broadcasting Stations, second edition, June 1968, defines the standard VU meter as follows:—

"Standard VU meter means a volume indicator in conformity with Standard C16.5 of the U.S.A. Standards Institute, or with such other standard as the Board may approve."

Earlier it was shown that the range of a d.c. moving-coil ammeter could be increased by the use of shunts, but this does not apply usually when measuring a.c. currents with a moving coil meter having a rectifier because the resistance of the shunt will remain constant whereas the resistance of the rectifier will vary. As a result, the scale will be very cramped at the beginning, the cramping becoming greater as the shunted current increases.

Measurement of a.c. current with this type of meter is done by using a current transformer. For instance, a very popular general purpose meter is the Palec Model M32A. This meter, for alternating currents, requires a current transformer designed for 1 milliampere in the secondary for full-scale deflection of the meter pointer. Some current transformers are tapped so that the meter may be used to measure a wide range of alternating currents.

One of the advantages of the rectifier type of moving coil a.c. voltmeter is that it is possible to make the scales above about 3 volts linear and to be the same as the d.c. voltage scales. However for 0-3 volts a.c. a special scale is used, but there are some meters with special circuitry where all the d.c. voltage scales are used for a.c. voltages, then there are other makes of meters where the d.c. and a.c. scales are completely different, so that with multimeters there may be very few scales or a multiplicity of them.

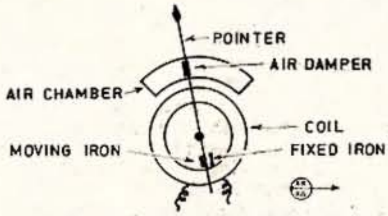
However, there is one disadvantage in using this type of a.c. voltmeter in the vicinity of radio transmitters and this is that the meter may pick up sufficient r.f. energy that it will give false readings. This is the reason that it is usual for "moving iron" voltmeters to be used in broadcasting and communications transmitters to measure a.c. voltages as they are not affected by r.f. energy.

MOVING IRON METERS

The moving iron instrument is the commonest type used in a.c. measurements although it may be used on d.c. There are two types. In the first, there is a fixed coil of wire through which current flows. An iron vane, attached to a pointer, is attracted into the coil when current flows, the zero position of the pointer being determined by springs as in the moving coil instrument.

The second type of moving iron instrument has a piece of iron which is rigidly fixed in position near another piece of iron which is free to move on pivots, with a pointer attached and controlled by springs. Current flowing through a fixed coil magnetises both pieces of iron similarly, hence they repel each other. This is the commonest type of moving iron meter. Moving iron meters require more volt-amperes for their operation than rectifier moving coil meters. The scales are generally restricted at both ends, but open in the centre.

Fig. 7 shows the essentials of the repulsion type of moving iron meter, using air damping, by means of a small vane attached to the pointer and moving in an air chamber.



REPULSION TYPE MOVING IRON METER
FIG.7.

Nickel iron alloys are usually employed to reduce the hysteresis losses and a high degree of accuracy can be obtained.

As the operating torque depends on the square of the current through the coil, these meters read on both a.c. and d.c. and are calibrated in r.m.s. values. On rectified systems they read r.m.s. values and give different readings to moving coil instruments.

Ranges of moving iron ammeters may be from one ampere to about 300 amperes for self-contained instruments. For higher ranges an ammeter of between one and five amperes full scale may be used with a suitable current transformer, the scale being calibrated in terms of the full current flowing through the primary of the current transformer.

Instrument transformers will be described later in this lecture.

Moving iron voltmeters are connected across the line for voltages up to about 600 volts, through a series resistor which is frequently external to the instrument. For higher voltages, especially for switchboards, a high value resistance may be placed in an insulating cage for protection of personnel or a voltage transformer may be used. It is common practice to use a meter having a full scale deflection of 110 volts, the scale being calibrated in terms of the actual line voltage.

Also, it is normal practice for the full-scale value to be in excess of the normal current or voltage being measured. Thus a voltmeter for use on a 240 volt circuit may be scaled 0-300 volts.

For instance, here at 3CS we have a number of moving iron voltmeters having full scale markings of 500 volts. By means of suitable switching, these meters are used to read the voltages between any phases in a three-phase system in addition to reading the voltage between any phase and neutral in a.c. power systems.

Moving iron instruments should read the r.m.s. value of an alternating current, but this is not always correct, as an harmonic present in the current wave may reach a high value of induction where the B-H curve is nearing saturation, thus a very bad wave-form can lead to an incorrect reading.

Moving iron meters do not give accurate readings at frequencies much above 60 Hz. as eddy currents lead to losses and low readings. However there are some instruments of this type available with uniform accuracy over the range of 25 to 500 Hz.

The usual scale arc is between 90° and 120° although there are some designs with extended scales to 270°.

Damping may be by means of a vane moving in a restricted air space, as in Fig. 7, or by eddy currents induced into an aluminium disc which is attached to the pointer spindle.

The main advantages of the moving iron meter are that it is immune to radio frequency fields, is cheap to make, and can be made very accurate.

DYNAMOMETER INSTRUMENTS

If the permanent magnet of the moving-coil meter is replaced with an electro-magnet the instrument becomes an electro-dynamic or dynamometer type. Accuracy is high and depending on the connections of the two coils a voltmeter, ammeter or wattmeter is obtained. As a wattmeter the scale is linear, but as a voltmeter or ammeter it is square-law.

Normally the dynamometer type uses air-cored coils, but with the development of better grades of iron, such as nickel-iron low-loss alloys, the accuracy remains the same as for the air-cored types but the presence of the iron leads to higher torque. This type of instrument is known as a "ferro-dynamometer" type.

For ammeters and voltmeters the coils are connected in series and for a wattmeter one coil is connected across the line and the other in series with it, so that the load current flows through it. The series coil is known as a current coil, whilst that across the line is known as a voltage or "pressure" coil.

If the inductance of the voltage coil is ignored then the current flowing through it is in phase with the voltage and proportional to it, and the torque is proportional to volts $\times$ amperes $\times$ $\cos\phi$, the true watts, $\cos\phi$ being the power-factor of the load.

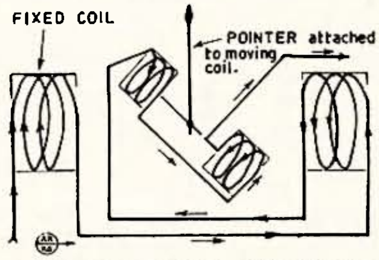
The inductance of the voltage coil and its mutual inductance with nearby metal parts of the instrument introduces a phase angle "d" into the voltage coil, thus producing an error into the reading. The correction factor is equal to the ratio: True Watts $= 1 + \tan^2 d$, and the wattmeter reading is $1 + \tan d \tan\phi$.

Frequency errors will occur because of the inductance of the voltage coil, hence wattmeters of this type are usually calibrated for one frequency only.

There are several other errors that can occur in a dynamometer wattmeter.

For true measurement of a.c. power **the current in the voltage coil must be in phase with the voltage which produces it.**

Because of the inductance of the voltage coil this condition is not met, so means must be taken either to make the reactance of the coil very small or by introducing an angle of lead to compensate for the angle of lag caused by the inductive reactance of the coil. If the coil is made of relatively few turns, then it can be connected in series with a high value of resistance (which should be non-inductive). The voltage coil and resistance can be connected across the line and the current in the coil will be sensibly in phase with the voltage. The other method is to shunt the voltage coil with a suitable capacitor.

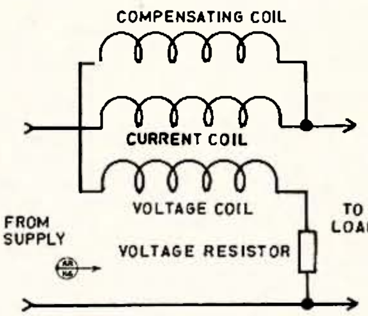


AN AIR-CORED ELECTRO-DYNAMIC TYPE OF INSTRUMENT
FIG.8.

The wattmeter then reads true power. Temperature compensation is made within the instrument so that its accuracy remains constant over a wide temperature range.

A problem arises if the power is to be measured in a circuit having a very low power factor as the current and voltage may be equal to the full rated values of the meter, involving the maximum losses in the instrument itself so that the measured power may approach zero, thus giving a completely false result.

This state of affairs may be overcome almost completely by using a compensating winding.



CIRCUIT OF A COMPENSATED WATT-METER
FIG.9.

The compensating coil is wound, turn by turn, with the current coil so that a given current passing through either coil would produce the same flux in the same place.

The compensating coil, at one end, is connected to the load side of the current coil, whilst the other end is connected to the voltage coil, which in turn is connected to a series resistor thence to the other load line.

Thus the combination of the resistor, voltage coil and compensating coil are connected (in series) across the load side of the wattmeter.

Because of this connection the current coil always carries the current which flows in the voltage coil, but the amount of flux which this current produces in the current coil is cancelled by the current flowing in the compensating coil, producing a flux which opposes the first because of the manner in which the compensating coil is connected.

Complete compensation cannot be achieved as it is impossible to wind the current and compensating coils so that they each occupy the same space. However, it is only in cases of exceptionally low power factor that this instrument is not suitable.

Wattmeters may be used on polyphase circuits as well as single phase circuits. In some cases two or more meters are used and in other instances a multi-element wattmeter may be employed.

A wattmeter indicates the power at the time that the reading is made. Wattmeters measure "true" power taken by a load, the "wattless" power not being registered.

For measurement of power over a period of time watt-hour meters are used.

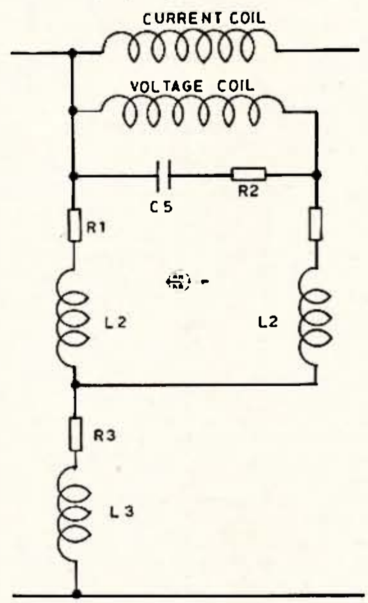
VAr METER

The reactive power in a circuit is given by $Q = VI \sin \phi$ and the unit of measurement is the VAr (meaning volt-ampere reactive). It is the rate of change of energy which is stored in the electric and magnetic fields of the system.

It can be measured in a single phase system by using a dynamometer type of instrument if the current in the voltage coil is made to lag 90° behind the voltage. Then the torque is proportional to $VI \cos (90° \pm \phi) = \pm VI \sin \phi$.

This can be done by winding the voltage coil to have as much inductance as possible.

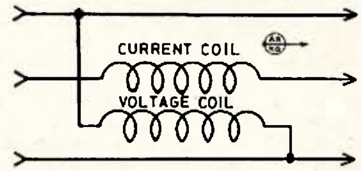
The circuit of one make of VAr meter is shown in Fig. 10. Reactances C5 and L2 compensate for the effects of the resistances R3 and R1 and the mutual coupling between the current and voltage coils.



CIRCUIT OF ONE MAKE OF VAr METER
FIG 10

This type of instrument indicates correctly only at the frequency at which it was calibrated. The instrument uses a zero centre scale and when in use the deflection of the pointer from zero not only indicates the reactive power but whether it is leading or lagging.

For three-phase systems a single wattmeter can be connected to read VAr, the power being taken as three times the meter reading. A simplified circuit of a single phase wattmeter connected for three-phase VAr working is shown in Fig. 11.



WATT-METER CONNECTED TO SHOW VAr IN A THREE-PHASE CIRCUIT
FIG.11.

There is another type of a.c. wattmeter known as the induction type. The "Lipman" type consists of a core with two windings, voltage and current, and are connected so that their fields are 90° apart. The moving element consists of a circular disc or cylinder. A third winding, in series with a small adjustable resistance, is wound in the form of two small coils around two legs of the core. The resistance is adjusted to alter the flux produced by the voltage coil, so that the meter is compensated for power factor. The scale is linear, being the product of volts × amperes × cos ϕ.

Important.—Unless otherwise stated by the manufacturer, a wattmeter, either electro-dynamic or induction, measures the "true" power as the power factor is not measured.

Sometimes VAr meters are incorrectly referred to as wattmeters and care should be taken in answering a question on wattmeters not to confuse the VAr meter with either the electro-dynamometer or induction types of wattmeters. Also, a wattmeter is not a watt-hour or KwH. meter. These will be discussed later.

Wattmeters described so far have been for use at power line frequencies. Audio frequency and radio frequency wattmeters are not discussed in this lecture. ●

NEWCOMER'S NOTEBOOK

(Continued from Page 10)

of this experimenters' magazine are available.

The two transistors and the power diode must be mounted on heat sinks. If more than 1.5 amps. are required from a power supply of this design it is suggested the AC127 be replaced with an AC187, the zener with a 1.3 watt unit BZY96/C5V1 and replace the power diode with one capable of 6 amps. R1 and R2 would need to be reduced to approximately half if the supply is to put out twice the current of the one described. A full wave bridge rectifier can be used if so desired. The output voltage is adjustable from about 7 to 15 volts via VR1. ●

Commercial Kinks

With Ron Fisher, VK3OM*

It seems that I hit on the right subject for the June issue. During the last couple of weeks several letters have come in requesting information on the Trio 9R 59D series of receivers, so this month I will present a little more modification data on this set.

I am quite surprised at the number of requests that have come in for information and circuit details on the various carphones. As I have never taken a great deal of interest in this aspect of our hobby, my data on carphones is very limited. If you have circuits or know someone who has, please let me hear about it. I would be more than happy to pay any out-of-pocket expenses. If successful, we might be able to set up a full information service on all the available carphones. Now it's up to you.

TRIO 9R 59D

One of the major problems with low-priced receivers is frequency drift or other forms of front-end instability. I have always felt that there are strict limits to the improvements that can be achieved in receivers of this type. Therefore please do not expect that a few or even a lot of modifications will turn your Trio into something that will rival a Collins 75S3. It just cannot happen. However, small improvements are often very worth while.

So saying, let us take the bottom plate off the Trio and have a look inside. If you examine the oscillator section of the coil box you will see that all the wiring to the coils and switch sections is done in a very light gauge of plastic-covered wire. Replace all this, including the connections to the main and bandspread tuning condensers oscillator sections, with 18 or 20 s.w.g. tinned copper wire covered with close fitting spaghetti tubing. I suggest that you do this one wire at a time, so that there is less risk of making an incorrect connection.

Another culprit near the oscillator section is the red plastic covered wire that supplies h.t. to the oscillator valve. This runs across the front of the chassis parallel to the front panel. Rather than replace this, I have found that it can be held to the chassis with a spot of quick-setting glue every inch or two. While you have the glue out, there are quite a few loose looking wires floating about under the chassis that will benefit from the same treatment.

To complete the job, solder pins 6, 7 and 8 of V3, the 6AQ8 oscillator, directly to the chassis. You should now note a distinct improvement in both the mechanical and electrical stability.

One other small change. The original dial globes are rated at 0.15 amp. Replace these with 0.3 amp. globes and you will get much improved dial illumination plus quite a bit of light onto the S meter.

To conclude this series on the Trio, I cannot over stress the importance of correct alignment. On the higher bands, in particular, a reasonable image rejection is dependent on exact alignment. If you do not feel qualified to do it yourself, DON'T. Find someone who can, or take it along to your local Radio Club.

COMMERCIAL INTEREST

One of the things that seems to enthuse owners of the latest Yaesu FTDX-401 and the FT-101 is the most efficient noise blanker. Bail Electronics Services tell me that they can now supply the blanker as a separate item with details on fitting them into the FTDX-400 or FTDX-560. The price is most reasonable. I suggest you get in touch with Bail Electronics for all details.

Slow scan t.v. is taking on like wild fire. Perhaps you would like to be in it, but like a lot of us just have no time to build up the required gear. Stan Dixon, VK3TE, has recently imported a complete set of American Robot slow scan equipment. If you would like to know more about this fascinating aspect of Amateur Radio and also about importing gear for it, contact Stan.

Next month I intend to start a series on the FT-200. Thanks to those who have helped with information and suggestions. If you have carried out any modifications to your FT-200, please let me know so that it can be included.

* 3 Fairview Avenue, Glen Waverley, Vic., 3150.

☆

"20 YEARS AGO"

With Ron Fisher, VK3OM

July 1952.—Why cannot a person be licensed to operate an Amateur Station at the age of 16 years? That was the question that Federal Executive put to us on the Editorial page of the July 1952 issue of "Amateur Radio". F.E. argue of course that a licence should be granted to 16-year-olds. This has of course long been resolved and this Editorial, like many others of this vintage, tells the continuing story of Federal Executive's work, not only for the Amateur but also for the intending Amateur.

July was a lean month for technical articles. However, although there was a lack of quantity, quality was well represented. Some Pointers on Good Quality Phone by the late Dick Dowling, VK3XD, took us through all the requirements to produce good phone—a.m. of course.

The AR301 was a popular piece of disposals gear of the time. Don Haberecht, VK2RS, explained how to get one of these going on 144 MHz. I see that Ham Radio Suppliers were then advertising AR301s at £7/10/- each, complete with three 954s, one 955 and six 6AC7s in the 30 MHz. i.f. stages.

Ken Wall and John Jarman continue Television Made Easy with part nine—Outline of Colour Television. It does not seem to have much relationship to the type we will see in a couple of years, but none the less interesting.

VK4QL reports in his DX Notes that conditions were not good. The new 21 MHz. band had opened up in a disappointing way and the general opinion was that it would be a good band when conditions improve.

The VK2 section of "Fifty Megacycles and Above" reported activity on the 580 MHz. band, but no details of the gear in use.

An excellent description and photo told about VK5WI operating from the Adelaide Exhibition. The impressive set-up included a converted Philips b.c. transmitter for 7 and 14 MHz., plus gear on 50 and 288 MHz. An AR7 receiver was installed for 7 and 14 MHz., but as local noise was a problem a 50 MHz. link was set up to a remote receiving location.

A notable silent key was that of Wal Ryan, VK2TI. Wal was a tireless worker for the N.S.W. Division over more than twenty years. He was a Past Federal Secretary and President and a Life Member of the Institute.

Finally, F.E. were offering free copies of Phil. Rand's book on t.v.i. This series was undoubtedly a classic on the subject. I cannot remember who I lent my copy to, but if he sees this he might return it.

AWARDS COLUMN

With Geoff Wilson, VK3AMK*

The aim of this new section is to introduce Awards issued by the W.I.A. and overseas Societies, and in addition to give information about QSLing, how to apply for Awards, etc. It is felt that there are many people who are uncertain as to just what is available and how to go about getting Awards, which can form a very enjoyable and rewarding part of our hobby.

This month I will discuss QSLs which are a vital requirement for most Awards. Before an Award is issued the applicant must show some form of proof that he has made contact with the stations claimed and the QSL card is still the only really acceptable proof that a QSO has taken place as claimed. QSL cards are today a fairly expensive item and to get value for your money they must meet certain requirements to have any value for Award purposes. Regardless of whether you have a very elaborate multi-colour card or a simple one-colour card, it is only of use to its recipient if you provide certain basic details of the QSO. You may put as much additional material on it as you like provided the details below are included.

During recent years I have checked many thousands of QSLs for various Awards and it never ceases to amaze me that so many people are unaware of the basic information a QSL must contain. Perhaps even more difficult to understand is why so many have cards printed without provision for even the call of the station worked.

The following details must be included:

1. **Your call sign** shown prominently. (Users of postcards please note.)
2. **The words** "To Radio.................... confirming our QSO" or "This confirms QSO with ....", clearly showing the call sign of the station worked.
3. **Location of your station** including your full postal address. Remember some stations will not have a current Call Book and otherwise will not be able to send their QSL to you in many instances without this information.
4. **Date and time of QSO.** ALWAYS use GMT.
5. **Band and mode used.** If it was a QSO using the same mode both ways, mark this clearly as many Awards give credit for all one mode.
6. **Signal report** using the standard RST system.

The above list seems simple enough, but how often is a card received which lacks at least one or more of these details, either because there is no provision on the card for it or the operator has not filled it out completely.

The following can be used as a basis for QSL cards and is very simple to fill out while at the same time meeting the above requirements.

YOUR CALL SIGN

YOUR QTH

To Radio........... confirming our QSO

on .... MHz. 2 x .... at

.... hrs. GMT on ..../......../........

Your sigs here were R..... S...... T......

Should you make a mistake while filling out a QSL, **do not scratch it out**, write out another card. Altered QSLs will not be acceptable for Awards as the person issuing the Award may well take the view that the applicant has altered the card to make the information conform with the Award requirements as to date, time, mode, minimum acceptable report, etc.

When ordering QSL cards specify **standard postcard** size as larger cards have to be bent to fit in with bulk handling via Bureaus and arrive in a tattered condition. If sent direct, they require special envelopes and are therefore more expensive.

Most Divisional Bureaus have their own rules for outward cards, check with them re presorting, etc., and you will help speed up the whole handling process.

Remember that many overseas as well as local stations will be depending upon your card to help them towards a particular Award. If your QSL meets all the above requirements you have played your part in helping them to obtain their Award.

[Ed. note.—P.M.G. min. size from 1/10/73 for postcards will be 5½ x 3½ inches. The metric size is A6 at 146 mm. x 103 mm.]

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Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

MORSE QUALIFICATIONS

Editor "A.R.," Dear Sir,

Either QSP for May 1972 contains a misprint, or our Federal Council has gone off its collective rocker!

I refer to the 5 (five) word per minute "qualification" which our worthy administrators intend to put to the National Regulatory Body, apparently as the unanimous view of the Australian Amateur Radio community.

Who, in his right mind, would postulate 5 w.p.m. as a Morse "capability" of any practical use for everyday on-air communication? As those who use the c.w. segments know, Morse speeds are going up, not down, and DX is being worked at speeds regularly two and three times in excess of the Australian full licence requirement. With a 5 w.p.m. "capability" an Aussie B grader is not going to have the faintest idea what is going on—emergency or otherwise.

Even the simplest of routine c.w. contacts runs to about 28 words, (e.g. salutation, RST, QTH, Name, QRK?, close), so it will take our B grader about six minutes to stumble his way through the over. Whether anyone can (or will) send him a return over at a speed he will be able to understand, is doubtful.

So where does our proposed B grade qualification fit in?

Accepting that a 5 w.p.m. capability acquired in ideal class room conditions is tantamount to no capability at all in practice, it follows that the W.I.A. proposal is not within the spirit of the International requirement that h.f. band operators have a usable skill in Dr. Morse's code.

Perhaps the B grade proposal has been set as a sprat to catch the D grade mackerel. If so, it is to be hoped that the P.M.G's Dept. administrators will recognise the proposal for what it is—a smart-alec attempt to circumvent the International requirement for a useful communications capability, using International Code.

It is regrettable that the Institute Council feels constrained to publicly associate itself (and by implication all VK Amateurs) with another proposal advocating lower standards, at a time when technological and practical trends are clearly in the opposite direction.

If Council feels it must make some act of obeisance to the God of licence numbers and to the minority segment of the Australian Amateur population, it should at the same time recognise that the **competent** "full" licensee's relative privileges need strengthening; e.g. there must be a complementary requirement for the many amongst the 75 per cent. full licence component of the Australian Amateur population, who demonstrate skills far in excess of the current licence standard.

To be constructive, the W.I.A. proposal to be fair and meaningful should equate the proposed new B grade with the existing standards for full licence entitlement, leaving D grade as is. At the same time, the existing full licence should be upgraded to (say) **Extra** Class requiring standards of performance typical of the more skilful element of International Amateurs. Those who can cope with 25 w.p.m. **and** who have substantial non-Amateur (e.g. P.M.G.) qualifications such as Broadcast, Television Station and/or First Class Commercial tickets should be allowed progressive increments in d.c. input, etc.

In other words, Council should **not** take formal action to request a licence structure biased towards three limited grades and only one qualified grade of Amateur. To do so prematurely might prevent, or at best, unduly delay enhancement of the position of a significant number of skilled and technically competent members of the Institute.

The matter is probably sufficiently important to warrant the taking of a **proper** concensus, before the Institute commits itself to irreversible action.

—Colin Harvey, VK1AU.

EFFECT OF ECLIPSE OF THE SUN

Editor "A.R.," Dear Sir,

On 11th July there will be an important event which I think active Amateurs will be interested. There will be an eclipse of the sun from about 1630 E.A.S.T. to 1904 E.A.S.T. The path of totality is from Sakhalin (Kamchatka) through Northern Alaska, Northern Canada down to the mid-North Atlantic Ocean. The region of partial eclipse is some 30 degrees broad either side of this.

The eclipse will obviously modify the local (Northern Hemisphere) ionosophere as well as modifying the ionosphere at the magnetic conjugate to the path of the eclipse.

The major effects at the conjugate points in the Southern Hemisphere are expected to be on a path running from about Adelaide, East across Bass Strait, then South-East to Antarctica. Effects are anticipated to occur, however, in a broad region about this path. The main effect will be ENHANCED E-LAYER IONISATION in the regions just defined. Amateurs active on h.f. and/or v.h.f. could experience enhanced propagation across this region (or along it) for the period of the eclipse.

—Roger Harrison, VK2ZTB.

☆

THE YOUNG S.W.L.

● **The Editor hopes this little article will be useful for the young beginner and will point a moral for us all. With acknowledgments to Hans Hoppe, writing in "A.P.C.," the monthly newsheet of the Moorabbin and District Radio Club.**

So you are keen on Radio? So am I. To start with, it need not be expensive, as, in the beginning, we only want to listen. Young people are sometimes at a loss on what to do and here are a few clues which might be helpful.

Firstly, a receiver is needed. What shall it be? Commercial, home-made or surplus? This depends on how much money, if any, you have saved or can get. Always try to make your hobbies as cheap as possible and have fun. Remember, we are only amateurs, not professionals.

Have a look in the disposals shops or write to them for details of what you are looking for. Several advertisements appear regularly in "A.R." Look for a set which tunes about 550 kHz. to 18 MHz. or more. This gives you broadcasts as well as the most popular h.f. Amateur bands. Types to look for would be BC348 range 950 kHz. to 18 MHz.; AR13 aircraft type 195 kHz. to 9 MHz.; R1155 75 kHz. to 18.5 MHz.; BC455 6.00 MHz. to 9.1 MHz. These are a few to think about.

They all use valves, but do not be put off because they require h.t. and l.t. A small p.s.u. for 240v. mains to give outputs of 250v. or more d.c. at 80 mA. and 6.3v. (or 12.6v.) at say 2a. will usually suffice and can be made up cheaply and easily from suitable bits and pieces. In some cases a simple little audio stage, using perhaps a 6V6 after the detector, and a small speaker will give adequate output. Remember though, whether you use valves or solid state, they both work. Use whichever is cheaper or whatever you can acquire. It is a hobby to have fun with, to explore the ever-changing world of radio, so keep within your limits.

Converters for bands higher in frequency can easily be made up from circuits and details in the various handbooks, especially such beginners' books as the A.R.R.L. "Understanding Amateur Radio", available to members through W.I.A. Fed. Publications.

Don't be discouraged in your search for knowledge. If you see a set that could be useful, but covered in dust and cobwebs, get busy on it. Do not fiddle with slugs or trimmers until you know what you are doing, and always, but ALWAYS, treat power with care. You, the beginner of today, will be the Amateur of tomorrow with help and understanding from others. Share your knowledge with others; in this way we all learn.

Remembrance Day Contest, 1972

"THE FRIENDLY CONTEST"—12th and 13th AUGUST

CONTEST COMMITTEE NOTES

VHF-UHF contestants will be able to make more than one contact with the same operator on the same band provided that a full two hours elapses from the previous contact on that band. This is intended to enable these operators to carry on for a much longer period, and obtain a larger score, whereas previously most of those in the Contest could be contacted in a few hours. I hope this brings forth a good response from Limited licensees.

To encourage c.w. operation each c.w. to c.w. contact will be worth twice as many points. More notice was desirable but there is still time to find the key and get in some practice.

You will note a variation in scoring to and from the smaller call areas. It is fundamentally wrong for two contestants to both count their contact to the same score. For example, VK4 and New Guinea VK9 contacts score twice for VK4 in the old table. In the new table one point for each contact is allowed, total 2 points, as contacts must not be discouraged.

There was a variation in entry closing times. Irrespective of postal date stamps (so many illegible), entries will be received up to 22nd September. Send by camel train if you wish, but after the 22nd September it will not be looked at. Please get **your** entry in well before that date or I will not be able to cope.

PLEASE ensure that you have your entry with a front page as shown in the Rules. Sorting and listing is so much simpler if "section", "call sign", and "claimed score" can be selected quickly. Use at least a quarto size paper—small sheets tend to get lost in the heap as they are difficult to file.

Within a limitation, Amateurs portable/mobile in other States than their home State may work for their home State in 1972. Naturally contestants wish to score for their own State or Division, but the previous rule laid down scoring for the host State. As a result, quite a few portable/mobile logs were not submitted last year. This, of course, applies to travellers who have their own gear with them and not to those who may wish to use their host's gear.

In 1971 there were only a few contacts on 10 metres but all good contacts. This year I suggest that 1100 hours Z on Saturday and 0100 hours Z on Sunday morning be the start of one hour's calling times for 10 metres.

Remember the reason for the Contest.

The Contest is between VK Divisions. Do your bit for your Division.

Do not forget that at least six high scores are needed for each Division.

Make sure that you and everyone you contact enjoys the Contest. Make it a "Friendly Contest".

—Peter VK4PJ.

A perpetual trophy is awarded annually for competition between Divisions of the Wireless Institute of Australia. The name of the winning Division is, each year, inscribed on the trophy and in addition the winning Division will receive a suitably inscribed Certificate.

Because of the excellent relationship between New Zealand and Australian Amateurs, "Kiwis" are invited to participate in this Contest. However, New Zealand operators compete for certificates only and not the Remembrance Day trophy.

OBJECTS

Amateurs in each VK call area will endeavour to contact operators in other VK and ZL call areas, on all authorised bands. Contacts within a call area are permitted on bands of 52 MHz. and above.

Contest Date: 0800 hours GMT, Saturday, 12th August, 1972, to 0759 hours GMT on Sunday, 13th August, 1972.

All Amateur stations are requested to observe 15 minutes silence before the commencement of the Contest on that Saturday afternoon. An appropriate broadcast will be transmitted from each Divisional official station during this period.

RULES

1. There are four sections in the Contest:—
   (a) Transmitting, phone
   (b) Transmitting, c.w.
   (c) Transmitting, open
   (d) Receiving, open.

2. All Australian Amateurs are invited to enter the Contest whether their stations are fixed, mobile or portable.

3. All authorised bands may be used and cross mode operation is permitted. Cross band operation is not permitted.

4. Amateurs may operate on both phone and c.w. during the Contest, i.e. phone-c.w., phone-phone, or c.w.-c.w., but only one section may be entered. An open log will claim points for both phone and c.w. contacts.

5. One contact per station, per band, only is permitted for scoring, with the exception that a second scoring contact may be made on the same band using the alternate mode. Arranged contacts on other bands are not permitted. On bands 52 MHz. and above, additional contacts may be made with the same station provided that two hours elapses after the previous contact with that station on that band.

6. Any operator may enter one log only, and multi-operator stations are not permitted. Although log-keepers are permitted, only the licensed operator is allowed to make contact under his own call sign. Should more than one operator wish to use any station each will be considered a separate contestant. Such contestants shall be referred as "substitute operators" for the purpose of these Rules and their operating procedures must be as follows:

Phone: Substitute operators will call "CQ RD" or "CQ Remembrance Day", followed by the call of the station they are operating, then the word "log" followed by their own call sign, e.g. VK4BB log VK4AA.

CW: Substitute operators will call "CQ RD" de VK4BB/VK4AA.

Contestants receiving the signals from a substitute operator will qualify for points by recording the call sign of the substitute operator only.

7. Contestants must operate within the terms of their licence.

8. **Cyphers**: Before points may be claimed for a contact, serial numbers must be exchanged and acknowledged. The serial number of five or six figures will be made up of the RS or RST reports plus three figures, starting at one, that will increase in value by one for each successive scoring contact.

9. **Entries** must be set out as shown in the example, using one side only of the paper, and no smaller sheet than quarto. Envelopes to be marked "Remembrance Day 1972" and forwarded to—

Federal Contest Manager,
W.I.A.,
Box 638, G.P.O.,
Brisbane, Qld., 4001.

Entries must be forwarded in time to open on 22nd September. Early entries will be appreciated. Late entries will not be handled.

10. Scoring will be based on the table shown.

Portable/Mobile operation: Log scores of operators working outside their home call area will be credited to their home call area provided that operation takes place in only one call area and contacts with their home call area do not count for scoring purposes. Otherwise scoring will be as for the host call area.

11. All logs **must** carry a **front sheet** showing the following information:

(Continued Next Page)

EXAMPLE OF TRANSMITTING LOG

Date/ Time GMT	Band	Emission and Power	Call Sign Worked	RST No. Sent	RST No. Received	Points Claim.

Note.—Standard W.I.A. Log Sheets may be used to follow the above form.

Name........................Section..........................
Address....................Call Sign......................
...................................Claimed Score............
No. of Contacts..........

Declaration: I certify that I have operated in accordance with the Rules and spirit of the Contest.

Signed..
Date...................

12. All contest contacts made must be shown including non-scoring invalid contacts. Logs in the open section must show c.w. and phone contacts in numerical sequence.

13. The Federal Contest Manager does not expect to exercise his right to disqualify any entrant who, during the Contest, has not observed the Regulations or who has departed from the accepted code of operating ethics, nor does he wish to disallow any illegible, incomplete, incorrect or late logs.

14. The ruling of the Federal Contest Manager is final and no disputes will be discussed.

AWARDS

Certificates will be awarded to the top scoring stations in Sections (a) to (c), Rule 1, of each call area and will include the top scorer in each Section of each call area operating exclusively on 52 MHz. and above.

There will not be an outright winner for Australia or New Zealand. Additional certificates may be awarded by the Federal Contest Manager.

The Division to which the Remembrance Day Trophy will be awarded shall be determined in the following way.

To the average of the top six logs shall be added a bonus arrived at by adding to this average the ratio of logs entered to the number of State licensees, including Limited licensees, multiplied by the total points from all entries in Sections (a), (b) and (c) of Rule 1.

$$\text{Average of top six logs} + \left\{ \frac{\text{Logs entered}}{\text{State licensees}} \times \begin{matrix}\text{Total Points} \\ \text{of Sections} \\ \text{(a), (b), (c)}\end{matrix} \right\}$$

VK1 scores will be included with VK2, VK5 with VK8, and VK0 with VK7. Also VK9 scores will be added to the Division which is geographically nearest. Note that in the scoring table contacts made between call areas who summate their scores count points.

Acceptable logs for each Section shall show at least five valid contacts.

The **Remembrance Day Trophy** shall be forwarded to the winning Division in its container and will be held by that Division for the ensuing period.

RECEIVING SECTION (d)

1. This Section is open to all Short Wave Listeners in Australia, but no active transmitting operator may enter.

2. Contest times and loggings of stations on each band are as for transmitting.

3. All logs shall be as set out in the example. The scoring table to be used is the same as that used for transmitting entrants and points must be claimed on the basis of the State in which the receiving station is located. Refer to the sample log. It is not sufficient to log a station calling CQ—the number he passes in a contact must be logged.

It is not permissible to log a station in the home call area of the receiving station on the 1.8-30 MHz. bands, but on bands 52 MHz. and above stations in the home call area may be logged for one point on each occasion.

4. Except for 52 MHz. and above, a station heard may be logged once on phone and once on c.w. for each band.

5. Club receiving stations may enter for this Section of the Contest and if sufficient entries are received an award will be made to the top entry in Australia and New Zealand.

6. Certificates will be awarded to the highest scorers in each call area provided a minimum of four entries are received from that call area.

SCORING TABLE

To

From	VK0	VK1	VK2	VK3	VK4	VK5	VK6	VK7	VK8	VK9	VK9	ZL1	ZL2	ZL3	ZL4	ZL5
VK0	–	6	6	6	6	6	6	6	6	6	6	2	2	3	4	1
VK1	6	–	1	1	2	3	5	4	6	1	5	2	2	3	4	6
VK2	6	1	–	1	2	3	5	4	6	1	5	2	2	3	4	6
VK3	6	4	1	–	2	1	4	3	6	5	5	2	2	3	4	6
VK4	6	3	1	2	–	3	6	5	4	1	3	2	2	3	4	6
VK5	6	5	2	1	3	–	4	3	1	6	6	2	2	3	4	6
VK6	6	6	2	1	4	2	–	3	5	1	6	2	2	3	4	6
VK7	1	5	1	1	3	2	5	–	5	6	6	2	2	3	4	6
VK8	6	5	1	1	2	1	6	4	–	3	3	2	2	3	4	6
VK9	6	1	1	2	1	4	1	6	1	–	–	2	2	3	4	6
VK9	6	5	1	2	3	4	5	6	1	–	–	2	2	3	4	6
ZL1	6	3	1	1	2	3	5	4	6	5	5					
ZL2	6	3	1	1	2	3	5	4	6	5	5					
ZL3	6	3	1	1	2	3	5	4	6	5	5					
ZL4	6	3	1	1	2	3	5	4	6	5	5					
ZL5	1	5	2	1	4	3	5	1	6	6	6					

Read table from left to right for points for the various call areas.

There are two columns and lines for VK9. Use the lesser figure if the call areas are adjacent and/or scores summate. For example, New Guinea VK9 and VK4 are adjacent and summate for the trophy score, so count one point, but New Guinea VK9 and VK6 are not adjacent and do not summate so count five points.

In addition to the above table, all intrastate contacts on 52 MHz. and above are worth one point each.

CW scoring: All c.w.-c.w. contacts carry a multiplier of two. Insert the final figure in your log.

REPEATER IDENTIFIER

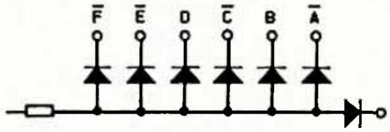
(Continued from Page 5)

DITS		DAHS		STOP	
Dec.	Bin.	Dec.	Bin.	Dec.	Bin.
1	000001	4	000100	36	100100
2	000010	6	000110		
3	000011	8	001000	1 Stop	
7	000111	14	001110		
10	001010	21	010101		
11	001011	24	011000		
12	001100	28	011100		
13	001101	33	100001		
16	010000	34	100010		
18	010010	35	100011		
19	010011	10 Dahs			
22	010110				
23	010111				
25	011001				
27	011011				
29	011101				
31	011111				
32	100000				
18 Dits					

There are six digits in the binary representations of each number, so we will require a six-stage ripple carry counter. Let the outputs of each flip-flop be A, $\overline{A}$, etc., as shown in Fig. 4. Now since A, $\overline{A}$ is the most significant digit, the number represented on the ripple carry counter is of the form

F E D C B A
e.g. 0 0 1 0 1 0

If we require one of the AND gates in the diode matrix to produce a 1 output for the above number, we must connect the six inputs of the gate to logical 1 for that number and for that number only. Since $\overline{Z}$ = NOT (Z) it is simply achieved by connecting to Z where a 1 occurs in the number, and to $\overline{Z}$ where a 0 occurs in the number. For the above example we would connect $\overline{F}$ $\overline{E}$ D $\overline{C}$ B $\overline{A}$



For VK4EI/R2 we have 29 × 6 = 174 diodes plus 28 to prevent interaction, making a grand total of 202 diodes.

No doubt the more astute reader will have counted only 99 diodes in Fig. 5. This was achieved by a logical network simplification procedure known as a Karnaugh map. The use of Karnaugh maps would require a course in logical design which is somewhat beyond the scope of this article. (The author's usual fee for Karnaugh map simplifications is 50 guineas.)

So there it is, a completely solid state automatic repeater identifier that produces an output when the repeater transmitter has been on the air for 4.5 minutes and for every 4.5 minutes after that until the transmitter goes off air.

If the transmitter goes off air before the end of a 4.5 minute period, the timing circuit is reset to zero. The device thus complies with P.M.G. requirements. ●

DIVISIONAL NOTES

DIVISIONAL DIRECTORY

OFFICERS, 1972/73

(Note—Officers refer to the Division of their call sign)

Patrons: VK6QJ, VK7BQ.

Presidents: VK2ACV, VK3IZ, VK4ZBV/T, VK5TY, VK6HD, VK7EJ.

Secretaries: VK2AM, VK3AZT, VK4VV, VK-5KF, VK6NE, VK7CL.

Treasurers: VK2ZIA, VK3YQ, VK4UC, VK5TL, VK6EU, VK7VK.

Federal Councillors: VK2GN, VK3OR, VK-4ZGL, VK5TY, VK6NE, VK7EJ.

Vice-Presidents: VK3 2YB, 2ZIM, 3YQ, 4IE, 5RG, 5QO, 6DD, 6DC.

Council Members (additional): VKs 2ZDD, 2ZGW, 2ZIU, 3AJV, 3AXF, 3CDR, 3NT, 3ZA, 3ZCK, 3ZDW, 4AK, 4EV, 4HB, 4NP, 4VU, 4XG, 4ZST, 5GZ, 5NB, 5RG, 5XV, 6BY, 6DA, 6LO, 6PG, 6RU, 6ZJF, 7AK, 7CL, 7JV, 7MD, 7VK, 7ZAS, 7ZMK.

Federal Executive: President VK3KI, Vice-President VK3QV, Editor VK3ARZ, VKs 3DM, 3ADW, 3AGZ; Secretary VK3CIF.

VICTORIA

BAND PLANNING
VHF REPEATER FREQUENCIES
PROPOSALS FOR CONSIDERATION

The VK3 Division Repeater Committee, headed by Peter Linden, VK3BX, recently called two meetings—the latter on 3rd June at the direction of Divisional Council.

At the last meeting all interested users of the 144-148 MHz. band were invited to attend to generally discuss the future frequency requirements of repeaters, determine their compatibility with existing simplex channels, and frequencies to be used by stations in the Amateur Satellite Service.

The meeting adopted a system proposed by Ian Yandell, VK3ZIY, which is shown in the Table below which deserves close study.

TABLE 1

(Note all Repeaters 600 kHz. spacing between input and output freq.)

Freq. MHz.	— Simplex — Exist.	Future	— Repeaters — Revised	Future	Satellite
145.85	Ch. A	—	—	—	Yes
145.90	—	—	—	—	Yes
145.95	—	—	—	—	Yes
146.00	Ch. B	—	—	—	Yes
146.05	—	Yes	—	—	—
146.10	—	--	Ch. 1 in	—	—
146.15	Ch. C	—	—	—	—
146.20	—	—	Ch. 2 in	—	—
146.25	—	—	—	Ch. 5 in	—
146.30	—	—	Ch. 3 in	—	—
146.35	—	—	—	Ch. 6 in	—
146.40	—	—	Ch. 4 in	—	—
146.45	—	—	—	Ch. 7 in	—
146.50	Ch. S	—	—	—	—
146.55	—	Yes	—	—	—
146.60	Ch. T	—	—	—	—
146.65	—	Yes	—	—	—
146.70	—	—	Ch. 1 out	—	—
146.75	—	Yes	—	—	—
146.80	—	—	Ch. 2 out	—	—
146.85	—	—	—	Ch. 5 out	—
146.90	—	—	Ch. 3 out	—	—
146.95	—	—	—	Ch. 6 out	—
147.00	—	—	Ch. 4 out	—	—
147.05	—	—	—	Ch. 7 out	—

It should be noted:—

(1) That the repeater input frequencies remain the same and are the lower frequencies, and the repeater outputs are the higher frequencies.

(2) All present known simplex channels are preserved, as well as individual specialised net frequencies in VK3.

(3) The Amateur Satellite Service world wide has endeavoured, by general agreement to have the frequencies between 145.85 and 146.00 MHz. kept relatively free of constant use communication channels.

(3) The present repeater output frequencies (your receive frequency) could also be utilised for simplex operation by purchasing the corresponding transmit crystal.

The meeting recognised the cost to existing users of having to update their receiving crystals, for repeater operation, but believes that action taken now has the two-fold effect of rationalising 2 metre operation in terms of conflicting requirements and makes better use of the spectrum available to us in this part of the world.

FUTURE ACTION

These recommendations have been forwarded to the Federal Repeater Secretariat and the Federal Band Planning Committee recently formed from members of this Division to assist Federal Council.

In the same way as the recommendations from the Wodonga Conference on Repeaters became a nationally adopted procedure, it is to be hoped that this proposal finds favour in a similar manner.

The latest band planning arrangements in Region 1 (Europe) where the band 144-146 MHz. ONLY is available is as follows:—

144.00 — 144.15 MHz.	CW
144.15 — 145.90 MHz.	CW, Phone
145.90 — 146.00 MHz.	Beacons, Satellite
145.00 — 145.25 MHz.	Repeater inputs
145.50 — 145.85 MHz.	Repeater outputs also mobile, RTTY, SSB, calling chan.

(Courtesy cable from G2BVN)

—P. D. Williams, Pres., Vic. Div.

SOUTH AUSTRALIA

Glad news at last. The Divisional Council has been given permission by the Thebarton Council to formulate a plan for use of the Walter Burly Griffin designed establishment on their property. This central location should prove ideal for section meetings, storing of components and materials, and housing of the official VK5WI transmitter. Conversion plans have been approved by the general meeting and have been submitted to the Thebarton Council so, hopefully, almost certainly, the dream of a home for VK5WI is coming true at last; thanks to the hard work of the site investigation committee. The outline of the changes will appear in the journal.

As a final passing note, just a reminder about the VK5 intrastate contest scheduled for early August. —Dave VK5GZ.

NEW TYPE OF BATTERY

It is announced that P. R. Mallory & Co. Inc. has been granted an exclusive world-wide licence to manufacture and market lithium organic batteries under the patents and technologies of American Cyanamid Company.

J. David Ehlers, managing director of Mallory Batteries (Australasia) Pty. Ltd., said, "The Company plans initially, under the licence, to concentrate on the further development and manufacture of a three-volt lithium organic battery with characteristics considered especially suitable for government-related portable power applications. The battery has exceptionally high energy density, constant voltage discharge characteristics, a long shelf life and can be used over a wide range of environmental conditions."

Mr. Ehlers said that Mallory Batteries (A'sia) Pty. Ltd., a subsidiary of P. R. Mallory & Co. Inc., U.S.A., will market those products in Australia in 1973. The parent firm, The Mallory Battery Co. (U.S.A.) is establishing a pilot line facility in Tarrytown, N.Y., to produce several cell sizes of lithium organic batteries.

Mr. Ehlers said, "Mallory also is developing other lithium battery systems, including a family of solid-state batteries with rating of from 20 to 200 volts, or higher. These batteries have potential use in medical electronics, time pieces, military devices and in other applications where high voltage density and reliability are required."

OVERSEAS MAGAZINE ABSTRACTS

March 1972.—Converting the T-278/U Transmitter to 2 mx; Converting the ART-13; Improving Your HR-2; Twelve Channels with the Regency HR-2; Morse Centennial; Updating an Old Receiver; Solid-State Tuneable I.F., Part 2; Checking Zener Diodes; Putting the ARC-3 on Two; Blown Fuse Indicators; Nonlinear Resistors; Constant Current Charger for Ni-Cads; The ESM/1 Transceiver; Low-Cost Transistor RF; Updating the W1PLJ Counter; Simple Diode Controller; Low-Pass Filter in Action.

April 1972.—200 Watt 2 mx Amplifier; Using the Drake TR-22; An Auto-Bandwidth Selector Unit; Customised AFSK-MCW-Code Practice Oscillator; Using the LM373; Repeater Site Alarm; T44 Base Station Conversion; The HR-2 as a Base Station; FM Repeater Guide; Electronic Symbols and Abbreviations; 73 Tests the Comcraft; Ross and White Transceiver; Ionospheric Effects of Thunderstorms.

"QST"

March 1972—An SSB and CW Transverter for 220 MHz.; HF Propagation Estimation for the Radio Amateur; A Dual-Voltage Medium-Current Power Supply for Repeaters; Dual Polarisation DX Antennas; The VE2HN Digital CQer; Broadband Solid-State Power Amps. for SSB Service; Noise Generators; Review: Curtis EK-402 Electronic Keyer.

"CQ"

May 1172.—CQ Yeti—Ham Radio at the Top of the World; An Improved Calibrator using Solid-State Techniques; General Purpose Wide Band Amplifier; Direct Etch Resist for Printed Circuits; Noise and Noise Generators, Part 1; Safe and Easy Field Day Antenna Raising.

"RADIO ZS"

March 1972.—Twenty Metre Band Spurious in the FTDX-100; Transistorised Capacitor Discharge Ignition System.

"HAM RADIO"

February, 1972.—Digital Readout Station Accessory; Solid-State Driver and Final for 40 and 80 Metres; The TR-144 Transverter for Two Metres; Third Generation Solid-State HF Converter; Pre-Emphasis for SSB Transmitters; Modular Receiver for Two Metre FM; A Simple Crystal Checker; Calculating the Inductance of Toroids.

March 1972.—Ecology Linear; Solid-State 2304 MHz. Converter; 455 kHz. Filter for Amateur FM; Improved Two Metre Pre-Amplifier; Reciprocating Detector; Monitoring SSB Signals; Digital Station Accessory, Part 2.

"BREAK-IN"

April 1972.—Re-learning the Code; Annual Report and Accounts, etc.

"RADIO COMMUNICATION"

April 1972.—A Hand Portable Transceiver for 70 MHz.; Crystals for Carfones and Other Things (Reprint from "A.R.," May 1971); A 9 MHz. Crystal Filter for Amateur SSB; A Switched Z-Match Aerial Unit; A Scaffold Tilt-Over; Microwaves; RF Probes; Review of RCS Type 501 Timer/Counter.

"SHORT WAVE MAGAZINE

March 1972.—Top Band Transverter for Transceiver Operation; Using the Roller Coaster Coil Unit; The Phase Locked Loop; Loading up a Wire for Top Band. —VK3ASC.

you and DX

With Don Grantley*

Times: GMT

Having just spent a few short days in VK4, it is not a very pleasant task to have to return to the cold VK2 climate, sit in a freezing shack and attempt to compile these notes. But all is not lost, I hope to move to the Sunshine State before the end of the year. My apologies to my many friends up there, I had to make a hurried business trip, thus had no time to renew acquaintances, but better luck next time. At least the DX was good up there, which is more than I can say for the conditions in this part of the world.

Many strange prefixes have appeared during the month of May. C29ED on May 17 was a special operation for Nauru Constitution Day, and was operated by C21TL, Box 32, Nauru. SK2XA on May 26-28 by Kiruna Radio Club, celebrated the arrival of the Midnight Sun. SK0ITU was on for World Telecom Day, QSL to SK0CC. WM2GK QSL to K2NP. WM4SFC QSL to K4BFT. WP6JPL QSL to W6ZGC, were special stations, whilst WU3SNA, QSL to W3ADO, was the Armed Forces Day operation from the Annapolis Naval Academy.

9H3WTD was a special exhibition station, QSL to 9H1N. KA6DO is ex-KR6DO, using his new prefix. (KR6 Ryukyu now counts as Japan as from May 15 in most lists). EI0DMF from Dundalk May Festival May 12 to 21, manager is EI2I. HW5UIT is a special I.T.U. station, QSL to F9OE. KD4USA was Armed Forces Day operation from Sth. El Monte, California. SX0E/72, QSL to SV1EN, Box 1442, Athens, was QRV from the Electron 72 Exhibition. Another I.T.U. station was KE4ITU, QSL to K4ZA. U4L was the Lenin Memorial Station by Ulanawosk Club Station UK4LAA, QSLs to UA4LN. A special call WP6JPL was used for reasons unstated in May, QTH Box 262, Barstow, Cal., 92311.

The prefix XQ is being used by CE stations on 21 MHz. only during Unctad 3 Conference whatever that may be. The 6D4 prefix is now in use for Revilla Gigedo.

A note to hand from "Monitor" re YA1RG states that Wolfgang has now returned to Germany, and should now be QRL as YA1RG/DL Folfgang Renner, 34 Gottingen, Friedensstr, 25, Germany. He is still award manager for the Afghanistan Radio Award and the Camel Drivers Ten Award, but all other YA material should go to Box 279, Kabul.

BV2AA is in the news again. I have often stated that I doubt their authenticity, and it is now reported by Geoff Watts that the A.R.R.L. will not accept these QSLs for DXCC as the station is unlicensed, QSO reports are relayed by other stations and there is a strong possibility that "BV2AA" is located in Japan. His name is Nong (which could mean anything) and his manager is JH1HWN, Hiromichi Katsurashima, 2236-33 Zamalriya, Zama-machi Koza-gun, Kanagawa, Japan. BV2AB has been reported closed down by the government. In passing, 2AA is often in the Pandora's Net 14287 Mondays at 0430z.

There has been a recent spate of activity from HB0, several stations were in operation over almost a month, ending at the beginning of June. HB0XJL and XJK had DJ2BW as manager. XJQ was managed by K3SSC, XIW by DJ5CD, XIZ by WB8FGZ, XJG by WA4WME, and XJJ by DL7HZ.

KC6WS and KC6YL, now back in the States, have finally received their logs from the West Carolines, and will be pleased to answer any outstanding QSLs. Their home QTH is W. Sendore, W5SZV, 3224 Bob-O-Link Lane, Denton, Texas, 76201.

UK1ZFI is active from Franz Josef Land at the time of writing. The operation is by UR2AR and UR2DW, who ask that all cards go via the Central Radio Club, Box 88, Moscow. Other Russian stations of interest include UA1GZ/M from Vostol, UPOL 19 USSR Ice Station "North Pole 19" cards for which go to UW3HY at Box 88, Moscow. UK1OAH/1 from Solovetskie Is. and UK0BAC from Dickson Is. The /M suffix indicates an Antarctic station.

Pacific Stations.—Many interesting stations are active in this area at the present time and here are a few of them with their QSL information where possible. KB6DA (W6CUF), KC4DX operation now completed from Navassa Is., QSL to W4GKF or Box 11555, Atlanta, Georgia, 30305. KX6EB usually on 14035 c.w. about 1900z, QSL to KX6DC. VR1AC (K3RLY), VR1W and KB6DA on from British Phoenix. YJ8RV (G5RV), and YJ8GH (W6ANN) both active, the latter often on sked with ZL2AMI or ZL2AUJ on 40 mx at 0815 usually on 7220. VS5PW is often in the South-East Asia Net 14320 s.s.b. daily, he is Capt. Paul White, RBMR Berakas Camp, Bandar Seri Begawan, Brunei.

Allan G3WUW is currently active from 9M6AB 14160 and 14240 mainly on week-ends at about 1600z onwards. He planned to move on to VS5AP then 9M8WUW, QSLs for all three calls go to JA2KLT, however Allan may be contacted in the area for a year at the following address, A. Papworth, Decca Survey Co., Topo Dept., Brunei Shell Petroleum, Seria, Brunei. From the same, 9M6BA and 9M8TJZ should soon appear. The latter has the same QTH as 9M6AB, while 6BA is Barney Avery, manager, O'Connors Sdn., Bhd., Box 1197, Kota Kinabalu, Sabah, East Malaysia.

Don't pass up that log entry with the official I.T.U. station for that contact that you had on World Telecom Day, or during the period from May 6 to 18 as their special QSL is one worth adding to any collection.

Darleen WA6FSC will shortly marry Joe HC2OM, and is hoping for the call HC2YL. As Darleen is a most reliable person where a QSL is concerned, maybe I will now get that HC QSL which has been eluding me for 20 years.

WA2BAV and WB2AQC recently completed their West African travels, which included operation from TU4AB. They have returned home where their address is George and Eva Patake, 34-24 74th Street, Jackson Heights, New York, 11372, U.S.A.

VB2KOC, which was active during the Newfoundland State Convention of the Knights of Colombus from May 19-22, served a double purpose, as well as being a strange prefix, it also enabled many more contacts with the elusive Zone 2.

Often when tuning over the bands I wonder just what is happening to them. There are so many intruders on twenty these days that it is just not funny any more. The position in the UK evidently has the authorities worried, for I note that the R.S.G.B. have been allotted an official Intruder Watch Station GB2IW. I have heard recordings of some of the rubbish which inhabits 20 over in G land, and it leaves ours for dead. It is all very well to record, identify and report these menaces, but I firmly believe a few solid well placed watts do far more to shift these chaps than all the reports in the world. Without getting on my pet soap-box, how about a little of this to these contest spoilers.

Short Jottings.—7X2BK has a new manager W5LUJ. Bob Stark, W5OLG, manager of VR-6TC, passed away recently. G3XEC, manager for MP4MBC, has a new QTH: 26 Plumian Way, Balsham, Cambs CBI 6EG. KZ5EK QRV 28525 or 21200 Saturday and Sunday 1200-1600z. ZF1WE replies quickly if QSLs are sent to Box 440, Grand Cayman. GB2IOS from Scilly Isles May 27 to June 27, QSL to G3TBS. CT-2BG now has a new manager, WA2BCK, from May 5.

Nets.—A reminder on a couple of the more interesting and productive nets. The British Commonwealth Net now on Summer QRG 21354 s.s.b. Monday to Friday 1430, with Net Control G3LQP. On Saturday and Sunday the time is 1000z same frequency, control is G3SUW. The Arabian Nights Net meets Mondays 14290 1900, Thursdays 21355 at 1500z, and Fridays 14190 at 0730z. The African Net meets daily on 21355 at 1900 with net control being W2PPG, whilst the ZL/VK/African Net appears on Saturday and Sunday 21225 at 0700 with ZL1BKX or VK3PA in the chair. (3PA, is that still you, Perce?)

At this stage we run out of space. My thanks to Geoff Watts DX News Sheet and Monitor for notes in this issue.

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* P.O. Box 222, Penrith, N.S.W., 2750.

Book Review

THE RADIO AMATEUR'S HANDBOOK

1972 Edition

Radio technology has been changing at a rapid rate and the 49th edition of this popular Handbook has been revised extensively. Thirteen chapters have been re-written to cover new devices and techniques. The book has been completely re-organised to make material easy to find. This new edition contains an additional fifty pages and covers digital logic devices, linear ICs, h.f. and v.h.f. antennas, broadband amplifiers, filter networks, converter designs and s.s.b. techniques. Two hundred new drawings and charts have been included to present the current state of the art in all areas of Amateur communications.

Published by A.R.R.L., available from Divisions or from Fed. Publications. —VK3ASC

IONOSPHERIC PREDICTIONS FOR JULY 1972

The predictions for July from charts supplied by the I.P.S. are listed below. It is of interest to note that the MUF, in most areas, has dropped to around 25 MHz. at the peaks. 10 metre DX operation from VK is almost non-existant, and will probably remain this way for at least four months.

The best opportunities for DX is still on 20 metres, but don't overlook 15 metres during the daylight hours.

Last month a survey among a small cross-section of Amateurs was taken to discover the reaction to the change in format of the predictions, and all Amateurs interviewed unanimously agreed that the new presentation is for the better. The Editor would greatly appreciate receiving by mail your comments regarding the predictions.

Note.—VK4 is Townsville, VK0 is Macquarie Island and all times stated are E.A.S.T.

28 MHz.—

VK4 to	KH6		1300-1500

21 MHz.—

VK1/2 to	ZL		minus 4 1100 plus 4
	VE3	SP	1200
		LP	minus 1 1000 plus 1
	W6		minus 5 1200 plus 5
	VK0		minus 5 1300 plus 3
	5Z	SP	minus 1 1700 plus 2
		LP	0700. 1700
	ZS		minus 2 1700 plus 1
	G	SP	1800
		LP	minus 1 0800 plus 1
	VU		minus 1 1200 plus 6
VK3 to	UA		minus 3 1700 plus 2
	F	SP	1800 plus 1
		LP	0700 plus 2
	VK0		minus 3 1300 plus 3
	I	SP	1500-1900
		LP	0800
	ZL		0800-1600
VK4 to	KH6		0700-1900
VK5 to	KH6		0700-1800
	JA		0800-1900
VK6 to	ZS		1500-2100
	G	SP	minus 1 1900 plus 2

14 MHz.—

VK1/2 to	ZL		0700-1800
	8P	SP	minus 2 0900 plus 10
		LP	minus 2 0900 plus 3
	VE3	SP	minus 2 1400 plus 2
			2200-0200
		LP	minus 1 1000 plus 6
	W6		1200-0300
	PY		minus 2 0900 plus 4
	VK0		minus 6 1300 plus 6
	VK6		0900-1800
	5Z	SP	minus 1 0900 plus 3
			minus 2 1700 plus 2
		LP	1200-2000
	ZS		minus 3 1700 plus 4
	VU		1000-1300
			1900-2400
VK3 to	VK8		0900-1800
	UA		0700-1200
			2000-2400
	F	SP	0800-1300, 2300
		LP	0700-2000
	VK0		0800-1900
	G	SP	0800-1200
			2200-2400
		LP	0700-2000
	I	SP	0800-1400, 2200
		LP	0700-2000
VK4 to	KH6		0600, 1300-0200
VK5 to	KH6		1200-0400
	JA		1600-0300
			0700-1100
VK6 to	W1		2100-0200
	ZS		1400-2300
	G	SP	0900-1400
			2100-0300
		LP	0900-2200

7 MHz.—

VK1/2 to	ZL		1600-0700
	8P	SP	1500-2100
	VE3	SP	1600-2000
		LP	0900
	W6		1600-2400
	PY		minus 1 0700 plus 1
			1500-2100
	VK6		1700-0900
	ZS		2400-0900
	G	SP	0200-0700
		LP	1500 plus 1
	VU		2300-0800
VK3 to	VK8		1700-0900
	F	SP	0400-0800
		LP	1500 plus 1
	VK0		1600-0800
VK4 to	KH6		1700-0300
VK5 to	KH6		1700-0300
VK6 to	W1		1900 plus 1
	ZS		2400-1100

Smoothed monthly sunspot number predictions for July 49, August 47, September 46, October 44. Swiss Fed. Observatory, Zurich.

VHF UHF

an expanding world

With Eric Jamieson, VK5LP*

Closing date for copy: 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK3	144.700	VK3VE, Vermont.
	144.925	VK3ZQC, Moe South.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Albany.
	145.010	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
	145.250	ZL2VHP, Palmerston North.
	431.850	ZL2VHP, Palmerston North.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

It seems that this column, together with similar columns in the "Victorian VHFer" and the new N.S.W. "6 Up" all beat the gun regarding the frequency change of the VK6VF beacon from 52.006 to 52.300. It appears that this proposed change will take place at some period this year but not just at present, so the beacon is currently listed again on its former frequency. I have also received a letter from Neil Penfold, Secretary of the W.A. Div. of W.I.A., the contents being as follows and self explanatory: "Please note that the VK9 beacon on Christmas Island is not operative, and is not likely to be for some time. The equipment has been "taken back" by the D.C.A. for other work." Thanks, Neil, now we know.

While on the subject of beacons, Mike VK-2AM mentions that an application for a licence for the proposed VK2 beacon has been filed for some time. A tower is available, the present repeater antenna is at the top and the beacon antenna/s will be mounted underneath. Final frequencies have not yet been determined, but may operate on selected frequencies until a band plan by the new W.I.A. Band Planning Committee is put forward. This last sentence gives me a good excuse to once again mount the soap box and re-iterate my own views on my favourite subject—beacons—that all two metre beacons should be located above 144.500 MHz. but not above 145 MHz. This places them in the second 500 kHz. tuning range of the average transceiver out of the way of DX contacts which are invariably to be found in the first 500 kHz., still within a useful working area (gain) for antennas such as the popular 10 element yagi, and also where most converters have a useful performance. Some specially designed narrow bandwidth jobs may have some difficulty in doing well when tuned to the second 500 kHz. but then these converters as a rule are designed for a specific purpose and would not normally be used to listen for beacons anyway. Let us hear from you if you have something useful to say on the matter, and certainly get your case ready for a hearing by the Band Planning Committee.

50 MHz. IN THE U.S.A.

A copy of a letter from Victor Frank, WB-6KAP to KH6HK has come into my hands and briefly states that on 29th March the six metre Amateur band was open from 2100-2200 GMT from Northern California and much of the United States to Central and South America. Rusty XE1PY reports daily openings to South America from Mexico City since March 1 beginning as early as 1930 GMT and remaining till 2300 GMT, also evening transequatorial openings to LU, CE and HK starting about 0030 GMT. Since mid-March he had been receiving and recording the field strength of Australian and New Zealand t.v. video carrier frequencies near 46.250 and 45.250 MHz. respectively. They had been in (weakly) at various times between 2100 and 0300 GMT, not necessarily simultaneously.

The ZK1AA beacon in Rarotonga, Cook Islands, has been off since mid-December, but is expected to be on from a new location on 50.101 and 40.661 MHz. In addition, Stuart is preparing to put a beacon on 52.5 MHz. in Suva, Fiji, 3D3AA, starting this summer (one-way only, however). The WB6KAP six metre beacon on an attended basis was licensed until June 21. WB6KAP seeks reports of reception of his or ZK1AA beacons. He monitors 50.101 MHz. continuously by tape, chart, and/or speaker during the last 25 seconds of each minute. (The beacon transmits the first 30 seconds of each minute, but the 18th of each hour). He listens near 51 and 52 MHz. also and can be reached on 14.082 MHz. after his 0500 GMT schedule with ZK1AA.

The above comments upon VK/ZL t.v. stations being heard in U.S.A. may be some "consolation" to those who are off the air whilst Channel 0 is transmitting—at last some use has been found for the signals.

Lance VK4ZAZ/T has added another confirmation to his VHF WAS Certificate, this being from Bill KH6HK in the Marshall Islands, who runs 140 watts a.m. to a 6 element beam about 40 feet high. Receiver a Collins 51J4 and converter. Lance's list of countries now extends to about 10, so congratulations are in order for a fine effort.

TWO METRE OPENING

An air of expectancy hovered over VK5 on 21st May. The night before Garry VK5ZK reported hearing the tropospheric beacon at Albany on 135 MHz. 5 x 9 at 2330. The next night (Sunday) did not appear very prospective early in the evening. However, a telephone call from Bob VK3AOT asking me to get the VK5s on the air as he was hearing the VK5 beacon resulted in several phone calls, a message on Channel 4, and the band opened up.

Not a great deal was heard down on the Adelaide plains, Mick VK5ZDR worked VK-3ZOO, and there was not much else. Tony VK5ZDY from his home mountain site at Stirling was pulling them in thick and fast and is known to have worked nine VK3s and three VK7s. Not sure whether he worked Allan VK2ZEO in Deniliquin. This sort of thing was too much for Bob VK5ZDX and Garry VK5ZK who quickly went portable near Mt. Lofty and used Bob's mobile running 50 watts input to a 3 element fox hunt beam, 6CW4 converter to a double converted 6 to 9 MHz. Command receiver. From their portable site they worked three States, VK2, 3 and 7, signals varied from 5 x 3 to 5 x 9.

Stations to be heard included VKs 2ZEO, 3YER, 3ZL, 3ZUT, 3ALZ, 3AKC, 3AOT, 3AMH, 3ZKN, 7JV, 7ZAX and 7ZAH. John VK7JV worked Eric VK3ZKN by the long path, through the Adelaide Channel 4 repeater. Jim VK-5ZMJ in Port Pirie was heard working VK3AMH Ballarat, about 440 miles, which is good going for a contact from non-elevated sites. For my part, I had to be content with hearing VK3ZOO and not being able to contact him!

MOONBOUNCE SUCCESS

Congratulations are the order of the day for the Dapto Moonbounce project workers for their success on 432 MHz. A lengthy report in the VK2 "6 up" (first issue) carries the details. On 31st March, 1972, the first E.M.E. test was carried out, and regular echoes were received for a period from 2130. The strength of the echoes varied up to 2 to 3 dB. above noise level, using a 2.1 kHz. receiver passband. On 18th April a sked with WA6HXW was not successful, but on the 19th, VK2AMW was hearing WA6HXW running 3 to 4 dB. above the noise and copying partial call signs. Full call signs from VK2AMW were being copied by WA6HXW. However, no reports were exchanged as the Dapto Group did not realise that reception of a full call sign, in parts, during one transmit session constituted a contact. Another sked was arranged for 14th May.

TRANSEQUATORIAL PROPAGATION

The following by Roger Harrison, VK2ZTB, of the Ionospheric Prediction Service, and printed in "6 Up" is worthy of the wider coverage that "Amateur Radio" can give it, particularly as TEP contacts will be more and more sought after as Amateurs improve their equipment and so much more band watching takes place. The item is headed "Propagation Dissertation": "A number of fallacies seemed to have crept into the Amateur journals and on-the-air discussions concerning Sporadic-E and TEP openings on 6 metres. I have noticed a tendency for some people, who should know better, to call strong, steady openings with distances in excess of 2,000 miles (i.e. working Cook Island, Nauru or Guam) F-layer openings. Also openings to Japan in the afternoon (distances of 5,000 km. to 8,000 km.), which tend to exhibit strong steady signals with little or no fading, are often called F-openings. I don't know how these conclusions are arrived at, but they are rubbish!

"Two-hop Es is not uncommon and distances up to 2,600 miles (about 4,000 km.) can be covered. Exceedingly few openings occur where the F-layer MUF rises above 50 MHz. for a single-hop path. Even fewer occur for a double-hop path. Afternoon openings to Japan are supported by Class 1 TEP which involves a 'chordal-hop' or 'supermode' propagation mechanism. Class 1 TEP certainly involves propagation via the F-layer but it is a special mode—one which as yet cannot be included in normal predictions. Afternoon-type TEP is rarely seen in VK2 and points South, as the propagation mechanism does not normally allow distances longer than about 9,000 km., generally symmetrically situated normal to the magnetic equator, VK2s, VK3s, and VK7s have to rely on an Es openings and TEP occurring simultaneously."

SKEDS WANTED

In addition to the requests last month from VK3YBE, VK2AM, VK2ZQJ for skeds with other stations covering various types of operation and bands. Now also is noted a request from Ian Berwick, VK3ALZ, 107 Loongana Ave., Glenroy, Vic., 3046, for meteor scatter skeds, particularly to VK4 and northern VK2. Runs 150 watts input on c.w. to 31-ft. long quad-yagi on 144.050 MHz. You might also note that VK7ZAA at Burnie and VK7EM at Penguin have a sked at 2000 hours every Tuesday night on 144.150 MHz. approx. VK3s and any others hearing them are welcome to join in.

VK3 VHF-UHF CW CONTEST

Details are to be released soon of a c.w. contest for our bands, and cross mode contacts are being considered to allow Limited licensees to join in. Some incentives might also be considered to get a few stations out portable, too—they might then be heard interstate.

VK3 VHF DX CONTEST

Plans are presently being drawn up for an annual contest during August with rules similar to those of the VK8AU sponsored VHF DX Contest last year. Proposed dates of operation are 4th to 20th, which includes the "R.D." Contest and some meteor showers.

2300 MHz. EXPERIMENTS

2300 MHz. experiments between Dick VK-2BDN and Bill VK2ZAC have come to a standstill at present due to Dick being laid up in hospital. We all hope he will soon be well enough to continue. Both were disappointed with the results of trying to monitor Apollo 16 transmissions, mostly wide-band, which were not suitable for copy by their equipment. Further attempts are to be made with Apollo 17.

BEACONS—AGAIN!

From I.A.R.U. Region 1 News Bulletin are a few beacons which might interest some readers. 28.185 MHz. GB3SX; 28.200 DL0IGI; 29.000 DL0AR; 50.100 ZS6VHF; 50.500 ZC4VHF; and 3B8MS in the 28 MHz. band. The two 50 MHz. beacons mentioned will be of most interest to VK, as they may be heard by someone some day. The 28 MHz. beacons may be pointers to a rising MUF, that's about all.

TWO METRE ANTENNAS

Of considerable interest in the April issue of the "VHFer" are the results of the recent 2 metre antenna gain measuring test. The best performance was put up by a 13 element yagi on a 24-ft. boom, giving a F/B ratio of 10 dB. and a forward gain of 14 dB. and entered by Bob VK3AOT. In all, 38 antennas were tested, and the list of performances makes interesting reading, the lowest performance being from a particular 5 el. yagi with a —12 dB. gain! The value of tuning up a yagi correctly was indicated by one 13 el. on a 24-ft. boom which had a gain of 2 dB. Yagi antennas are not hard to get going reasonably well, but not too many liberties in departure from standards laid down for many years can be taken unless you are really clued up on antennas, and then you might not make anything better.

My spies inform me that Ian VK3ALZ has developed a quad-yagi on a 33-ft. boom with a measured gain of about 19 dB., and with this Ian is reputed to be able to copy the VK7 beacon at reasonable strength when no one else in Melbourne is able to hear it. Details are now awaited by many.

That's all the news for this month—not a lot of people have written, but some interesting publications come to hand regularly each month and what might interest you is taken from their pages. Thought for the month: "It is truly not the value but the worth of a thing that is important, as in the case of an inexpensive but strategically placed button."

—The Voice in the Hills.

* Forreston, South Australia, 5233.

SILENT KEY

It is with deep regret that we record the passing of—

VK3ANX—N. R. Heinrichsen.

INTRUDER WATCH

It is interesting to read of the I.A.R.U. Region 1 Intruder Watch activities, and in "Radio Communication" of April 1972, commenting on the conference held in the Dutch resort of Scheveninger, near the Hague, it has this to say:

"Colin Thomas, G3PSM, the R.S.G.B's Intruder Watch Organiser and the Region 1 Co-ordinator, has written a paper dealing with the past and future of the Intruder Watch, an activity in which the R.S.G.B. has led the world of Amateur Radio. G3PSM will personally introduce his paper and in off-duty hours endeavour to spread the idea of a complete European participation in Intruder Watch activities."

The formation of I.A.R.U.M.S. (International Amateur Radio Union Monitoring System) was also to be a topic for discussion.

I wonder if in Region 3 the various countries will become as organised? From the lack of co-operation thus far extended it would seem that Australia is the only country taking the matter seriously.

Alf Chandler, VK3LC,
Fed. Intruder Watch Co-ordinator.

W.I.A. 52 MHz. W.A.S. AWARD

Amendment:

Cert. No.	Call	Additional Countries
102	VK4ZIM	5

COOK BI CENTENARY AWARD

Late entries have been received from the following stations and Awards issued:

Certificate number 1488 DM2BTO, 1489 DM-2AUF, 1490 SP9PT, 1491 CE0AE, 1492 JA1WPX.

AROUND THE TRADE

In a recent press release N.S. Electronics Pty. Ltd. announces the availability of the latest issue of the FR Electronics Reed Switch Catalogue containing general information on the use and application of reed switches together with a fold-out for use as a wall chart. The latter is also available on request. Details are included on contact suppression and the use of reed switches in coils and with permanent magnets. Requests can be made direct to the Company (mentioning this brief report) or through the Business Manager.

• • •

Hy-Q Electronics Pty. Ltd. announces the appointment of Mr. Guy Thornton as National Sales Manager covering the Australasian area. Mr. Thornton was Divisional Manager of the Telecommunications Division of Pye, New Zealand, prior to his transfer of residence to Australia.

• • •

"The Little Red Book of the Electronics Industry" from Dick Smith Electronics Pty. Ltd., of 10 Atchison St., St. Leonards, N.S.W., 2065, is to hand. Their catalogue is very comprehensive and well produced, it contains a wealth of useful information in addition to acting as a back-up for their very prompt service of guaranteed quality merchandise. Their service includes an automatic telephone answering and recording machine in use for STD calls after 6 p.m., for actioning the following morning.

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	320/344	VK4VX	300/300
VK6RU	318/344	VK5AB	296/314
VK4KS	311/326	VK2APK	293/300
VK3AHQ	310/326	VK4FJ	286/307
VK4UC	303/303	VK4TY	284/288
VK6MK	303/324	VK4PX	281/282

New Members:

Cert. No.	Call	Total
130	VK3JF	104/104
131	VK4LZ	110/110
132	VK3SO	104/104
133	VK3AKR	125/125
134	VK3XD	104/104
135	VK6LK	216/216

Amendments:

VK3AMK	241/241	VK4NQ	124/124
VK4XJ	165/169	VK5WV	120/120
VK4QA	130/130		

C.W.

VK3AHQ	310/325	VK3NC	273/300
VK2QL	305/328	VK6RU	265/288
VK3YL	290/307	VK3YD	263/282
VK2APK	289/297	VK4TY	259/272
VK4FJ	289/315	VK3TL	254/260
VK3XB	285/300	VK3RJ	251/265

Amendments:

VK3KS	247/254	VK4XJ	145/151
VK4VX	242/242	VK3LV	123/123
VK3JF	194/201		

OPEN

VK6RU	318/344	VK4TY	306/321
VK4SD	315/330	VK4UC	303/303
VK4KS	312/331	VK6MK	303/324
VK2VN	311/330	VK2EO	301/325
VK2APK	307/319	VK2SG	298/304
VK4VX	307/307	VK4FJ	297/323

New Members:

Cert. No.	Call	Total
139	VK3SO	108/108
140	VK3JF	205/212
141	VK3XD	107/107
142	VK4LZ	124/124
143	VK4KX	221/221
144	VK9LV/ G5RV	140/140
145	VK9BA	104/104

Amendments:

VK3XB	291/306	VK3HE	152/153
VK4PX	288/293	VK4NQ	136/136
VK4XJ	204/211	VK3LV	128/128

KEY SECTION

This month's magazine carries Rules for the 1972 Remembrance Day Contest, and you will notice that a multiplier has been provided for c.w.-c.w. contacts to make this mode of operating of similar weight to phone in state totals. It would be nice to be proved wrong in the selection of this factor by immense scores being piled up in the c.w. segment of the Contest, even if equality with the talkers would be more diplomatic.

On the subject of Contests, there were no starters at all in the newly-restored c.w. section of the Ross Hull. Is July far enough in advance of December for giving notice to instal a key socket in the old 2 mx rig? Plans being hatched for a c.w. award would make a couple of contacts in the Ross Hull worthwhile.

If anyone has tit-bits which might interest other c.w. operators, let me know and I will try and get them in this column. QRX August, 73, Deane VK3TX.

HAMADS

- A free service for individual members.
- Four lines of print free (200 characters/spaces); full charge at $6 (min.) per col. inch if exceeded or for repeats: includes name/address—use QTHR if correct in Call Book.
- Copy, please in typescript if possible, and signed.
- Excludes commercial-class advertising.
- Exceptions only by PRIOR arrangement.

For full details see January 1972 "A.R.." page 23.

FOR SALE

Cheltenham, Vic.: Pre 1968 components including two Geloso VFOs, tuning condensers, 12v. DC relays, etc. Any reasonable offers. VK3LV, QTHR, Sunday mornings only.

Melbourne, Vic.: Complete Geloso Model 225 SSB, CW, AM Transmitter, 160-200 watts PEP with Model 226 Power Supply, 80-10 metres. Superseded model but in new condition, $345 FOR. Bob Cunningham, VK3ML, QTHR, Phones 20-7780 or 329-9633.

West Pymble, N.S.W.: Swan Transceiver, AC and 12v. mobile PSU, matching speaker box, desk mike, all mint condition. $425. VK2AQW QTHR. Phone (02) 449-3538 AH.

Greenwich, N.S.W.: Galaxy GT550, P/S, remote VFO, $550. Also HD Transformer $35. VK2AGO, QTHR. Phone (02) 43-2427 AH.

Downer, A.C.T.: Heathkit SB400 Transmitter, as new, $295. BC348 Rx, original condition, 110v., PSU, $65. VK1JL, QTHR. Phone (062) 49-7630.

Melbourne, Vic.: Collins 75S3B Receiver. Serial 85483, complete with regular 2.1 kHz. mech. filter, also 800 and 1500 Hz. filters. Absolute latest of S line, new six months ago, used two months. Rare opportunity for most discriminating buyer. Roth Jones, 1 Albert Rd., Melbourne, Vic., 3004.

Eastlakes, N.S.W.: 122 Rx Tx, 1.8 to 10 MHz., with Crystals, mic. and h/phones. Class B linear for above. PSU and spare. $25 o.n.o. Phone 663-7336, Tony Smith, 151/3 Slattery Place, Eastlakes.

Kew, Vic.: 40-foot Oregon Pole, $10. VK3ADL, QTHR, Phone (03) 86-5871.

WANTED

Riverton, W.A.: Yaesu DC-200 DC Power Supply for FT200. VK6LK, QTHR. Phone (092) 57-2202.

Nowra, N.S.W.: AR88 Receiver in good condition with handbook. VK2AJT, QTHR. Ph. (044) 22786.

Brisbane, Qld.: Split-stator Tx type capacitor 2 x 250 pF. or similar twin-tub, or single 500 pF., or both, suitable Z-match coupler. Mervyn VK4SO, Box 1513, G.P.O., Brisbane, 4001. Ph. (072) 2 2831 bus.

Concord, N.S.W.: Pre 1930 radio periodicals such as Wireless Weekly, Radio in Australia and N.Z., Wireless World, QST, etc., for Amateur Museum. VK2AAH, QTHR, Ph. (02) 73-2369.

Canberra, A.C.T.: 6 metre converter, preferably solid state. Contact J. Campbell, 6 Parer St., Scullin, A.C.T. Ph. (062) 541-546.

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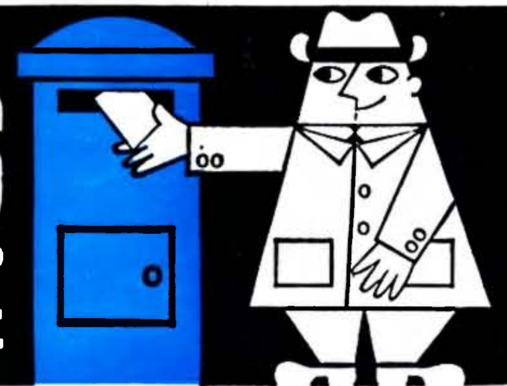

MULTIMETERS FOR AMATEURS

SPECIALS—CHECK THESE LOW PRICES

MODEL SK100: 100K O.P.V.
D.C. V.: 0.6, 3, 12, 60, 300, 600, 1200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.012, 0.3, 6, 60, 600, 12A.
OHMS: 1 Ω to 20 MΩ in 4 ranges.
SIZE: 7" x 5¼" x 2½".
PRICE: **$30.40** + 15% sales tax.

MODEL SK7: 4K O.P.V.
D.C. V.: 10, 50, 250, 1,000.
A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 0.25, 10, 250.
OHMS: 10 Ω to 2 MΩ in 2 ranges.
SIZE: 4⅞" x 3½" x 1½".
PRICE: **$8.80** + 15% sales tax.

MODEL M303: 30K O.P.V.
D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 2".
PRICE: **$17.50** + 15% sales tax.

MODEL SK120: 20K O.P.V.
D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 1¾".
PRICE: **$14.50** + 15% sales tax.

MODEL F75K: 30K O.P.V.
D.C. V.: 0.25, 2.5, 25, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500.
D.C. mA.: 0.05, 10, 250.
OHMS: 1 to 8 megohms in 3 ranges. Inbuilt Signal Injector.
PRICE: **$18.50** + 15% sales tax.

MODEL TP5SN: 20K O.P.V.
D.C. V.: 0.5, 5, 50, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 5, 50, 500.
OHMS: 0.5 MΩ in 4 ranges.
PRICE: **$15.00** + 15% sales tax.

MODEL 500B: 30K O.P.V.
D.C. V.: 0.25, 1, 2.5, 10, 25, 100, 250, 500, 1,000.
A.C. V.: 2.5, 10, 25, 100, 250, 500, 1,000.
D.C. mA.: 0.05, 5, 50, 500; 12A.
OHMS: 1 Ω to 8 MΩ in 3 ranges.
PRICE: **$25.00** + 15% sales tax.

MODEL MVA5: 20K O.P.V.
D.C. V.: 5, 25, 50, 250, 500, 2,500.
A.C. V.: 10, 50, 100, 500, 1,000.
D.C. mA.: 2.5, 250.
OHMS: 1-6 MΩ in 2 ranges.
SIZE: 4½" x 3¼" x 1⅛".
PRICE: **$12.00** + 15% sales tax.

MODEL TS-60R: 1K O.P.V.
D.C. V.: 15, 150, 1,000.
A.C. V.: 15, 150, 1,000.
D.C. mA.: 1, 150.
OHMS: 1K to 100K.
SIZE: 2¼" x 1¼" x 3½".
PRICE: **$6.75** + 15% sales tax.

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amateur radio

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA

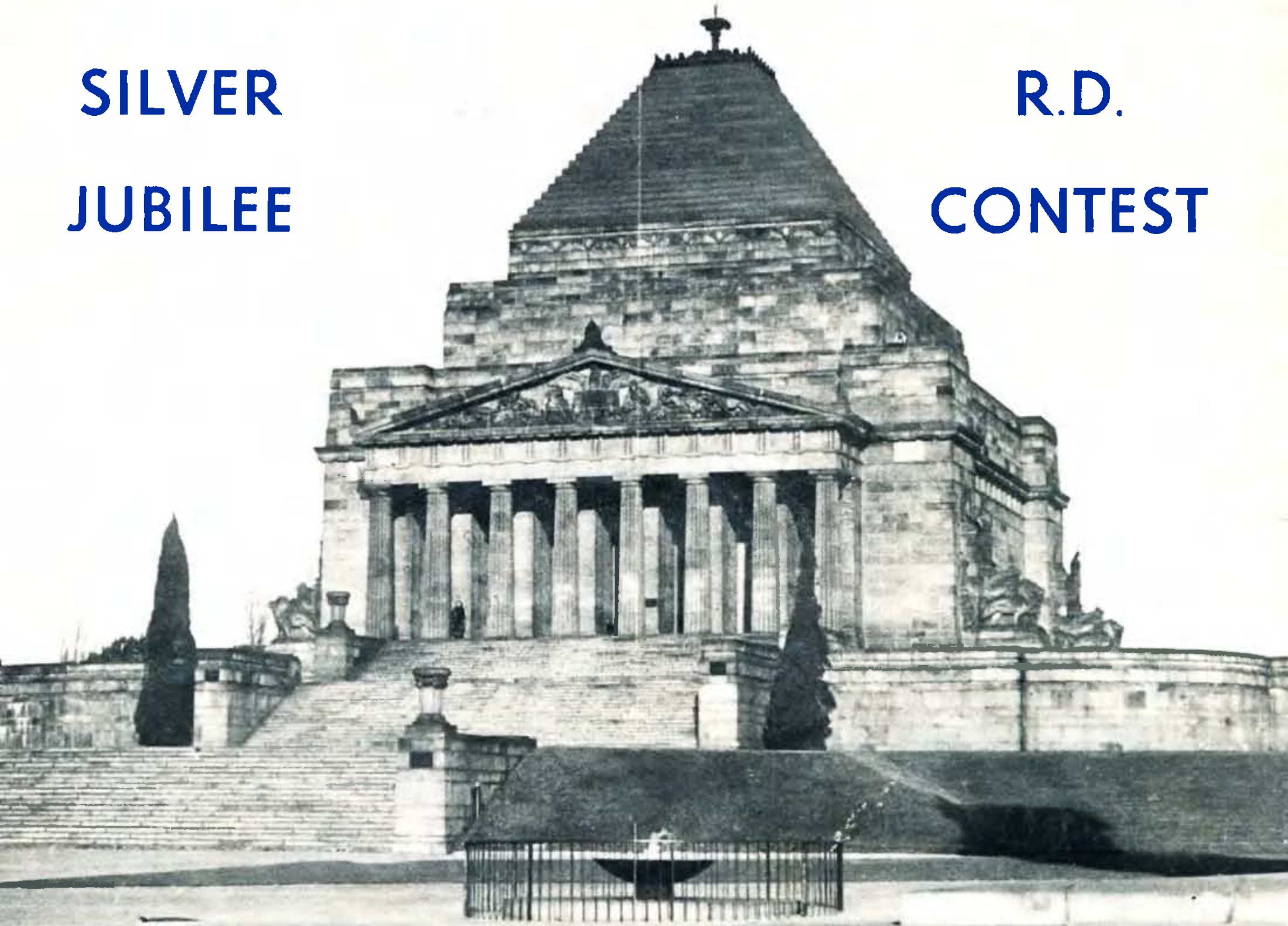
AUGUST, 1972

Registered at G.P.O., Melbourne, for transmission by post as a periodical Category "B"

Price 40 Cents

SILVER JUBILEE

R.D. CONTEST



The "Wipertator"

Multi-Band Antenna

TCA 1649 on FM

VK-ZL Contest Rules

Direct Keying

2 Mx FM Allocations

amateur radio

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA. FOUNDED 1910

AUGUST, 1972
Vol. 40, No. 8

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CONTENTS

COVER

August is the month of the Remembrance Day Contest. The Shrine of Remembrance, Melbourne, reminds us of those Amateurs in honour of whose memory the contest is held.

(Photo by VK3YAZ and VK3ZU)

QSP

August— A Jubilee Event

August is traditionally Remembrance Day Contest month. And so this month the Silver Jubilee R.D. Contest will be held in continuance of that tradition.

It is interesting to review the list of winning Divisions over the past twenty-four years. New South Wales has won once as has Victoria. Queensland has won three times, South Australia four and Tasmania seven times, whilst Western Australia tops the list with a total of eight wins. More details will be found elsewhere in this issue of "Amateur Radio".

Apparently the organisation of the necessary logistics for a win is beyond the two larger Divisions, New South Wales and Victoria. A pity, because a serious attempt by one or the other of these Divisions to win, would no doubt add interest to the Contest—and more QRM to the bands. As it is, they usually vie with each other for last place on the list. What can be done to encourage the "big fellas" to "have a go"?

A number of attempts have been made over the years to alter the rules, allegedly to make the Contest more equitable. Contestants are repeatedly asked to offer suggestions when sending logs but the number of viable ideas received has been small. Contestants should not be discouraged if their suggestions are not adopted straight away. Sometimes the idea may need "selling"—certainly it needs to be practical—and it should conform with the aims of the Contest.

"Selling" an idea can mean outlining all the advantages to the Federal Contest Manager, and then to one's own Division with a view to having the Division adopt the suggestion and add its weight of opinion to submissions to the Manager. Remember though the suggestions must be practicable—some years ago the rules required that only logs from members would be accepted for scoring purposes. This meant that all contestants had to send their logs to their Divisional office for accreditation. Logs were then sent on to the Contest Manager. This system proved cumbersome and slow in operation, loaded overworked Divisional Officers with extra work and caused frustrating delays to the Manager. The idea was not viable. The Contest Manager is usually the best judge of the practicality or otherwise of a suggestion and in recent years the Federal Council has very largely relied on his advice.

The aim of the Remembrance Day Contest is summed up as follows:—

> "A perpetual trophy is awarded annually for competition between Divisions of the W.I.A. It is inscribed with the names of those who made the supreme sacrifice and so perpetuates their memory throughout Amateur Radio in Australia.
>
> "The name of the winning Division each year is also inscribed on the trophy."

Thus basically the Contest is one between Divisions, individual operators do not win—a team effort—a Divisional effort is what is required. Suggestions therefore should be along the lines that will aid these aims.

With these thoughts in mind, then, what are YOUR suggestions for improving the twenty-sixth R.D. Contest?

D. H. RANKIN, VK3QV,
Federal Vice-President, W.I.A.

FEDERAL OFFICE

Arising out of consultations, the W.I.A. Federal office has moved to 474 Toorak Road, Toorak, Victoria, 3142. The offices are located above the shop at that address and entry to the offices is from Lamin Lane, parallel to Toorak Road (entry from Ross St.—one-way street), at the back of the shops. The telephone connection has now been made and is (03) 24-8652.

PHILATELISTS' NOTE

A circular from GW3VBP, Secretary of the Barry College of Further Education Radio Society, Colcot Road, Barry, Glam., advises that the British Post Office will issue, on 13th September, a set of four commemorative stamps. Three will commemorate the 50th anniversary of broadcasting by the B.B.C., and the fourth, at 7½ p., commemorates the 75th anniversary of the first wireless transmissions across water, by Marconi and Kemp from Lavernock Point near Barry to Flatholm Island and thence to Brean Down in Somerset. The B.C.F.E.R.S. will issue a special envelope for first day posting on the Island and this will include a post mark containing an Amateur Radio call sign—believed to be a first ever combination of this kind. If anybody is interested in receiving one of these rarities, please write direct (with 20 p.—not IRC's) or write to Magpubs, Box 150, Toorak, Vic., 3142; with a 75 cent postal order or cheque.

1973 CALL BOOK

If you have changed your address, call sign or the like please complete and send in the tear-out amendment sheet from the back of an old Call Book.

JAMBOREE-ON-THE-AIR

The Scouts 15th Jamboree-on-the-Air approaches quickly. The dates are 21st and 22nd October. Are you prepared? This year a special Pacific Islands theme is suggested: Contact as many as possible of the Groups in Micronesia, Melanesia and Polynesia. For those interested in Scout nets there is the world net every Saturday on 21.360 MHz. at 1800 hours Z and the Australian net on 14.120 MHz. at 2300 hours Z on the fourth Sunday of each month.

PROJECT AUSTRALIS

The A-O-C beacon on 435.10 MHz., which was built in Australia, has been sent to Amsat. A-O-C is still due for launch in November.

POST CODE POPULATIONS

Which is the most populated Post Code area? The current EDP membership listing shows this is shared by 3149 (Mt. Waverley) and 7250 (Launceston) with 37 in each, closely followed by 3150 (Glen Waverley) with 34. In the twenties are 2076 (Wahroonga) and 4700 (Rockhampton) each with 24, 3125 (Burwood) and 3128 (Box Hill) with 23. Sharing 22 each are 3046 (Glenroy) and 4810 (Townsville). With 21 is 6062 (Morley) and with 20 each are 3350 (Ballarat) and 4350 (Toowoomba). The most populous S.A. area is 5041 (Daw Park) with 17 which is shared with 5082 (Prospect). Others with more than 15 were 3500, 4305, 7018 (all 18), 2500, 3104, 3199, 4670, 7008 (17), 3131, 3193, 3550 (16). The population of VK1 is 61, VK8 mustered 38 and T.P.N.G. totalled 42.

COMMENT

The only thing that operates well outside the band is a cigar. (A.R.N.S.)

THOSE LETTERED BANDS

Know what they mean? "S" covers 1.5 to 4 GHz. which includes our 2.3-2.45 (low S) and 3.3-3.5 (high S) GHz. bands; "C" covers 4.0-6.0 GHz. (includes our 5.65-5.85 GHz. band); "X" runs from 6-12 GHz. (includes our 10-10.5 GHz. band); and "L" covers 400-1500 MHz. (1.5 GHz.). "P" is from 200-400 MHz., whilst "K" (12-36), "Q" (36-46), "V" (46-56) and "W" (56-100) apply to the higher GHz regions.

TIME ZONES

Do you know your time zone? Z, meaning GMT (Greenwich Mean Time—0 degrees longitude), is well understood. 105 deg. to 120 deg. East is time zone H and covers the western part of Australia, 120 deg. to 135 deg. East—Zone I—includes the central area, and 135 deg. to 150 deg. East, Zone K covers the East. New Zealand is in Zone M from 165 deg. to 180 deg. East longitude.

V.H.F. ADVISORY COMMITTEE

A motion was passed at the 1972 Federal Convention that the Executive appoint a V.h.f. Advisory Committee to make recommendations on v.h.f. and u.h.f. band planning and to administer v.h.f. activities previously conducted by the Federal V.h.f. Officer. A motion arising that this Committee be provided for the next three years by the Victorian Division was also adopted. The Committee, which has now been appointed and has been accepted by the Executive, consists of John Spicer, VK3ZEL, as Chairman; Ian Cowan, VK3ZDW, as Chairman for the time being of the VK3 V.h.f. Group; Bob Halligan, VK3AOT; Peter Wolfenden, VK3ZPA, and Bill Rice, VK3ABP.

Modifying the TCA 1649 Low Band FM Transceiver to Two Metres

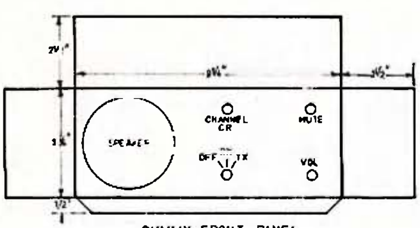
RODNEY CHAMPNESS,* VK3UG

● The TCA 1649 is a six-valve transmitter and 13-valve receiver used on the 70 to 85 MHz. band. Very few of these are still in use, but many are thought to be still available from various second-hand sources. They are quoted as being capable of 7 watts output and if the 6V4 in the power supply (Fig. 6) is replaced with a couple of 800 to 1,000 volt silicon power diodes the output power can reach about 10 watts.

The modifications to the receiver about to be described were quite successful, but the results on the transmitter were singularly disappointing. The lack of success with the transmitter is felt to be due to the general layout of the transmitter, where in fact the low level audio is quite close to the output stage. Probably the change to high band accentuated the problem of audio input and r.f. output proximity. One Amateur at least who has modified one of these units has had complete success with the transmitter. The transmitter modifications are included for those who wish to try them.

The receiver suitably modified seems to be quite a reasonable performer although not up to the standards of a FET or nuvistor front-ended set, but not far behind. The unit was converted from semi-remote operation to fully local control. This transceiver makes a compact cheap monitor set, when multi-channelled.

These sets when first picked up seem to be full of faulty ½ watt resistors, so as the first suggestion check every resistor in the set to make sure it is of the right value. One or two of the ceramic capacitors were also faulty. The valves in general seemed to be reasonable.



DUMMY FRONT PANEL

Fig. 1.

TRANSMITTER MODIFICATIONS TO 146 MHz.

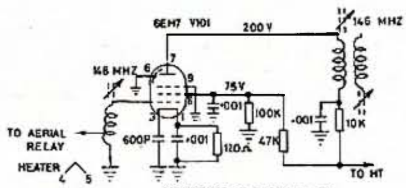
The following modifications were supplied to me by Tony VK5ZAI/T and were used as the basis of the modifications (see Fig. 4): T1 = 602 replaced with T2 = 603. T2 = 603 is replaced with T3 = 604. These are marked on the sides of the cans.

Original T1 = 602 is rewound with 20 turns on each winding with 1/16" between windings. Plate winding 26 B. & S. with 5.6 pF. across it, and the grid winding 26 B. & S. has 2.2 pF. across it.

L1 = 605, remove 3 turns until 5½ turns remain, no capacitor across this coil. L2 is cut back to 3 turns ⅝" long, L3 is cut back to 4 turns ¾" long. Couple L2 and L3 approximately ¾" centre to centre.

R27 changed from 180K ohms to 39K ohms, and R37 changed from 18K ohms to 15K ohms.

L4, p.a. tank coil, is reduced from 8 turns to 4 turns, spaced to cover original length.



MODIFIED R.F. STAGE Rx.

Fig. 2.

RECEIVER MODIFICATIONS

The receiver alterations (Fig. 5) supplied were as follows: T101 rewind with 3¾ turns 18 B. & S., tapped at about one turn up from earth for the aerial input. T102 plate 3½ turns 18 B. & S. spaced 5/16", the grid winding 3 turns 18 B. & S. spaced ⅜" with windings 1/16" apart. No capacitors are across these coils and they will be slug tuned. The oscillator coils are unchanged, and multiply by two in each stage, giving about 59 MHz. and 118 MHz. as the output from each multiplier stage. L101 can have 1 turn removed for easier tuning.

In actual fact, with everything going your way, this is all the modification that is strictly necessary other than the actual alignment.

It was felt possible to improve the performance and at the same time reduce the current drain of the set. Valves V110 (6AL5 discriminator) and V111 (6AU6 first audio) were removed completely. The heater chain remains balanced if both of these are removed. V113 (6N8 noise amp. and mute) was replaced with a 12AX7, being used as an audio amp. and also as the mute amplifier. The discriminator was replaced with two 0A81 germanium diodes as were the mute diodes.

With this alteration to the circuit several parts are eliminated, the circuitary in general is more straight forward and there is less current drain. The actual modifications can be seen by comparing the original and modified circuit diagrams of the receiver.

The 6AK5 in the front end was replaced with one of the latest frame grid valves, a 6EH7. This involves changing the valve socket from a 7-pin to a 9-pin. This was wired as shown in Fig. 2. I felt that T101 and T102, with their rather long leads, were far from suitable for use at 2 metres. Both of these metal cans were removed, the whole of the assembly was removed and the coil former sawn off about ⅜" above the chassis.

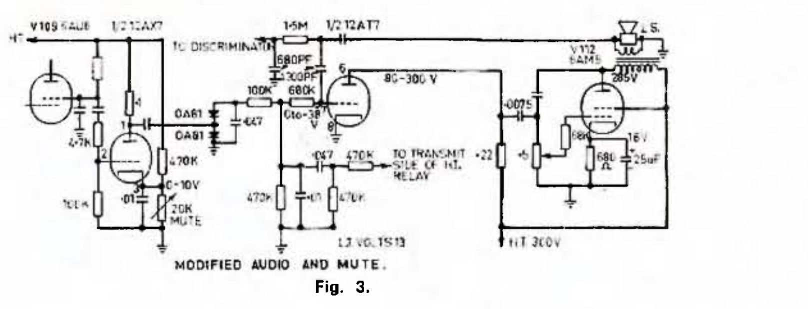
Three small Neosid formers were then glued to the bits left of the old coils. One was glued to T101 and two were glued side by side on opposite sides of the ridge in the centre of the base of the other old coil former. From memory the two grid coils were wound with 3 turns of 24 gauge wire and the plate winding had 5 turns. There is no capacitor across any one of these coils. The v.h.f. ferrite slugs will tune these coils nicely with little loss.

When the 6AK5 is replaced with the 6EH7, the balancing resistor on the heater line should be changed to about 100 ohms. The heater wiring for the 12AX7 must also be altered such that pins 4 and 5 are commoned to 6 volts and pin 9 is earthed.

The speaker circuit should be modified as follows (see Fig. 5): The left hand connection of the speaker should be disconnected from the top of T110 and connected to the bottom end of T110, i.e. to the earth end.

As mentioned previously, this unit was made into local control only as it suited my needs that way. The front panel was removed and the speaker and grills removed. A false front panel as shown in Fig. 1 was constructed. The speaker was then mounted over to one side of the false front so that the controls could be mounted on the other side. The four controls were mounted into a square formation. The controls were positioned such that the added control of channel change could be fitted in the least awkward position.

There is just sufficient room above the transmitter audio valves to mount



MODIFIED AUDIO AND MUTE.

Fig. 3.

* 24 O'Dowds Road, Warragul, Vic., 3820.

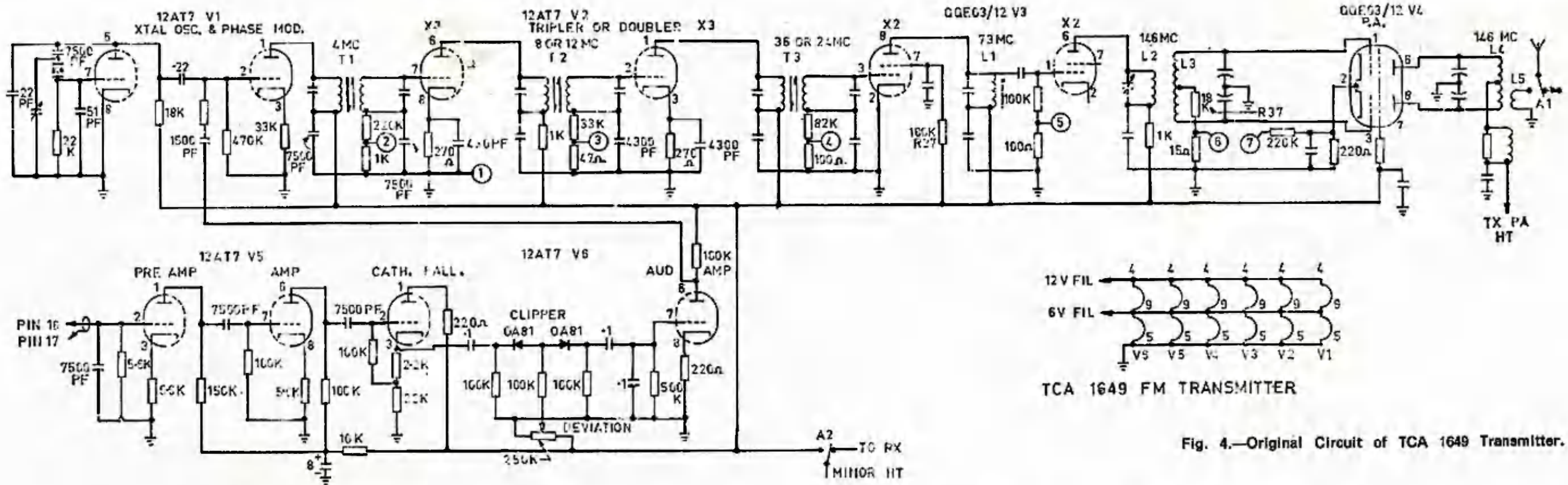


Fig. 4.—Original Circuit of TCA 1649 Transmitter.

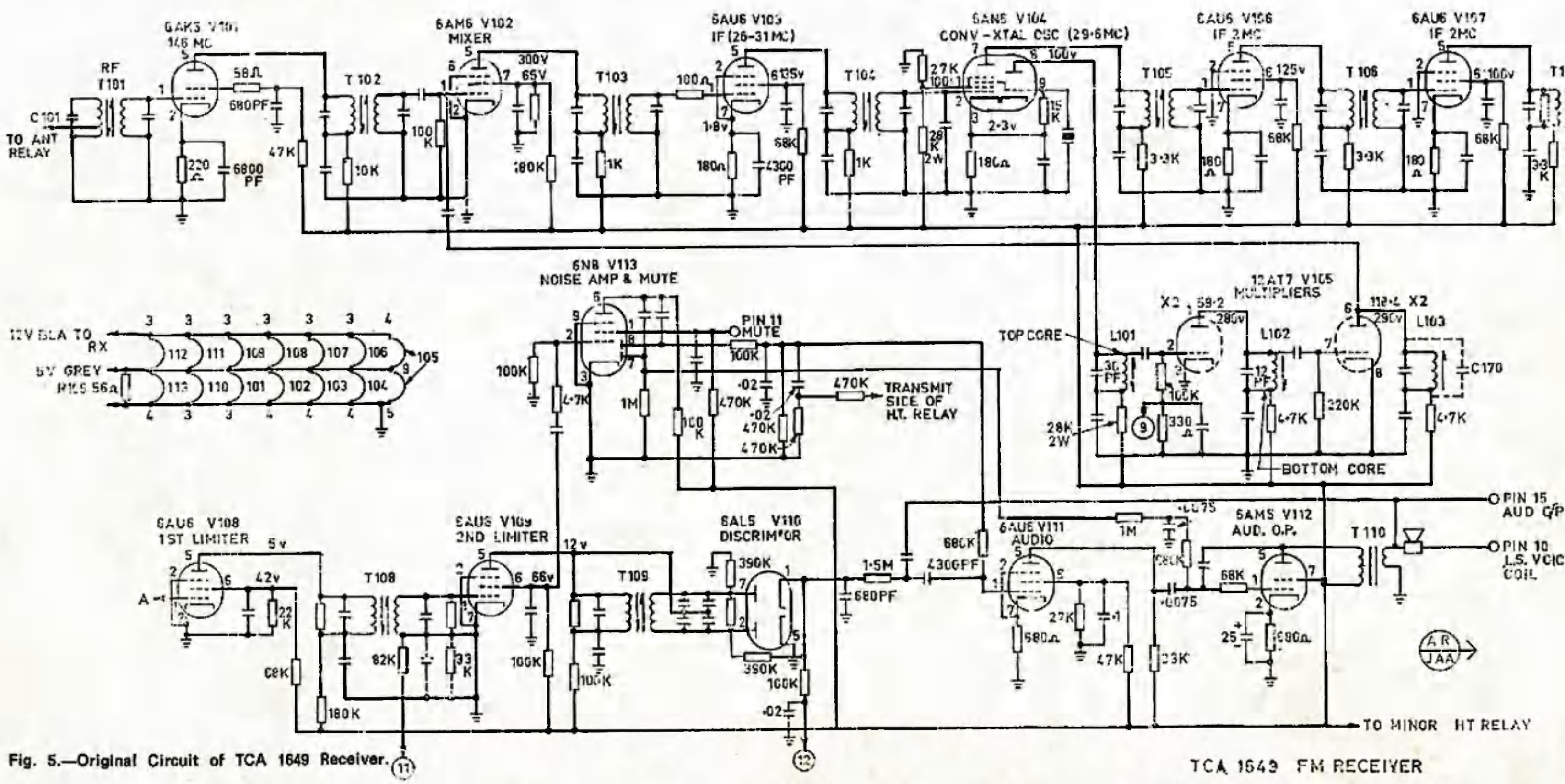


Fig. 5.—Original Circuit of TCA 1649 Receiver.

a 3-channel transmit and receive bank of crystals. The crystals are mounted such that they only clear the top of the set mounting case by about ½". If it is decided that only the receiver will be used, it would be possible to have facilities for switching more channels. The receiver switching is simple, only involving extension of the wire from pin 9 of the 6AN7 to a switch which appropriately switches the crystals. No trimmers for frequency correction are used on the original circuit and it was found unnecessary too, due undoubtedly to the wide band i.f. channel.

RECEIVER ALIGNMENT

Now to the alignment of the receiver. The i.f. train is aligned to 2 MHz. exactly. It is unnecessary to dampen the windings. Monitor pin 10 of the monitor socket and adjust all i.f. cores for a maximum reading on the limiter meter. To adjust T108 shift metering to pin 11 and, keeping the input fairly low so that the first limiter is not limiting too heavily, adjust the primary and secondary for a maximum. To adjust T109 meter pin 12: Adjust the secondary, which is usually the top winding, for some reading on the meter when adjust the primary, which is the bottom winding, for a maximum reading. Once this peak is obtained, adjust the other winding for zero reading. You should get a reading either side of zero as the slug is wound in and out of the core. The 2 MHz. i.f. strip is now aligned. It would pay, however, to go over these cores again to make sure all are peaked right on the nose.

The oscillator can now be tuned. Tuned circuits L101 and L102 are included in the one can. First adjust L101, which is tuned with the top core for 60% of maximum output as measured at pin 9 of the meter socket. If adjusted to give more output than the 60% recommended, it will be found that the oscillator is unreliable in starting. At this stage it is most desirable to have a signal source of quite high strength to line up the front end and the rest of the oscillator train.

Inject a strong signal at the front end of the set, preferably have another carphone running on a dummy on the bench alongside. Meter again on pin 10 of the meter socket and adjust all the front-end cores for a maximum on the meter, including the oscillator cores. With luck the set will now be fairly well tuned up.

It would be desirable to put the set onto an aerial now and either listen for a signal or have a signal generator pump a detectable level of signal into the set so that it can be peaked further. The level from the generator is reduced as the set comes into alignment.

This is, of course, an easy way out if you have access to another carphone. Without another unit, put a signal on 27.6 MHz. into the grid of V103 and adjust T104 for maximum limiter current. Now put the signal generator output into the grid of the first mixer V102 and adjust T103, and re-adjust T104. This is the high i.f. aligned using Channel B as the alignment channel. On the frequency of Channel B (146 MHz.), inject a signal at the same point as above and adjust L102 and L103 for maximum limiter reading. If the generator is now connected to the aerial terminal, T101 and T102 can be adjusted and L103 re-adjusted for maximum limiter current.

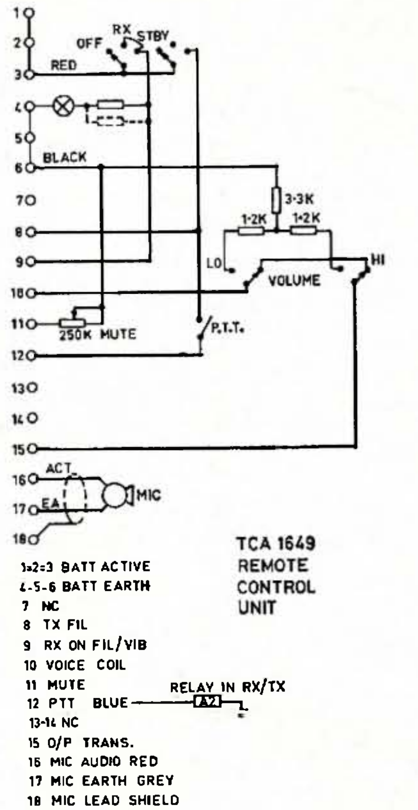
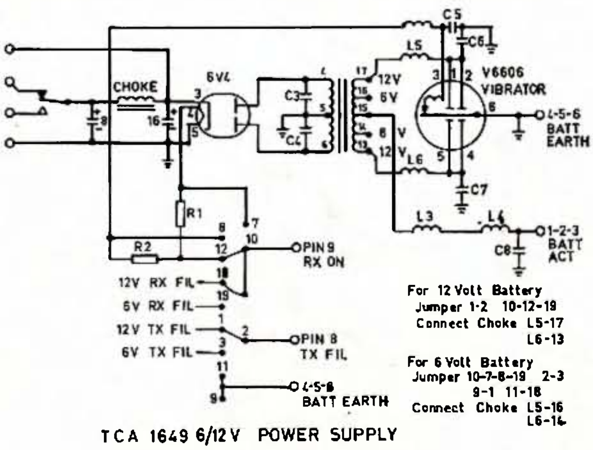


Fig. 7.

Note Errata: The volume control resistors are in ohms, not K ohms. They should be 1.2 ohms, 3.3 ohms and 1.2 ohms.



TCA 1649 6/12V POWER SUPPLY
Fig. 6.

The set will now be fairly well aligned. Once again, however, it would be advisable to go over all slugs except L101 whilst listening to a fairly weak signal. The set should now give quite credible performance, in regards sensitivity, mute characteristics, audio volume and clarity.

Fig. 3 shows the modified discriminator, mute and audio circuitry.

CRYSTAL FREQUENCIES

The crystal frequencies required are as follows:

Receiver—

Channel	A	29570.8 kHz.
„	B	29600 „
„	C	29629.2 „
„	1	29520 „
„	4	29580 „

Transmitter—

Channel	A	4051.55 kHz.
„	B	4055.5 „
„	C	4059.61 „
„	1	4058.33 „
„	4	4066.66 „

The transmitter crystals are the same as used in A.W.A. carphones, Vintens, I.G.L. transceivers, and many other varieties of f.m. transceivers.

The transmitter modifications as shown are for V2A to double to 8 MHz. from 4 MHz., V2B to triple to 24 MHz., V3A to triple to 73 MHz., and V3B to double to 146 MHz. This line was modified in the quest to get decent performance from the transmitter such that V2A triples from 4 to 12 MHz., V2B from 12 to 36, V3A to 73, and V3B to 146 MHz. The differences in the transmitter coils are unavailable as the modified set has been sold.

If it is desired to run the unit on a.c. it would be fairly simple to substitute an a.c. supply for the internal vibrator supply. In all, if you can get the transmitter functioning more successfully than I did, quite a compact multi-channel 10 watt a.c. or d.c. 2 metre transceiver results.

One final point, a small tinplate shield should be soldered across the 6EH7 valve socket such that the grid and plate circuits are shielded from one another. It may also be more convenient to mount the grid input coil below the chassis for the convenience of tapping the aerial lead on the aerial coil.

The remote control unit diagram is shown in Fig. 7. ●

AMATEUR FREQUENCIES:
ONLY THE STRONG GO ON — SO SHOULD A LOT MORE AMATEURS!

THE "WIPERTATOR"

or how to rotate your VHF array with a windscreen wiper motor

PHILIP R. JOHNSTONE,* VK3YAZ

● Two windscreen wiper motors (ex any auto-wrecker) plus a fair amount of mechanical and electrical ingenuity have gone into the device described here. The result is a simple and economical unit, ideal for rotating an acceptable size of v.h.f. or u.h.f. array.

It should be stressed from the outset that this device is restricted to small v.h.f. and u.h.f. arrays, this being due primarily to the nylon gears used. Those disenchanted with the capabilities of nylon read no further! However, there is an inherent advantage of nylon gears in that they can withstand fairly high impulsive loads without shearing under shock as can happen with die-cast gear trains.

Although this rotator is capable of high torque, the design of the antenna arrays is important. It is desirable to keep the inertia to a minimum and hence the operating angular momentum low. This is achieved by using:

1. Yagis of short boom length with vertical stacking, particularly for 144 MHz.
2. Phased colinear arrays for 432 and 576 MHz.

Thus by concentrating the mass of the array at the point of rotation, the moment of inertia and the resulting starting torque will be minimised. A 52 MHz. antenna has not been tried, however on the performance to date it would seem feasible to use a three element yagi, perhaps in lieu of a 144 MHz. antenna.

The period of rotation of approximately one minute has proven to be a good compromise between speed and sensitivity.

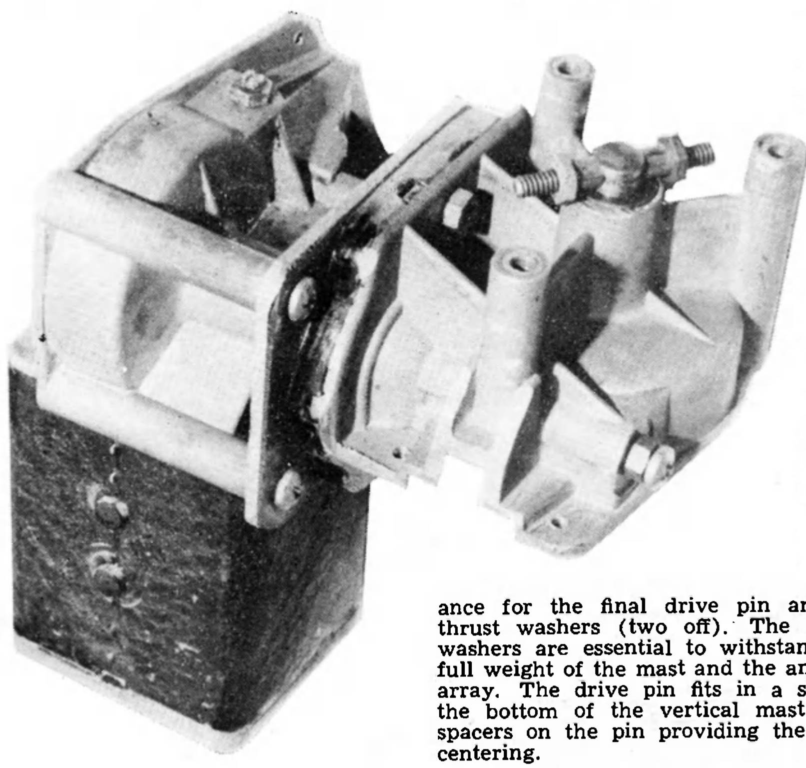
The following notes are divided into three sections, viz. Mechanical, Electrical, and Calibration, enabling construction without recourse to extensive workshop facilities. It would seem prudent to read all sections fully before assembly is contemplated.

MECHANICAL DETAILS

The basis of the unit is two 12 volt Lucas windscreen wiper motors readily purchased from your neighbourly motor wreck for about $4 the pair. Those actually used were of Triumph Herald origin, although virtually all post-1950 English cars were fitted with almost identical units. The self-parking models may be found more useful, although they are not necessary for the direction indicating mechanism described herein.

It can be seen that there are two major components: the motor and gearbox from one unit, and the gearbox and armature shaft from the other. The first step is to dismantle and thoroughly clean each unit separately, ensuring that no components become interchanged, and select the armature with the better commutator and bearings to form the basis of the motor. The other armature has to be removed from its shaft, ideally done in a press but achieved simply by slipping a piece of ½" pipe over the shaft and carefully hammering without bending or scoring the shaft.

Next, remove the nylon gear in the motor unit from its shaft and driving flange. Hacksaw off the shaft flush with the flange, and then drill a 13/32" hole in the centre of the flange.



Cut out and drill the adaptor plate to the dimensions shown in Fig. 2, using either 8 gauge aluminium or ⅛" mild steel. Next cut 5/16" from the body of the second unit at the gearbox end. This, together with the adaptor plate, now enables the attachment of the second gearbox to the first. Having done this (still leaving the adaptor plate bolts loose), slide in the armature (secondary) shaft to check that the dimensions given in Fig. 3 will, after attaching the drive flange, give satisfactory bearing surface and end float. Naturally this will depend on the thickness of the adaptor plate chosen! The end-float adjusting screws should be retained on both gearboxes.

After cutting the secondary shaft to length, the drive flange is attached. The best method is to weld it, although collars and bolts could well be used if the secondary shaft is sufficiently projected through the flange. The circlip groove on the secondary shaft can be "turned" on later with judicious use of the hacksaw while the motor is running. The tertiary shaft can be drilled 3/16" for the final drive pin.

Approximately ⅛" is cut from the secondary gearbox casting through which the tertiary shaft passes to provide the final drive. This results in a reduction of length in the tertiary shaft bearing and permits sufficient clearance for the final drive pin and its thrust washers (two off). The thrust washers are essential to withstand the full weight of the mast and the antenna array. The drive pin fits in a slot at the bottom of the vertical mast with spacers on the pin providing the mast centering.

The indicator mechanism is a pair of **wire wound** potentiometers "araldited" together and connected as shown in Fig. 1 to become VR1. The indicator drive could be bolted instead of welded as shown. This arrangement allows 600° relative rotation between the two shafts. The housing of this "siamesed" resistor is fashioned from the original cover with an appropriate length of tube soldered inside between the ends of the sectioned cover. The tube length will depend on the dimensions of the potentiometers used.

After assembling the complete unit (with a liberal packing of grease) fit the final drive pin—a 3/16" metal-thread, and check that the secondary shaft alignment is satisfactory. The

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adaptor plate bolts can be "nipped up" later with the unit running.

The siamesed indicator resistor can be installed, with its housing left free to rotate under the gear cover clamp plate. The control leads should make at least two turns around the potentiometers before exiting the housing.

ELECTRICAL DETAILS

The motor unit draws about 5 amp. at 14 volts d.c. from the filament windings of an old t.v. power transformer, and the indicating system requires about 30 mA. at 14 volts.

The simple method of motor direction control presented requires only a two-wire circuit. It can be seen from Fig. 4 that the bridge rectifier installed inside the motor unit allows current flow in one direction only and hence reversal of polarity of the motor supply results in shaft reversal. The four BY126/400 diodes fit neatly inside the end housing and are soldered directly to the terminals.

The circuit of Fig. 4 has been submitted purely and simply because it works, and no other claims are made! Its inherent limitation is that it is somewhat dependent on device parameters. Because a variable resistance and not a potentiometer is used at the rotator, then some form of non linear circuit is required to obtain linear meter operation. A simple ohmmeter type circuit is unsatisfactory. The original design was constrained by the 1 mA. 100 ohm meter movement and the 1,000 (2 x 500) ohm siamesed resistor.

The pinch-off voltage of the FET is critical and VR2 and VR3 are used to set the zero and f.s.d. points respectively. R1 provides feedback contributing to the non-linearity while R2 prevents the needle from slamming f.s.d. when the supply voltage is removed. It is mandatory that a regulated supply be used for the metering circuit. Transistors Q2 and Q3 in a Darlington configuration act as an emitter follower, with Q1 as a constant current source. Incidentally, the zener diode used was a reverse biased base-emitter junction of a silicon transistor from the junk box. It may be necessary to test a few to find one having the required break-down voltage of 11 vlots, however the affluent purists may use a BZY88/11v. diode. The 0.01 uF. across the brushes may be needed to reduce commutator "hash".

CALIBRATION

It is considered that the following method is the simplest and most accurate method of calibration. The first step is to set the unit up on the bench using the ultimate correct length cable with VR1 (the siamesed resistor) disconnected. Ensure that VR1 housing on the secondary gearbox is free to turn, operate the motor to what will be the in-situ North-South position. Now rotate VR1 housing until VR1 resistance measured with an ohmmeter is zero, the housing should be fully a.c.w. (viewed from below with the unit in its ultimate orientation), if this is not so then VR1 has been terminated incorrectly.

If the termination of VR1 is correct, connect it into circuit and rotate the housing 20° c.w.; mark this point on the body of the rotator, and adjust VR2 to give zero meter deflection. Now rotate the housing a further 400° c.w. and mark this point also and set f.s.d. with VR3; these two points are now the limits of rotation. Repeat the procedure and check the zero and f.s.d. points again as there may be some interaction. Check that the mid-scale meter deflection corresponds to the position midway between the two points originally marked. This shall be North. If this is not so, then some alteration to the feedback resistor R1 may be necessary. Having achieved the correct position for these three points, the remainder of the calibration is simple:

Meter zero = bearing of 160°
Mid-scale = 0°
f.s.d. = 200°.

This results in 40° overlap in the South (bearing 180) plus about 20° safety margin at each end of the rotation of VR1. The position of bearings 45 (NE), 90 (E), 135 (SE), etc., are determined by interpolation.

Having satisfied yourself with the accuracy of calibration, paint the unit liberally with aluminium roofing paint (bitumen based if possible) and water-

(Continued on Page 17.)

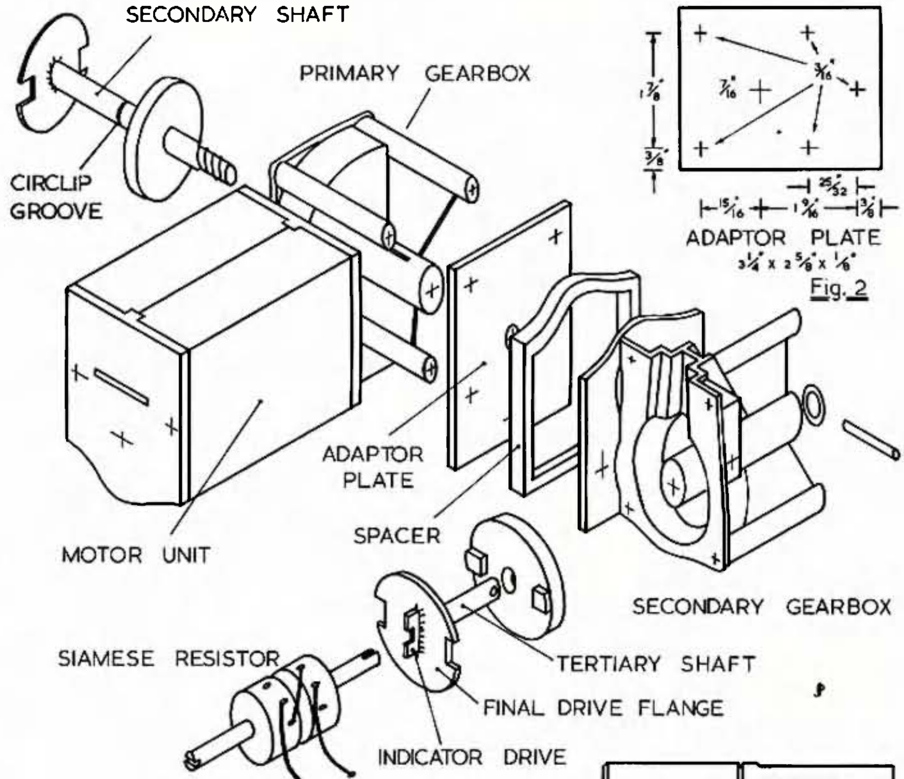


Fig. 1

Fig. 2

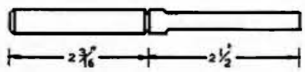
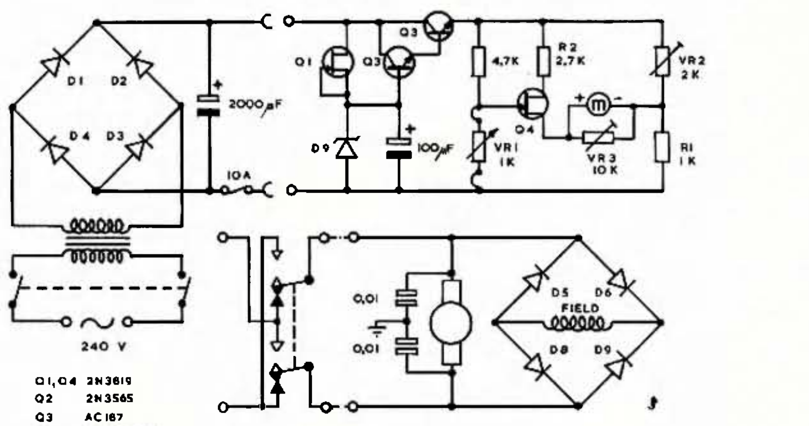


Fig. 3 SECONDARY SHAFT (approximate dimensions)



Q1, Q4	2N3819
Q2	2N3565
Q3	AC187
D1-4	BYX 21 200
D5-8	BY126 400
D9	BZY88 11V

Fig. 4

DIRECT KEYING OF S.S.B. TRANSMITTERS WITH LOW VOLTAGE TRANSISTORS

L. H. VALE, VK5NO*

● A useful adjunct for the c.w. operator using commercial equipment. Thoughts on the elimination of key clicks are included.

The use of the output transistor in an electronic keyer for directly keying a transmitter offers the main advantage that elimination of the keying relay obviates distortion to the characters, caused by the operating time of the relay. In addition, when it is considered that a fast relay, if new, will cost about as much as the rest of the keyer components put together, and probably consume five or six times the power (if you have used modern components in the keyer), then it does seem unwise to use the output transistor in the keyer to operate a relay which keys the transmitter with some distortion when the output transistor can key the transmitter directly without the distortion.

Not all transmitters are capable of being keyed by a transistor—fortunately, however, almost all the normal s.s.b. transmitters and transceivers use blocked-grid keying and this makes them ideal for this application. In these applications the voltage between the key terminal and earth is about 100 to 150 volts negative when the key is open. The current when the key is closed is somewhat less than 10 mA., so that a PNP transistor can be connected with the collector to the key terminal and the emitter to earth.

A negative base current to the transistor of a fraction of one milliamp. will suffice to saturate the transistor and bring the transmitter on the air. This base current can be supplied comfortably by even low powered integrated circuits in a keyer. However, the catch is that the keying transistor must have a V_{CER} rating of 150 volts, and while transistors of this type are available, they are comparatively expensive and are not usually found in the junk box.

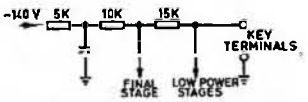


FIG 1 SIMPLIFIED KEYING CIRCUIT

The problem is how to reduce the open key voltage to a lower value. Generally speaking, 65 volt transistors cost about a dollar and 25 volt transistors about half that. If the voltage could be reduced to less than 25 volts almost any of the cheaper PNP transistors could be used.

Fig. 1 shows a simplified circuit of the keying circuit of the FL100B transmitter when switched to c.w. This is almost identical with other Yaesu circuits seen by the writer (except that of the FL-DX-400) and also most of the American valve transceivers. It will be seen that when the key is open the full 130 volts from the bias supply appears across the key and is applied to the grids of all the keyed valves in the transmitter, effectively cutting off all transmission and, in fact, all anode current, in the keyed stages.

The low power stages in the transmitter, however, do not require 130 volts to cut them off, or anything like that voltage. It is possible to connect a resistor across the key terminals and reduce the key-open voltage to quite a low voltage (about 10-15 volts in the case of the FL100B) before the transmitter starts to transmit.

The procedure then is to connect a variable resistor (say a 50K potentiometer) across the key terminals, turn the transmitter on, and reduce the resistance until transmission starts. Measure the voltage across the resistor and determine if it is within the capabilities of your proposed keying transistor. If it is, measure the resistance of the variable resistor across the key terminals and connect a fixed resistance of slightly higher value in its place across the key terminals. Re-check the key voltage with the resistor in place to make sure the voltage is still within the ratings of the transistor, then connect the keying transistor as shown in Fig. 2.

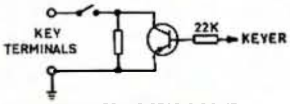


FIG 2 KEYING TRANSISTOR CIRCUIT

It is necessary to include the switch so that the keying circuit can be cut out while using s.s.b. If the resistor is left in circuit during s.s.b. transmission, it may disable the a.l.c. circuit, as it does in the FL100B. This extra switch can be obviated by the use of a blocking diode in the transmitter or by a re-arrangement of the internal switching. The writer understands, however, that internal modifications to commercial equipment are considered taboo.

An alternative method of choosing the correct value of resistance across the key terminals is to increase the variable resistance from zero until the voltage is just within the ratings of the transistor, then check that there is no back wave with the key up.

During the above procedures, the criterion with the key up is that the transmitter is not actually transmitting —not that the final stage anode current is cut completely off. To determine that there is a complete lack of back wave it is necessary to listen on a separate receiver. If you are using a transceiver it may be necessary to enlist the aid of a near neighbour.

If there is standing current in the final stage with the key up, this could well be a good thing for your neighbours because it does help to reduce key clicks. Whatever the resistor value used across the key terminals, the key-up dissipation in the transmitter on c.w. will be less than for the non-voice quiescent condition on s.s.b., which we accept.

Mention was made earlier of the FL-DX-400. In this transmitter there is a resistance already across the key and the key-open voltage is well below 25 volts.

In the writer's case, a 3.9K resistor across the key terminals of the FL100B reduces the open-key voltage to about 15 volts and an inexpensive 2N3638 keying transistor is used. For a time the 2N3638 was needed for another job and was replaced with a germanium 2N404, with no difference in performance. As between different transmitters and transceivers the required value of the added resistor may vary over a wide range and should be found experimentally. In some cases (for example in the FT-DX-400) it may be necessary to find a value that allows an internal monitor to operate satisfactorily and this may require the use of a transistor with slightly higher voltage rating.

Another advantage of direct transistor keying is the attainment of simple and effective key click suppression. The FL100B and, I believe, some other s.s.b. transmitters are somewhat deficient in the suppression of clicks when keyed with the normal pair of contacts of a key, relay, etc. By connecting a capacitor of correct value between collector and base of the keying transistor, the clicks at both make and break of the key can be completely eliminated.

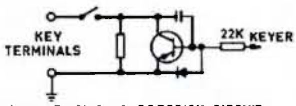


FIG 3 KEY-CLICK SUPRESSION CIRCUIT

If you are determined to remain faithful to your old pump handle or key, the circuit in Fig. 3 is strongly recommended as a compact and very effective click filter, connecting the key contacts between the open end of the base resistor and about 5 volts negative. The correct value of the capacitor will depend upon many factors and must be determined by experiment. A good value to commence trying is 0.0033 μF. It will be quite easy to make the keying too soft with a capacitor too large in value.

The suppression is equal on both make and break, and this is a little difficult to achieve with circuits used with contact keying. Do not omit the diode between base and emitter or an inadvertent short across the key terminals will probably ruin the keying transistor by transferring a positive spike to the transistor base.

(Continued on Page 15.)

* 29 Calton Road, Gawler, S.A., 5118.

"EVERY AMATEUR STATION SHOULD HAVE ONE"

LINDSAY DOUGLAS,* VK2ON

● For a multi-band antenna which works on seven bands and has about 13 dB. gain on 146 MHz. in two directions, the rhombic takes a lot of beating. The materials cost about $10 for a pair of them.

The location of Gosford is about mid-way between Sydney and Newcastle so that a bi-directional beam is quite effective for v.h.f. Actually two similar rhombics, whose axes are almost identical, are used. One is horizontally polarised and the other (situated two feet higher) is vertically polarised. No interaction between the two has been observed.

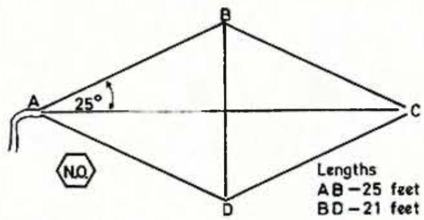
Each rhombic uses 100 feet of 18 gauge s.w.g. hard-drawn copper wire and about 30 feet of 300 ohm ribbon for the lead-in. In the shack a two feet section of the bare copper 18 gauge, spaced ½" with four spacers, enables matching to a six feet piece of 50 ohm co-ax. The latter plugs into the equipment via an s.w.r. meter. On 146 MHz. the position of the co-ax. leads and Philips trimmer are varied a half to one inch at a time and the variable condenser tuned, for best s.w.r. A ratio of 1:1 is easily obtained. The rhombics are unterminated.

On the h.f. bands these rhombics give a useful performance although no directional effects can be expected. The matching section, of course, does not function at h.f. frequencies. An antennascope (r.f. bridge) was used to plot the resonances on or near the various bands. The rhombics can be used as emergency antennas when the main h.f. antenna is out of service.

* 5 Mason's Parade, Gosford, N.S.W., 2250.

RESONANCE OF 146 MHz. RHOMBICS ON H.F. BANDS

Band MHz.	Antenna Polarisation	Impedance Ohms	Resonance MHz.
3.5	Vertical	45	3.7
3.5	Horizontal	45	3.8
7	V	45	7.1
7	H	45	7.4
14	V	50	14.0
14	H	50	14.1
21	V	45	18.5
21	H	45	19
28	V	45	30.5
28	H	45	31.5
52	V	45	52.5
52	H	45	52.5

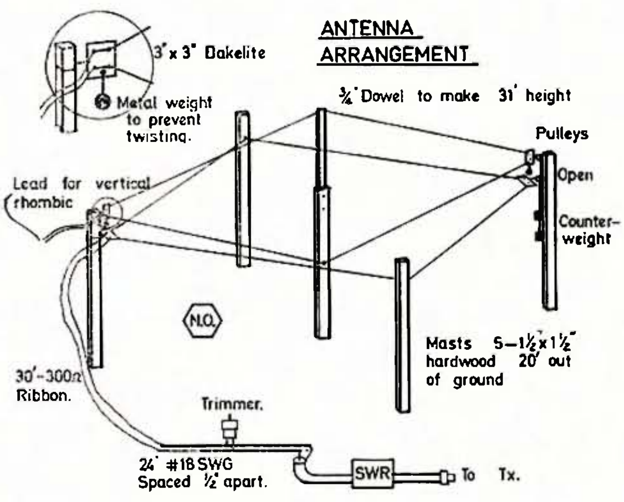


PLAN OF 3.6λ PER SIDE RHOMBIC

The rhombic described is only 18-20 feet high which appears satisfactory on 146 MHz. For those who like to vary the dimensions, I include an extract from Jasik's excellent book on antennas:—

Rhombics

Power gain (dB.)	10.5	13	14	15	15.5	18
Length of side (wavelength)	2	3	4	5	6	11
Half Angle of vertex	40°	30°	25°	22°	20°	15°



ELECTRICAL MEASURING INSTRUMENTS

LECTURE 15C

C. A. CULLINAN,* VK3AXU

• Continuing the series of lectures by C. A. Cullinan, VK3AXU, at Broadcast Station 3CS for students studying for a P.M.G. Radio Operator's Certificate.

MEASUREMENT OF POWER FACTOR

The phase displacement between the voltage and current in an a.c. circuit is dependent on reactances which may appear in the circuit.

If the circuit (load) is a pure resistance it does not contain reactance and there will not be any phase displacement between the voltage and the current, and the power factor of the load is unity (1.0).

However, it is common to find that the load consists of resistance with inductance or capacitance; sometimes there may be a mixture of all three. Now the presence of an inductance in the load causes the current to lag behind the voltage, whilst a capacitance will cause the current to lead the voltage. If the reactance of the inductance exactly equals the reactance of the capacitance then they cancel each other and only the resistance is left for the load. In practice, all inductances and capacitances contain some resistance, therefore it is the total resistance which consumes power.

Thus the angle of lag or lead of the current is a function of the amount of inductance, capacitance and resistance which is present in the circuit.

The power factor is the cosine of this angle of displacement and it can be measured by an instrument known as a power factor meter.

There are two types of these meters. One is the electro-dynamic and the other is a moving-iron type.

Power factor measurements may be made, too, by using a voltmeter, an ammeter and a wattmeter when:—

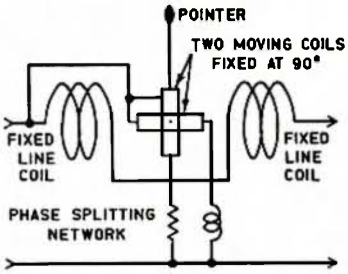
$$\cos \phi = \frac{\text{watts}}{\text{volts} \times \text{amperes}}$$

In the electro-dynamic type of power factor meter there are two coils of heavy wire. These are connected in series with each other, the combination being in series with one leg of the a.c. line. These are current coils, as they carry the line current.

Between these coils, suspended on pivots, are two coils physically attached to each other but spaced 90° apart in the form of a cross. These are both voltage or pressure coils. One end of each coil is connected to one leg of the line as shown in Fig. 12. Then the free end of one of the coils is connected to the other leg of the line through a resistance. This leg of the line is connected to the other coil through an inductance. The resistance and inductance make up a phase splitting device and as a result of this the currents in the two coils are approximately 90° part. This in effect produces a rotating magnetic field.

The driving torque required to move the voltage coils depends on the interaction of the fluxes from the two voltage coils and those from the two current coils, and is dependent on the actual phase displacement between the current and voltage in the system.

Therefore the moving coils take up a fixed position which depends entirely on the power factor of the load and their position only changes if the power factor changes. The scale follows a cosine law with an arc of about 90°.



CIRCUIT OF A SINGLE-PHASE POWER-FACTOR METER
FIG. 12

The second type of power factor meter is the moving-iron or induction type. The pointer is free to move through 360° in either direction. The pointer is attached to moving irons which are specially shaped and displaced by 180° from each other. The irons are enclosed by a polarising winding which is connected across the voltage. Two other coils are arranged to surround the moving irons and the polarising winding and are displaced from each other by 90°. These coils are connected to a phase splitting network.

The principle of operation is similar to the electro-dynamic type as the torque is proportional to the phase displacement between the current and voltage in the system.

The power factor meters described are for use in single-phase systems, however there are P.F. meters available for poly-phase systems. These are similar to the single-phase meters just described except that the phase-splitting networks are not used, instead the angular displacement of the phases is used to obtain the rotating field.

The three-phase balanced load type may use a single current coil and three voltage coils, alternatively it may have three current coils and one voltage coil, but for three-phase unbalanced loads the power factor meter will have three voltage and three current coils.

THE SYNCHROSCOPE

When an a.c. generator is to be connected to an existing a.c. supply it is necessary for the machine to be brought up to the correct speed so that its frequency is the same as that of the a.c. supply and **most importantly** the phase-angle must be as close to the phase-angle of the supply as possible, before the machine is switched into circuit. Provided that the phase-angle of the machine is very close to that of the supply then the a.c. generator will pull into synchronism as it will be delivering negligible power. As soon as synchronism has been achieved the generator's primary drive and its excitation can be increased so that it will deliver power into the a.c. supply.

There are several methods of checking the phase-angle difference between the generator and that of the supply but only one will be described.

This is a modified form of single-phase power factor meter with both sets of coils arranged for connection as voltage coils. One set of coils is fed with voltage from the a.c. supply and the other set of coils with voltage from the a.c. generator.

When the current and voltage of the generator are in phase with that of the a.c. supply an oscillating field results and the pointer of the instrument remains steady. However, if there is a phase difference between them then a partially-rotating field results. If the voltage remains constant then the strength of this field is proportional to the product of the current and the sine of the angle of lag or lead $= C \sin \phi$.

By allowing this rotating field to act on a pivoted disc, a deflection is obtained proportional to $C \sin \phi$.

A typical synchroscope has circular scale with a mark at the top centre. Arrows on each side of this mark are marked to indicate lag or lead, thus enabling an operator to know if a generator being brought onto line has a phase-angle which is lagging or leading the a.c. supply.

This section on synchroscopes has been included as there have been cases to the writer's knowledge where a radio station's own power plant has been used to feed power into a power supply authority's system during a period of acute power shortage. These have been cases where the station has had an excess of generating capacity over that needed to operate the station itself. There have been cases, too, where a station generates all its own power and when it became necessary to change from one a.c. generator to another the two generators would be connected in parallel to avoid closing down the station whilst the switch-over was being made.

If an a.c. generator is connected to the a.c. supply mains or to another

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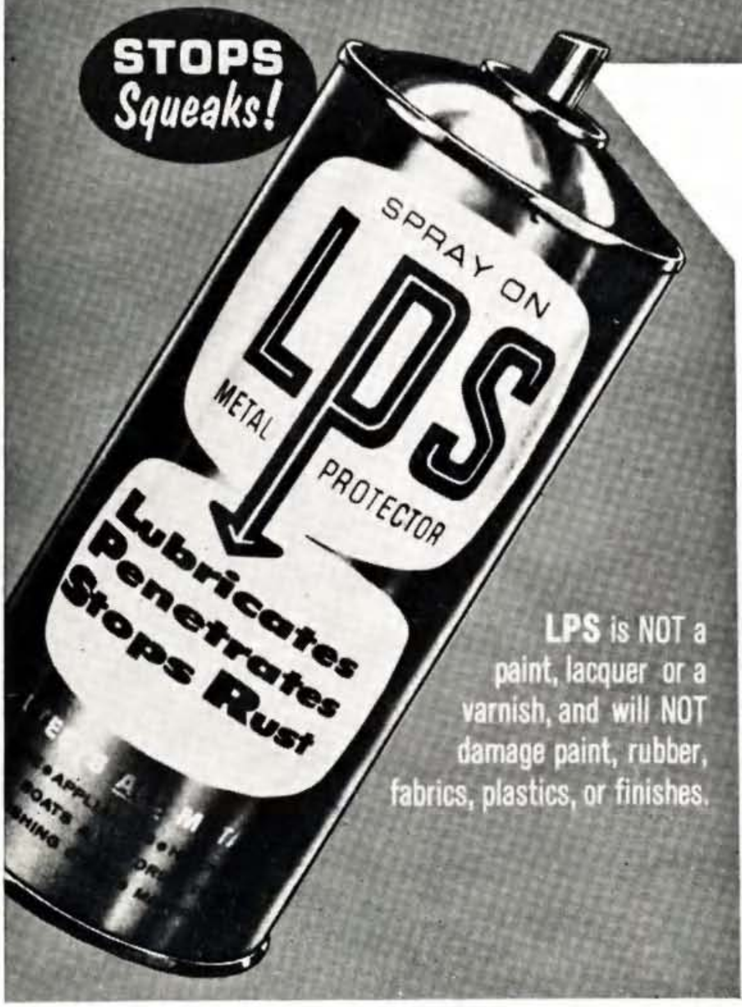

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Dielectric Strength per ASTM D-150:
Breakdown Voltage 0.1 inch gap, 32,000 volts.
Dielectric Strength volts/inch, 320,000 volts.

Flash Point (Dried Film), 900 degrees F.
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TESTS AND RESULTS: 950 degrees F.

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Mil. Spec. C-16173 D-Grade 3, Passed.
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generator when it is not synchronous considerable damage may occur. Again to the writer's knowledge there has been an occasion when a very large a.c. generator was switched to an a.c. supply and accidentally it was 180° out of phase. This resulted in many thousands of dollars damage.

It is only proper to point out that very few Authorities will permit any switching that will allow a privately owned a.c. generator being able to be switched to the a.c. supply.

FREQUENCY INDICATORS

There are a number of different methods of measuring the frequency of an a.c. generator. Probably the commonest instrument consists of a number of magnetic reeds of different lengths located near an electro-magnet which is energised from an a.c. source. Only those reeds whose free natural period of vibration is half the frequency of the a.c. supply will vibrate. This type of indicator is known as a vibrate "vibrating reed" or "resonance" meter and sometimes is referred to as a "cycle meter" which can be a bit confusing to one not familiar with this term in relation to electrical work.

ELECTRO-STATIC VOLTMETERS

In some cases it is desirable to measure high voltages where no current or power may be taken from the circuit. Where the moving-coil type of instrument is not suitable, use is made of the electro-static voltmeter.

There are two basic types. One depends on the attraction between two plates (for very high voltages), whilst the other uses pivoted vanes (one fixed and one movable as in a two-plate variable condenser).

When used on d.c. no current passes between the vanes but on a.c. there will be a small current, as with any capacitor, but the current is out of phase so there is no power component other than the very small loss due to the dielectric.

Attraction between the vanes is proportional to the square of the voltage so this type of instrument works equally well on d.c. as on a.c. giving the r.m.s. voltage.

HOT-WIRE AMMETERS

Ordinary a.c. ammeters already described are not suitable for the measurement of radio frequency currents, so in the early days of wireless an ammeter was developed which made use of the expansion characteristics of a wire such as platinum-iridium alloy. This type is obsolete.

THERMO-COUPLE AMMETERS

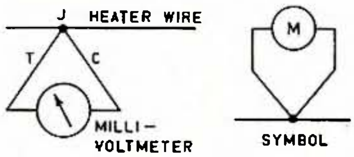
Certain metals, such as steel and constantan, bismuth and antimony, will produce an e.m.f. if brought under contact pressure at high temperature. The heat which produces the e.m.f. is produced at a rate which is proportional to the square of the current which flows through the junction of the metals. This junction is known as a "thermo-couple". A direct-current milli-voltmeter may be connected across the thermo-couple to measure the e.m.f. which has been generated.

As the e.m.f. is proportional to the heating of the thermo-couple, and as the heat increases as the square of the current flowing through the thermo-couple, then the e.m.f. increases as the square of the current flowing through the thermo-couple.

Thus the scale of the meter may be calibrated in evenly spaced heat units and the meter will be known as a current-squared meter. Alternatively, it may be calibrated in current units when it becomes an ammeter or milli-ammeter.

It is not necessary for the thermo-couple to be built into the meter case. In many radio transmitters the thermo-couple will be located in the most advantageous place in the circuit and the meter movement mounted some distance away, say, on the front panel of the transmitter.

However, it is important to realise that there is metallic contact between the heater and thermo-couple, so if the heater is at a high potential above ground, so then will be the meter movement.



THERMO-COUPLE AND METER
J IS THE JUNCTION OF THE TWO DIFFERENT WIRES, T AND C, WHICH MAKE UP THE THERMO COUPLE.
FIG. 13

Thermo-couple ammeters may range from about 50 milliamperes full scale to hundreds of amperes full scale.

The thermo-couple ammeter is very rugged and has great accuracy, also for all practical purposes it does not add inductance, capacitance and resistance to the circuit in which it is included. Therefore it will measure with equal accuracy from d.c. up to very high radio frequencies.

When used in radio frequency transmission lines and in aerials, it is quite common to use a shorting switch across the meter terminals to avoid burn-out due to near-by lightning discharges, however these switches can lead to meter errors, when the switches are opened, because of their capacitance, as they may appear as though a small capacitance is connected across the meter terminals. At d.c. and low frequencies this will not cause trouble but may do so at high frequencies.

It is most important to realise that a thermo-couple ammeter will read with equal and great accuracy on both **d.c. currents and a.c. currents** up to high frequencies (30 MHz. at least).

INSTRUMENT TRANSFORMERS

Reference was made earlier to "current" and "voltage" transformers which are used to increase the range or safety where a.c. instruments are concerned.

There are two types of instrument transformers. These are "current" and "voltage or potential" transformers.

Special types of current transformers are sometimes used with thermo-ammeters at radio frequencies.

The Voltage Transformer

This has its secondary working into a high impedance load such as a voltmeter or the pressure coil of a wattmeter or watt-hour meter. In comparison with their own internal impedance, voltage transformers operate almost as though the load, which is known as a Burden, is an open circuit.

Voltage transformers consist of two coils of a different number of turns magnetically coupled by a ferro-magnetic core of special nickel-iron alloy of high permeability and low loss.

The low voltage secondary is connected to a voltmeter, which forms the burden and is specified by the total volt-amperes and power factor at a specified frequency.

For any given frequency the ratio of primary to secondary volts is not linear. The change from linearity is greater the ratio of magnetising current to primary current and the greater the magnetic leakage of the transformer. Accuracy is obtained by designing the transformer for low magnetic leakage and low magnetising current. If the transformer is to be used with a wattmeter or watt-hour meter, then it is necessary to reduce as far as possible the phase angle between primary and secondary vectors. This, too, means low magnetic leakage and low magnetising current. The same remarks apply for any other instrument which is critical of phase.

Probably the main use for the voltage transformer is to enable very high voltages to be measured in safety as great care is taken in manufacture to provide adequate insulation between primary and secondary. It is quite a common practice in electricity undertakings to arrange a.c. distribution in terms of voltages which are multiples of 110, i.e. 220, 440, 6,600, 33,000, 220,000 volts, and it is common, too, to use a voltmeter having a full scale deflection of 110 volts, the scale being calibrated in terms of the primary voltage. It must be clearly understood that not all undertakings in Australia use the voltages mentioned, in fact there are great differences.

The Current Transformer

Current transformers are used mainly to enable a very large current, at possibly a very high voltage point, to be measured on a low range ammeter, and possibly at a distance from the position at which the actual current is to be measured. For instance, it may be desired to measure the current in a high voltage transmission line, many feet above ground, and the practical way to do this is to insert a current transformer in the transmission line, if single phase and more if poly-phase, whilst the actual measuring ammeter may be in a switchboard at eye-level.

The current transformer is designed for its primary to be connected in series with the load. The core flux is produced by the magnetising ampere-turns which is the vector sum of the primary and secondary turns. Should the secondary become open-circuited this becomes the full primary ampere-turns

(Continued on Page 15.)

Commercial Kinks

With Ron Fisher,* VK3OM

THE YAESU FT200

But first off I must make an apology for the non-appearance of the notes on vox units as promised in the July issue. We ran into a few problems with copyright of the circuits, so until this is cleared up in the near future this particular article will be held over. However, the additional notes on the Trio 9R 59D must have filled a need if the amount of correspondence I have received over the last few weeks is any indication. I am working on more modifications for this series of receivers and along with some of the experiences and problems of readers, you can look forward to more in the near future.

It would indeed be hard to find a piece of commercial gear so universally accepted as the Yaesu FT200. This rig must surely have put more Australian Amateurs on s.s.b. than any other, or perhaps all other transceivers, transmitters and receivers combined.

It must also stand as a tribute to the designers of the FT200 that in its three years on the Australian market very few problems have come up and certainly none of them serious. Also, the latest model is very little different to the original FT200 of three years ago. Some of the differences are, however, interesting and will be discussed during the course of these notes.

First though, some service notes. The Australian Agents for Yaesu, **Bail Electronic Services**, have compiled a most informative trouble shooting guide on the FT200 and with their kind permission I intend to reproduce this over the next couple of months. Even if you don't own an FT200, I think you will find many of these hints applicable to your rig.

Sympton: Transmitter output down; low operating IC; low IC off tune. Probable cause: Faulty p.a. tubes. Cure: Replace tubes.

Sympton: Transmitter not operating; no p.a. resting IC; receiver okay. Probable cause: P.a. inoperative. Cure: Check that the 11-pin accessory plug is plugged into socket at rear of set. Refer to instructions book for details. If the p.a. is still inoperative, then check h.t. voltage, bias and p.a. components.

Sympton: Output low on all bands; standing IC okay. Probable cause: Driver circuits out of alignment. Cure: Re-align all stages as per the instruction book.

Sympton: No p.a. dip obtainable on 80 metres; indications of p.a. oscillations. Probable cause: High gain in driver causing oscillation. Cure: Try installing a 22K ½w. resistor on 80 metre switch contact, similar to the 10K resistor R64 which is in circuit on 40 metres.

Sympton: No output on 80, 15 and 10 metres. Probable cause: Faulty sideband crystal. Cure: Check in the reverse sideband position and if output becomes normal, suspect the sideband crystal and replace. This problem can also be caused by faulty components associated with the carrier oscillator tube V106 and will also show up as lack of sideband reception. That is, a.m. only reception in all function switch positions.

Sympton: Transmitter output low on 21 MHz. and weak reception. Probable cause: Maladjustment of trap L22. Cure: Adjust as per instructions book.

Sympton: Transmitter output down and poor c.r.o. pattern on the lower frequency bands; output normal on 10 metres and on 15 metres, but plate tuning in 40 metre position; insulation burnt on h.t. lead to p.a. r.f.c.; p.a. coil slightly discoloured showing signs of overheating. Probable cause: 15 metre tap shorted to 10 metre tap on p.a. coil. Cure: Separate and re-solder any shorted taps.

Sympton: Transmitter output down or receiver insensitive on one band only. Probable cause: Misalignment of driver circuits on defective band. Cure: First try the other bands to confirm that these are okay. Re-align driver and r.f. coils on defective band. Also check any appropriate heterodyne crystal.

Sympton: Receiver losing sensitivity accompanied by low drive or variation in transmitter output. Probable cause: Fault in L12, r.f. driver plate coil, possible dry joint or open circuit. Cure: Repair coil or re-solder as necessary.

Sympton: No a.l.c. reading or incorrect zero setting of meter on a.l.c. Probable cause: First i.f. tube or metering circuit. Cure: Check V104 and all a.l.c. circuitry. Note that the meter reads in reverse for a.l.c. and provides an indication of effect of a.l.c. voltage by reading V104 cathode current. The meter zero is a full scale deflection of the needle. To adjust "zero" switch transmitter to s.s.b. Mike gain off. Meter switch to a.l.c., rec./opr. switch to opr., press mike p.t.t. button and adjust the small preset pot VR101 on top of the printed circuit board next to the crystal filter. I have noticed in quite a few FT200s that the meter zeros right at the extreme setting of VR101, or in many cases will not quite reach zero. Replace R122 with either a slightly larger or smaller value. Its size varies in production models from 1K to 1½K ohms. Also the value of the a.l.c. zero pot has been changed from 1K to 2K in later models.

More trouble shooting next month, but before ending, one quick modification. If you have operated some of the better sideband receivers or transceivers the first thing you will notice when using the FT200 is the excessively fast a.g.c. decay. It is so fast that even the S meter is hard to read. The remedy is simple, a bit more capacity across the a.g.c. line. A value of 0.22 to 0.33 μF. appears to be about right and the best place for it is across C124. Some of the perfectionists say you should wire a 100K resistor in series with the new condenser so that the a.g.c. attack is not slowed down too much. However, I have found no noticeable difference either way.

While on the subject of the received signal, another simple change comes to mind. In the earlier models the cathode of the product detector V102A was earthed through a small r.f. choke L106. It seems that there was insufficient d.c. resistance to produce adequate bias. In the current series this choke has been replaced with a 100K ½w. resistor, which has made a marked improvement to strong signal reception. If you find that signals over S9 sound better with the r.f. gain backed off, give this one a try.

I'll be back again next month with more on the FT200.

TRANSCEIVER TYPE NUMBERS

No doubt readers of overseas magazines have noticed advertisements for Yaesu Musen transceivers, but with different type numbers and in some cases different even in name. In Europe Yaesu has been sold under the name of Sommer Kamp and in the U.S.A. Tempo. These are both manufactured by Yaesu in Japan and are identical to types sold here in Australia. Here is a handy reference guide to identify the various types:

Yaesu Musen	Sommer Kamp	Spectronics
FT-DX100	FT-DX101	—
FT101	FT727/277	FT101
FT200	FT250	Tempo 1
FT-DX400	FT-DX500	FT-DX560
FT-DX401	FT-DX505	FT-DX570
FT-DX560	FT-DX747	—

This information has been supplied to us by the advertisers in "A.R." of Yaesu equipment.

* 3 Fairview Avenue, Glen Waverley, Vic., 3150.

Two Metre Frequency Allocations

A Special "A.R." Report on the Albury Conference, 8th and 9th July, 1972

● The purpose of the Conference was to consider proposals initiated by the Victorian Division that existing FM Repeater frequencies be changed to prevent a clash with frequencies allocated to International Amateur Satellites.

The Conference was chaired by the Federal President, Michael Owen, and was open to all interested parties whether members of the W.I.A. or not. Official Divisional representatives were present from VKs 2, 3, 4, 5 and 7, and a written submission in favour of the Victorian Division's proposals was submitted by the VK6 Division. Assisting Mr. Owen were the Federal Vice-President David Rankin and chairmen of the Australis Committee, Federal Repeater Secretariat and V.h.f. Advisory Committee.

Institute policy could not be decided by this meeting. However, resolutions arising from it will be forwarded to the Federal Council in the form of recommendations, and it is anticipated that considerable weight will be attached to any proposals clearly favoured by those present.

In addition to the proposed frequency changes, matters relating to the planned allocation of future Repeater input/output frequencies, simplex net frequencies and channel numbering systems were discussed.

As a result of motions passed by the Conference, the following **recommendations** will be forwarded to the Federal Council for consideration.

1. That the frequencies of the existing FM Repeater channels be moved above 146 MHz.
2. That these Repeater channels be established with Repeater output frequencies 600 kHz. above their respective input frequencies, and that this system be adopted as a standard for future Repeater allocations.
3. That the existing Repeater frequencies be changed as follows:—

		In	Out
		MHz.	MHz.
Channel	1	146.1	146.7
„	2	146.2	146.8
„	3	146.3	146.9
„	4	146.4	147.0

4. That provision for future Repeater channels be established on 50 kHz. spots around the above four channels, but within the band segment 146.0 to 147.0 MHz., along the following lines:—

In	Out
146.15 MHz.	146.75 MHz.
146.25 „	146.85 „
146.35 „	146.95 „

5. That if implemented by Federal Council, all Repeater channels within the band segmented 146.0 to 147.0 MHz. be made available for commissioning as desired by Divisions.
6. That 146.45, 146.50, 146.55, 146.60 and 146.65 MHz. be adopted as national simplex FM net channels.
7. That 146.5 MHz. be adopted as the national FM net calling frequency in lieu of 146.0 MHz.
8. That 146.6 MHz. be adopted as the national FM teletype net frequency.
9. That the present form of channel identification be replaced by a sequential numbering system based upon 50 kHz. spots throughout the 2 metre band allocation. 144.00 MHz. to be known as channel 0, 144.05 as channel 1, 144.10 as channel 2, etc., through to 148.00 MHz. channel 80. On this basis, 146.00 MHz. would be channel 40, 146.05 channel 41, 146.10 channel 42, etc. In the case of Repeater channels, the channel number to be derived from the Repeater input frequency. Further discussion between interested parties is anticipated on this matter.
10. That 1st November, 1972, be set as a date for change over of existing Repeater frequencies.
11. That existing simplex FM net frequencies be rounded to the nearest 50 kHz. spot and that this be implemented on 1st November, 1972.

Measuring Instruments

(Continued from Page 13.)

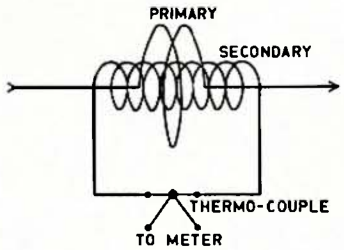
and the transformer may be damaged because of excessive flux overload.

The term "load" when used with current transformers refers to the magnitude of primary current, and the instrument connected across the secondary is known as the "burden".

One factor in the design of a current transformer is the number of primary ampere-turns and if the primary current be high, then all that may be necessary is one turn.

Sometimes the primary consists of a straight bar. This may be confusing but may be explained by stating that "the whole primary circuit" is in fact the complete primary winding, even if "the whole primary circuit" is many miles in length, such as in an a.c. supply system.

The current and voltage transformers described have been for use at power-line frequencies.

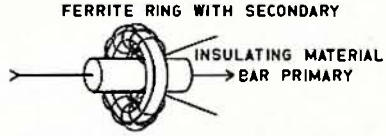


CIRCUIT OF ONE TYPE OF R.F. CURRENT TRANSFORMER.
NOTE THAT THERE IS NO DIRECT ELECTRICAL CONNECTION BETWEEN PRIMARY AND SECONDARY AND THAT THE TRANSFORMER IS AIR-CORED
FIG. 14

Current transformers are used by some manufacturers of radio transmitters and associated equipment for radio frequency measurements. For instance, here at 3CS, we use a number of r.f. current transformers, of two types.

The first type has one or more turns of heavy gauge plated copper tubing as the primary, wound on a large diameter. The secondary, of many turns of fine gauge wire, is arranged so that the coupling between primary and secondary is adjustable. The secondary is connected to a thermo-couple in the base of the transformer and this in turn is connected to a meter located several feet from the thermo-couple.

FERRITE RING WITH SECONDARY



R.F. CURRENT TRANSFORMER WITH BAR-PRIMARY
FIG. 15

The bar-type of transformer is used too. This consists of a straight bar, enclosed in insulating material, and forms the primary of the transformer. In the length-wise centre of the bar there is a ferrite ring, with several turns of wire, mounted over the bar insulating material. The secondary may be connected to a nearby meter, by means of co-axial cable to a distant meter. In one of our cases the distance is over 300 yards. ●

☆

DIRECT KEYING OF TX

(Continued from Page 9.)

Finally, a word of warning. When the correct value of parallel resistor has been found, solder it directly across the collector and emitter terminals of the transistor and do any switching or connecting elsewhere.

This keying system has been in use by the writer with an FL100B, and by a friend using an FL-DX-400, for about two years. Another friend has been using it with an FT-DX-400 for about six months.

NEWCOMER'S NOTEBOOK

With Rodney Champness,* VK3UG

CHEAP PARTS FOR CONSTRUCTION PROJECTS

If you are a struggling student or a married man with a young family supplies of cheap, but good, parts are essential.

Some people believe that only new parts can be used in projects and in some cases it is most desirable that this should be so. New components are often available at trade price or better through some of the smaller sellers who advertise through "A.R." and other electronics magazines. You can be assured of good sensibly priced components through the W.I.A. components sales section located in Melbourne. It will be found that these components and those advertised by the small sellers are mostly suited for transistorised projects.

For those who are quite happy to use valves—old t.v. chassis provide quite a few useful parts. Old t.v. sets whole or chassis only can sometimes be had for the asking or for only two or three dollars. It is important to know what parts are useful and which are of no value to you at all. For a start, all the paper capacitors can grace your rubbish bin. About 80% or more will be leaky if tested at about 150°F. Polyester, styroseal and mica are usually satisfactory although it will pay to check for shorts. Resistors are usually good but should be tested individually with an ohmmeter and discarded if more than 20% away from the marked value.

In quite a few sets the component leads are very short and the components are not easily salvaged. Some have quite long leads which means the leads can be cut where the component is soldered and still leave a reasonable length of lead to work with. It is not practical in most sets to unwind the leads from around the solder tags without overheating everything. The tag strips can often be salvaged by using sidecutters and cutting any apparent pigtail lead wrapped around a particular tag and then de-soldering it.

Potentiometers are usually satisfactory, but can be given a reasonable test by checking for smoothness of resistance change as the control is rotated. An ohmmeter is connected between the centre terminal and an outer terminal. Before discarding a suspect potentiometer spray the works with CRC2.26 or similar and see if any improvement results. If not, of course, the bush can be used as a shaft panel bush.

Electrolytic capacitors, if they look all right physically, should be checked with an ohmmeter, one lead to each terminal. The needle should kick up and then settle down to read a resistance of quite a few thousand ohms. If neither of the above occurs, the electrolytic is likely to be faulty. A more conclusive test is done on a CR bridge.

The power transformer is quite a valuable item in a t.v. set, particularly in the sets using a valve type rectifier. The transformer is usually sufficiently big to run an a.m. rig of from 60 to 100 watts d.c. input. Before stripping the transformer out of the set make a note of all the leads and where they go and what their purposes are. This can save you time later.

The various coils provide quite a few formers for new coils. The speaker and vertical transformers are suitable for audio work. Some vertical transformers could well be suitable for low power modulator transformers. The e.h.t. transformer seems to have little use as is, but the core is suitable for d.c./d.c. converters.

The valves in a t.v. set may or may not be any good. A large number of 6BX6s, 6BM8s, 6CM5s, 6DQ6As, 12AU7s. 6BL8s, etc., are found in sets. 6BX6s are good i.f. valves without a.g.c., for v.f.o's or crystal oscillators to mention but a few uses. 6DQ6As are good for modulator valves and good p.a. valves up to 6 metres. I have personally achieved about 75% efficiency at h.f. Some valves which are reputed to be troublesome in t.v. sets, such as the 6GV8 vertical valve, work well in other jobs. The 6GV8 works well as a low voltage audio valve, h.t. series regulator or an r.f. transmitting valve.

Very little else is of value in a t.v. set, the chassis may be of use but often they are of awkward shapes and have too many holes in them.

A number of people use aluminium for chassis, a cheaper material is galvanised sheet steel which is more rigid and can be soldered. Tin plate of heavy gauge can also look quite effective and the lighter gauges are suitable for under-chassis shields. Have a browse through various hardware stores and using a little imagination quite a number of hardware lines will be found which make cheaper alternatives to conventional radio lines—if available. Cupboard handles, heavy knitting needles for insulated shafts, and so on. Perhaps you have a few thoughts on what items could be used for radio work. If so, drop a line with your thoughts.

Next month I will deal with overhauling old broadcast and shortwave receivers and converting them for Amateur use.

* 24 O'Dowds Road, Warragul, Vic., 3820.

Regulations and Licensing

In reply to submissions by the Institute the Director-General of the P.M.G's Department has transmitted the following communications to the Federal Manager:—

REPEATER CALL SIGNS

With reference to your letter of 2nd May, 1972, and recent discussions, the call sign group VKXRAA - RAZ has been reserved for identification of Amateur repeater stations in lieu of the existing arrangement which, as you know, comprises the normal call sign of the operating W.I.A. group followed by the suffix R/1, 2, etc. The letter "X", of course, represents the State numeral.

Advice in this regard has been forwarded to the Superintendent of the Radio Section in each State, and local W.I.A. groups which are at present licensed to operate repeater stations should make arrangements with the Superintendents to have the call signs changed if they so desire. Future stations will, of course, be allotted call signs from the new series.

OSCAR REPEATER

With reference to your letters of 1st and 2nd May, 1972, and discussions with Mr. Williamson and myself, approval is given for:—

(a) The establishment and operation of a terrestrial repeater station to be used in a fixed or mobile capacity for demonstration purposes prior to the launching of the next Oscar Satellite; and

(b) Limited Amateur station licensees who will use both the terrestrial and space repeater stations to receive transmissions from other Amateur operators relayed by the repeater station on a frequency below 52 MHz.

The call sign VK(X)RZZ (X being the State numeral) is allotted for identification of the terrestrial repeater station. Stations communicating through the repeater stations will be subject to normal identification procedures.

[Because this repeater is intended for use in several States, the call sign VKXRZZ was allocated as an exception to the general rule.—Ed.]

AX CALL SIGNS

Careful consideration has been given to your letter of 2nd May, 1972, regarding the use of Amateur call signs prefixed by the letters "AX" during special occasions.

The decision has been reached, however, that approval for such an arrangement will be restricted to occasions of major national importance. It is considered that if the privilege was extended in the manner you have proposed that the value of the distinction would be lessened.

Reciprocal Licensing

The following correspondence is published for general information as the contents demonstrate liberalisation in relation to reciprocity for visiting Amateurs from any part of the world.

2nd May, 1972

The Controller,
Regulatory and Licensing,
P.M.G's Department,

Reciprocal Licensing

Dear Sir,

Another matter on which we spoke together briefly the other day concerns reciprocal licensing.

As I mentioned to you it appears that in many countries this question is dealt with on two separate planes. Firstly, there is the question of issuing licences to bona fide tourists as occurs in Europe in particular and since extended to many other countries in the world. Secondly, there is the separate question of issuing licences to intending residents and those people intending to change their domicile from one country to another.

In relation to the second of these questions there is little doubt that the authorities in the "receiving" country may require to be satisfied about a number of issues not directly related to the Amateur Service per se. For example, the security question.

However, in connection with bona fide visitors the position has been very considerably liberalised in many countries, as, for example in Belgium where a Belgian licence is issued to any Amateur from any country producing proof of being licensed in his own country of abode. I admit that possibly the bulk of visitors to such countries would operate mobile but this, as far as I know, is not a licence condition. If such visitors subsequently decided to remain for an indefinite stay, I have no doubt that the local Regulations would be trotted out and the person would "have to toe the line" to the same extent as residents.

Here in Australia, the tourist potential is considerable and is under expansion, but at the same time distances are great in order to get here. Hence, a visitor to these shores, except from New Zealand, would not ordinarily remain here for only a few days or a week or two but might be expected to tour about for up to two or three months at a time. Reciprocity for bona fide tourists and visitors for up to say three months maximum is therefore suggested.

I hope this can receive consideration.

Yours sincerely,
P. B. Dodd, Manager.

29th June, 1972

Mr. P. B. Dodd,
Manager, W.I.A.

Dear Sir,

With reference to your letters of 2nd May, 1972, careful consideration was given recently to the whole question of the issue of Australian Amateur station licences to persons visiting or taking up residence in this country who either hold, or are qualified to hold, Amateur station licences issued by the Administrations of their own countries.

As you know, it has been the practice in the past to issue Australian licences to persons whether they were visitors or settlers from other countries only if they held qualifications considered to be equivalent to what is required of an Australian Amateur, and on the understanding that Australian Amateurs would be granted reciprocal rights by the other Administration concerned.

It has been decided that there will be no change in this policy as far as persons desiring to settle permanently in Australia are concerned.

In the case of visitors, however, the Department, in future, will issue an Australian Amateur licence to a qualified Amateur from overseas for a period not exceeding 12 months on the understanding that:

(a) The category of licence (restricted or full privilege) will be determined by the class of operator's certificate or licence held by the applicant;
(b) The visiting Amateur will receive no greater privileges as far as frequency bands, power, etc., are concerned than he is eligible for in his own country; and
(c) There is strict compliance with Australian Amateur conditions.

Applicants for licences should write to the Controller, Regulatory and Licensing Section, Radio Branch, P.M.G's Department, 57 Bourke Street, Melbourne, well in advance of their proposed visit. A photostat copy of their licence or certificate should be enclosed and, if not evident from these documents, an indication given of any operating restrictions which have been applied to them by the issuing Administrations.

The Controller will then advise the applicant of the class of Australian licence which will be issued to him and forward for his completion an application form RB80 and a declaration regarding the secrecy of wireless communications, Form RB127. The licence will then be made available for collection or despatch to the applicant on payment of the prescribed fee of $6.00 (Australian) either at the office of the Controller or by the Superintendent (Regulatory and Licensing) Radio Section in the State of arrival.

It is not the normal practice to issue "C" series call signs to visiting Amateurs, but they would be granted approval to operate in a mobile capacity during their stay in Australia if this was justified.

Attached is the latest statement showing other Administrations with which Australia at present has a reciprocal licensing arrangement and the respective Amateur qualifications which are acceptable for issue of Australian Amateur licences.

There, of course, is no objection to the publication of the abovementioned information in "Amateur Radio".

Yours faithfully,
H. S. Young,
for Director-General.

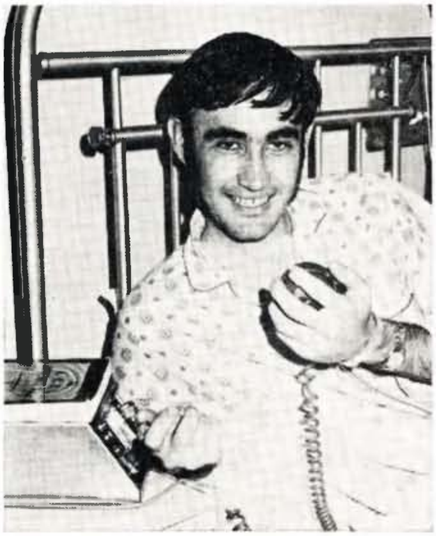
Statement showing eligibility of Persons holding various Overseas Amateur Licences and Operators' Certificates for Australian Amateur Station Licences under Reciprocal Agreements

Administration	Class of Certificate or Licence held	Australian Amateur Licence for which holder is eligible	Remarks
U. Kingdom	British Amateur (Sound) Licence	Full Privilege	
	British Amateur (Sound) Licence A	Full Privilege	
	British Amateur (Sound) Licence B	Limited	
U.S.A.	Extra Class Licence	Full Privilege	
	Advanced Class Licence	Full Privilege	
	General Class Licence	Full Privilege	
	Conditional Class Licence	Full Privilege	
	Technician Class Licence	Limited	
	Novice Class Licence	—	Not acceptable.
Canada	Advanced Am. Rad. Op. Certificate	Full Privilege	
New Zeal'd	N.Z. Amateur Operator's Certificate	Full Privilege	
	N.Z. Amateur Operator's Certificate (non Morse)	Limited	
Malaysia	Current Amateur Station Licence	Full Privilege*	* Where applicant furnishes acceptable evidence that he has qualified in telegraphy at a speed of 12 or more words per minute.
	Current Amateur Station Licence	Limited†	† Where no acceptable evidence is furnished of telegraphy qualifications.
Singapore		Same as for Malaysia	
India	Amateur Wireless Telegraphy Station Licence	Full Privilege	
Switzerland	Amateur Radio-Telegraphist's Certificate (Transmission)	Full Privilege	

F.M. AT BEDSIDE

Making the most of a several-week stay in Wollongong Hospital (N.S.W.), Barry Lacey, VK2ZYL/T, set up his home-brew solid-state 2 metre f.m. transceiver at his bedside.

Using a vertical dipole supported from the side of his bed, Barry made many contacts from his 7th floor wardroom. Barry's operation which took several hours straightened out his right hip and was a forerunner to another operation when he returns shortly for a complete replacement of the left hip.



Barry VK2ZYL/T at the controls of his home-brew 2 metre f.m. transceiver.

☆

THE "WIPERTATOR"

(Continued from Page 8.)

proof the terminals. Install the unit on the mast with the bearing of 0° = True North. Radiator hose clips, either galvanised or stainless steel, are ideal for attachment. A number of these may be used in series to obtain the necessary length. It is important that the hose clips are placed at the extremities of the motor housing to prevent distortion of the body. For the top bearing of the mast use a saddle clip with a quick release gate to facilitate easy assembly of the mast and array.

POINTS TO NOTE

1. Short booms and low weight are paramount for smooth and reliable operation.
2. Small diameter elements in the antenna have high Q, narrow bandwidth, light weight and low wind load.
3. Care in the alignment of shafts and bearings is essential.
4. The "excess" portions of the castings should not be removed without prior thought, as they can be made to fit snugly around the mast.
5. Heavy duty wire is needed for the motor supply feed.
6. Thorough lubrication and waterproofing will reap dividends.
7. The calibration should be checked carefully before finally mounting! ●

NEW CALL SIGNS

MARCH-APRIL 1972

VK2AM—M. J. Farrell, 4 Carlotta St., Greenwich, 2061.
VK2AX—A. W. Stowar, 7A Melbourne Rd., Lindfield East, 2070.
VK2BR—B. F. Darragh, 749 Forest Rd., Peakhurst, 2210.
VK2LE—St. George Amateur Radio Club, Civil Defence Hq., The Mall, Hurstville, 2221.
VK2BFW—E. G. Webster, 26 Arthur St., Homebush, 2240.
VK2BGT—G. L. Tillett, 9 Naomi Pl., Baulkham Hills, 2152.
VK2BNF—E. Smith, 8 Everton Rd., Belrose, 2085.
VK2BNG—G. Mattesich, 54 Lake Heights Rd., Lake Heights, 2502.
VK2BOR—Oxley Region Radio Club, 5 Condon Ave., Port Macquarie, 2444.
VK2BZV—B. V. Vlcex, 5 Birch St., Batlow, 2730.
VK2ZCC—C. J. Bourke, 7/266 Pennant Hills Rd., Carlingford, 2118.
VK2ZVS—A. J. Skewes, 61 Regent St., Junee, 2593.
VK2ZVT—K. S. A. Gormley, 115 Morpeth Rd., East Maitland, 2323.
VK2ZZO—R. D. Parker, 48 George St., Avalon Beach, 2107.
VK3DJ—D. G. G. Johns, 26 Porter St., Eltham, 3095.
VK3HT—I. B. Williamson, 20 Rosamond Cres., East Doncaster, 3109.
VK3LX—W. D. Moulton, 41 Railway Pde., Murrumbeena, 3163.
VK3MY—L. D. Money, 14 Blamey St., East Bentleigh, 3165.
VK3ZY—S. King, 1 Kalmai Ave., Mt. Waverley, 3149.
VK3AIP—E. F. Coate, 18/27A Domain Rd., South Yarra, 3141.
VK3ASN—K. J. Assender, 24/67 Moonya Rd., Murrumbeena, 3163.
VK3AZJ—J. J. Lilley, 11 Yarra Gr., Hawthorn, 3122.
VK3AZZ—R. J. Gray, 7 Fenwick Crt., Bundoora, 3083.
VK3BGE—I. H. Watson, 26 Lee-Anne Cres., Bundoora, 3083.
VK3BGF—C. L. Nichols, 162 Spring St., Reservoir, 3073.
VK3BGG—R. E. Snell, "The Pines," Locarno Ave., Kallista, 3791.
VK3CCB—G. J. Bradshaw, 27 Crown St., Glen Waverley, 3150.
VK3CDC—R. Chamberlain, 8 Bristow Dr., Nunawading, 3131.
VK3CEC—C. A. Cantor, 1/38 Park St., Hawthorn, 3122.
VK3CIF—P. B. Dodd, 10 Cannes Gr., Beaumaris, 3193.
VK3YDF—D. J. Furst, 19 Vernal Ave., Mitcham, 3132.
VK3YGW—G. Targownik, 282 Doncaster Rd., North Balwyn, 3104.
VK3ZDX—J. McEwen, 1703 Malvern Rd., Glen Iris, 3146.
VK3ZLT—G. J. Clements, 12 Whitty St., Sunshine, 3020.
VK3ZOF—W. E. Metzenthen, 132 Suffolk Rd., Maidstone, 3012.
VK3ZTI—N. J. Melford, Old Coonara Rd., Olinda, 3788.
VK4BS—A. H. Braby, Barnehurst St., Tarragindl, 4121.
VK4MI—L. Morrison, 18 Eleanor Ave., Springwood, 4127.
VK4UV—L. E. Martin, Station: Cr. Quentin & Jasen Sts., Cleveland, 4163; Postal: P.O. Box 94, Cleveland, 4163.
VK5IN—K. V. Hanson, 5 Foley St., Salisbury Downs, 5108.
VK5YK—M. J. Dodd, 127 Stephen Tce., Walkerville, 5081.
VK5ZDC—R. W. Parker, 55 Sixth Ave., Ascot Park, 5043
VK6DZ—D. J. Reitze, 6 Jeffries St., Albany, 6330.
VK6IM—I. A. Broughton, 28 Alexander Rd., East Fremantle, 6158.
VK6IQ—G. C. F. Hufner, Station: "Mareeba," Albany H'way, Arthur River; Postal: P.O. Box 21, Wagin, 6315.
VK6KE—R. Kovacic, Tropicana Motel, Broome, 6725.
VK6KM—K. M. Moore, Station: Lot 10, Boundary Rd., Albany, 6330; Postal: C/o. D.E. P.M.G. Dept., Albany, 6330.
VK6NE—N. R. Penfold, 388 Huntriss Rd., Woodlands, 6018.
VK6TD—T. Graham, Block 8, Flat 35, Korbosky Rd., Lockridge, 6054.
VK6YB—T. Ballantyne, 7/60-64 Forrest Ave., Eastside Gardens, East Perth, 6000.
VK6ZHY—C. T. Younger, Station: U.S. Naval Base, Exmouth, 6707; Postal: Navcommsta Holt, P.O. Box 26, Exmouth, 6707.
VK6ZKW—W. H. Knubley, 24 Traylen Rd., Kalamunda, 6076.
VK7HW—H. H. E. Westerhof, Station: 312 Nelson Rd., Mt. Nelson, 7007; Postal: P.O. Box 49, Sandy Bay, 7005.
VK7SS—P. R. Tompson, 1/21 Seymour St., St., New Town, 7008.
VK7ZAZ—W. J. Howse, 5 Haig St., Lenah Valley, 7008.
VK7ZMF—M. J. Fox, 13 Granville Ave., Lindisfarne, 7015.
VK9JC—B. J. Clary, P.O. Box 3, Ukarumpa, E.H.D., N.G.
VK9JD—R. Davis, P.O. Box 2087, Konedobu, P.
VK9MH—M. S. Hodgson, P.O. Box 2234, Konedobu, P.
VK9MI—A. McIsaac, P.O. Box 80, Rabaul, N.G.

LICENSED AMATEURS IN VK

MARCH-APRIL, 1972

	Full	Lim.	Total
VK0	6	1	7
VK1	92	28	120
VK2	1387	529	1916
VK3	1320	674	1994
VK4	522	208	730
VK5	514	215	729
VK6	362	135	497
VK7	154	67	221
VK8	35	12	47
VK9	89	14	103
	4481	1883	6384 Grand Total

CONTESTS

With Peter Brown,* VK4PJ

VK/ZL 1971

Although I was only a participant in the 1971 VK/ZL Contest, I consider that I should refer to this Contest. This is our only international Contest, but one would be forgiven for thinking that we were not interested. VK4 Division easily had the best representation and if other Divisions had participated in similar proportions to their membership, the showing would have been reasonable.

Let us face it, as a nation we should be able to run at least one international Amateur Contest or else we derate ourselves to an insignificant part of the Amateur Radio world.

This Contest depends on VK/ZL operators and the rest of the world will soon lose interest if there are few host operators.

The 1972 Contest comes up in October. Make sure that your Division, and your country, provides good representation. Don't rely on your entry only. Get at least two others to support you!

CERTIFICATES

I have not been entirely satisfied with the penwork on certificates issued by me during 1971/72. However, a good friend of the Institute has provided a good "pen" for Certificates, so if you would like a new Certificate just WRITE me so that I can anticipate demand, and I will advise you when to return your Certificate for replacement.

VK0MX's R.D. Contest Certificate was returned through the post . . . ???

R.D. CONTEST—THE FRIENDLY CONTEST

By now you will have digested, I hope, the 1972 Remembrance Day Contest rules. I am trying to please you and to make the Contest better. So when you return your log please give me an indication of your feelings. If satisfied, just place a big okay somewhere on the front sheet. If you have new ideas, I would like to hear them!

Don't forget! Make sure that everyone you contact enjoys the Contest . . . and make sure that your Division wins.

DIVISIONAL TROPHY WINNERS, REMEMBRANCE DAY CONTEST

1948—New South Wales	1960—Tasmania
1949—Tasmania	1961—Western Australia
1950—Tasmania	1962—Western Australia
1951—Tasmania	1963—Queensland
1952—Western Australia	1964—South Australia
1953—Western Australia	1965—South Australia
1954—South Australia	1966—Western Australia
1955—South Australia	1967—Victoria
1956—Western Australia	1968—Tasmania
1957—Western Australia	1969—Tasmania
1953—Western Australia	1970—Queensland
1959—Tasmania	1971—Queensland

1972 ?

CONTEST CALENDAR

Remembrance Day Contest—August 12-13, 1972.
VK/ZL—Phone—October 7-8, 1972.
VK/ZL—CW—October 15, 1972.
Ross Hull VHF-UHF—Dec. 9, '72, to Jan. 21, '73.
J. Moyle Nat. Field Day—February 10-11, '73.

* Federal Contest Manager, Box 638, G.P.O., Brisbane, Qld., 4001.

1972 VK-ZL-OCEANIC DX CONTEST RULES

N.Z.A.R.T. and W.I.A., the National Amateur Radio Associations in New Zealand and Australia, invite world-wide participation in this year's VK-ZL-Oceania DX Contest.

Objects: For the world to contact VK-ZL-Oceania stations and vice versa.

When? Phone 24 hours from 1000 GMT on Saturday, 7th October, to 1000 GMT, Sunday, 8th October.

CW 24 hours from 1000 GMT on Saturday, 14th October, to 1000 GMT, Sunday, 15th October.

RULES

1. There shall be three main sections to the Contest—
   - (a) Transmitting phone.
   - (b) Transmitting c.w.
   - (c) Receiving—"phone and c.w." combined.

2. The contest is open to all licensed transmitting stations in any part of the world. No prior entry need be made. Mobile marine and other non-land based stations **are permitted** to enter. Their "country status" will be determined by the country which issued the call sign used in the contest.

3. All Amateur frequency bands may be used but no crossband operation is permitted. **Note:** VK and ZL stations irrespective of their location **do not** contact each other for contest purposes **except** on 80 and 160 metres, on which bands contacts between VK and ZL stations are encouraged.

4. Phone will be used during the first week-end and c.w. during the second week-end. Stations entering both sections must submit separate logs.

5. Only one contact on c.w. and one contact on phone per band is permitted with any one station for scoring purposes.

6. Only one licensed Amateur is permitted to operate any one station under the owner's call sign. Should two or more operate any particular station, each will be considered a competitor and must submit a separate log under his own call sign. This is not applicable to overseas' competitors operating club stations.

7. Entrants must operate within the terms of their licences.

8. **Cyphers:** Before points can be claimed for a contact, serial numbers must be exchanged and **acknowledged**. The serial number of five or six figures will be made up of the RS (phone) or RST (c.w.) report plus three figures which may begin with any number between 001 and 100 for the first contact and which will increase in value by one for each successive contact. Example: If the number chosen for the first contact is 021, then the second must be 022 followed by 023, 024, etc. After reaching 999, restart from 001.

9. **Scoring: (a) For Oceania Stations other than VK-ZL:** 2 points for each contact on a specific band with VK-ZL stations; and 1 point for each contact on a specific band with the rest of the world.

(b) **For the Rest of the World other than VK-ZL:** 2 points for each contact on a specific band with VK-ZL stations; and 1 point for each contact on a specific band with Oceania stations other than VK-ZL.

(c) **For VK-ZL stations:** 5 points for each contact on a specific band, in addition, for each new country worked on that band, **bonus** points on the following scale will be added—1st contact, 50 points; 2nd contact, 40 pts.; 3rd contact, 30 pts.; 4th contact, 20 points; 5th contact, 10 pts.

Note: The A.R.R.L. Countries List will be used except that each **call area** of W/K, JA, and UA will count as "countries" for scoring purposes as indicated above.

(d) **80 Metre Section:** For 80 metre contacts between VK and ZL stations, each VK/ZL call area will be considered a "scoring area" with contact points and bonus points to be counted as for DX contacts. N.B.—Contacts between VK and ZL on **80 only.**

(e) **160 Metre Segment:** For 160 metres, contacts between VK-ZL, VK/VK, ZL/ZL and VK/ZL to the rest of the world. Each VK/ZL call area will be considered a "scoring area" with contact points and bonus points to be counted as for DX contacts (Rule 9c). **Note:** A contestant in a call area may claim points for contacts in the same call area for this 160 metre segment.

10. **Logs:**

(A) **Overseas Stations: (a)** Logs to show in this order—date, time in GMT, call sign of station contacted, band, serial number sent, serial number received, points claimed. Underline each new VK/ZL call area contacted. Separate log must be submitted for each band used.

(b) **Summary Sheet** to show call sign, name and address in BLOCK LETTERS; details of station; and, for **each band,** QSO points for that band; VK/ZL call areas worked on that band. "All band" score will be total QSO points multiplied by sum of VK/ZL call areas on all bands while "single band" scores will be that band QSO points multiplied by VK/ZL call areas worked on that band.

(B) **VK/ZL Stations: (a)** Logs must show in this order—date, time in GMT, call sign of station worked, band, serial number sent, serial number received, contact points, bonus points. **Use separate log for each band.**

(b) **Summary Sheet** to show—name and address in BLOCK LETTERS, call sign, score for each band by adding contact and bonus points for that band, and "all band" score by adding the band scores together; details of station and power used; declaration that all rules and regulations have been observed.

11. The right is reserved to disqualify any entrant who, during the contest, has not strictly observed regulations or who has consistently departed from the accepted code of operating ethics.

12. The ruling of the Executive Council of N.Z.A.R.T. will be final.

13. **Awards:**

World-wide (except VK/ZL): (a) Attractive multi-colour certificates to the top scorers in each country. (Call area in W, JA, UA.) Separate Awards for phone and for c.w.

(b) Depending on reasonable degree of activity, separate certificates may be awarded for top scores on different bands.

(c) Where many logs are received, consideration will be given to awarding second and third place certificates.

VK/ZL Awards: Attractive multi-colour certificates—

1. To the top three scorers in each call area of VK and of ZL.
2. To the top three scorers on individual bands (160, 80, 40, 20, 15, 10) in VK and in ZL. Separate awards for phone and c.w.

14. **Entries from VK/ZL Stations** should be posted direct to—
N.Z.A.R.T. Contest Manager, ZL2GX,
152 Lytton Rd., Gisborne, New Zealand,
to arrive not later than **31st December, 1972.**

From **Overseas Stations** to the above address OR—
N.Z.A.R.T.,
Box 489, Wellington, New Zealand,
to arrive **not later than 25th January, 1973.**

S.W.L. SECTION

1. The rules are the same as for the transmitting section but it is open to all members of any S.w.l. Society in the world. No transmitting station is permitted to enter this section.

2. The contest times and logging of stations on each band per week-end are as for the transmitting section except that the same station may be logged twice on any one band—once on phone and once on c.w.

3. To count for points, the station heard must be in QSO exchanging cyphers in the VK/ZL/Oceania DX Contest and the following details noted: date, time in GMT, call of the station heard, call of the station he is working, RS(T) of the station heard, serial number sent by the station heard, band, points claimed.

4. Scoring is on the same basis as for the transmitting section and a summary sheet should be similarly set out.

5. Overseas stations may log **only VK/ZL** stations, but VK receiving stations may log overseas stations and ZL stations, while ZL receiving stations may log overseas stations and VK stations.

6. Awards will be made as listed in the section under "Awards".

—Jock White, ZL2GX,
Contest and Awards Manager, N.Z.A.R.T.

AWARDS COLUMN

With Geoff Wilson,* VK3AMK

This month I would like to mention several things which should be observed when forwarding QSLs for checking, either when making an original application for an award or later additions to the total as extra QSLs are obtained.

1. Check to see that there are no duplications such as two cards from the same country but with different prefixes, e.g. a VK and AX.

2. Submit a check list of the cards in the same order as shown on the DXCC list and give essential details of each card as well, pack cards in the same order.

3. Use strong envelopes with adequate room for the QSLs. Often large numbers of cards are forced into a small envelope and when received have burst open in transit. If possible use only Post Office preferred sizes. Include with the cards a similar stamped and addressed envelope for their return. Cards will in future not be returned unless return postage is paid by the sender.

4. Clearly show sender's name and FULL postal address on back of article.

5. Do not use airmail envelopes for Australian internal mails unless the additional fee for airmail is paid.

6. Those having DXCC totals of less than 250 current countries confirmed would assist greatly if they forwarded cards in multiples of 25 at a time. Lesser numbers sent at a time greatly increases overall time spent in checking. Those having in excess of 250 current countries may send any number. If the above guidelines are followed not only will you speed the handling of your cards but by proper packing, etc., the chances of cards being lost in the mail are very slight.

GENERAL CERTIFICATION RULE

This term is now very common but still obviously not fully understood by many people. A number of awards state that GCR applies, this briefly means: Any officer of a recognised Amateur Radio Club or Society, any two licensed Amateurs at higher licence classes, or any CHCer may certify that they have sighted the applicant's QSLs for a particular award. The person applying for the award therefore retains his QSLs instead of forwarding them to the sponsor of the award, who in most cases will be in an overseas country. Despite the above, the sponsor of any award reserves the right to see the QSLs if any doubt exists.

WORKED ALL PACIFIC—"WAP"

Confirmations required from 30 Oceania "countries" as listed. No charge unless certificate is required by airmail. Different prefixes are acceptable as long as the countries are as listed below:

CR8/10—Port. Timor	VK9—New Guinea
DU—Philippines	VK9—Papua
FB8—Adelie Land	VK9—Norfolk Is.
FK8—New Caledonia	VK9—Christmas Is.
FO8—Fr. Oceania	VK9—Cocos Is.
FW8—Wallis Is.	VK0—Macquarie Is.
FU8/YJ—New Hebrid.	VR1—Gilbert Is.
KB6—Baker, Howl'd	VR1—Ellice Is.
KC6—Carolines	VR1—Br. Phoenix Is.
KC6—Palau, etc.	VR2—Fiji
KG6—Marianas	VR3—Fanning Is.
KG6I—Iwo Jima	VR4—Solomon Is.
KG6—Marcus	VR5—Tonga
KH6—Hawaiian Is.	VR6—Pitcairn
KJ6—Johnston Is.	VS4—Sarawak
KM6—Midway	VS5—Brunei
KP6—Palmyra	ZC5—Brit. Nth. Born.
KS6—Am. Samoa	ZK1—Nth. Cook Is.
KW6—Wake Is.	ZK1—Sth. Cook Is.
KX6—Marshall Is.	ZK2—Niue
PK1, 2, 3—Java	ZL—New Zealand
PK4—Sumatra	ZL—Kermadec Is.
PK5—Borneo	ZL—Chatham Is.
PK6—Celebes, etc.	ZL—Campbell Is.
JZ0—Nth. New Guin.	ZL5—N.Z. Antarctica
VK—Australia	5W1—Samoa
VK2—Lord Howe Is.	ZM7—Tokelau Is.
VK4—Willis Is.	VK9 (C2)—Nauru Is.

GCR lists OR QSLs to: ZL2GX, 152 Lytton Rd., Gisborne, New Zealand.

* 7 Norman Avenue, Frankston, Vic., 3199.

you and DX

With Don Grantley*

Times: GMT

The past two months have been rather hectic for me what with flitting around the countryside and such things, consequently many letters have remained unanswered to this date. My apologies for this, I will try and get them all done be.ore I jump off to VK4 again. In the meantime I will appreciate any news you care to send along.

Conditions still much the same as in the past months, there are the good days when the unexpected will happen, such as the good DX openings on 40 metres, and the times when there is nothing doing. By and large, 20 mx is still the band to which we look for the most consistant performance, and although conditions are on the way down, there is still some very good DX to be located.

Hank VK2BHL from Dapto is one who has been amongst the DX and his list is really a DX man's dream come true. MID, A35LT, IC1TRA, LX1DV, 9H1DG, IS1MUA, C31BC, EA-8GZ, OZ3MV, FO0RV, 9Y4VV, YA2ZL, DL6KB/OH0, FM7AA are just a few from a long list submitted by Hank. These lists, although not often published in their entirety, are a great help when compiling the notes and are appreciated by many of the other DX editors with whom I am in regular contact by tape.

On the subject of tape. This naturally enough is not a DX item, but is a subject related to Amateur Radio, as many of our operators use a tape medium to assist their overall operation. Have any of you noted the large number of faulty cassettes on the market? I use a top brand cassette recorder for much of my overseas contacting, and I am amazed at the number of cassettes on the market which become jammed and cause trouble with the recording. The particular items are not confined to one single brand. They bear all varieties of labels, but all have one thing in common, they are assembled from U.S.A. components in a foreign country. Not every one is faulty, but there is quite a large percentage which are useless, in fact they won't get through the first side. So the warning is, when buying cassettes for your recorder buy a reputable brand, and insist on a receipt from the retailer in case you should have to return them.

NEW AND STRANGE PREFIXES

JF1 is being used by Japan for stations in the Kanto area. 3G3AA was used for the World Telecom Day, all QSLs to go via the CE Bureau, Box 13630, Santiago, Chile. FO0 and FP0 were in operation around Tahiti, FO0RV being G5RV who wants the QSLs to his home QTH, while FP0VQ goes to manager W2NQ.

IZ1ISS was I1PFL from International Space Show, QSL Box 250, Torino, Italy. JY9 is being used by several stations. JY9GR is DL9GR, QRV until November, QSL to DK4PP or Box 1170, Amman. JY9EA goes to his SM5EAC QTH, and JY9VO goes to Box 5089, Amman, Jordan.

PT has been in use by Brasillia stations since April 19, and the QSL Bureau for that district is Box 07-0911, Brasillia-DF-700000, Brazil. PT2EYO is QRV 14180 daily s.s.b. 2100-2230z, and on 14050 c.w. at 0200 over the week-ends. His manager is WA1OKF/1, but this is listed in the current Call Book under his former novice call WN1OKF.

VT1LC is the only other special prefix which I have for the month, this was a special station operated by VE1ASJ from the Lions Club Car Show. Cards to Box 552, St. Johns, N.B., Canada.

SILENT KEYS

Two appear in the Geoff Watts DX News Sheet. WA6YVW, Bill Nesbit, who passed away on May 21, and I1ER, Mario Santangeli, on April 26. Mario was noted for his consistent encouragement to S.w.l's.

GENERAL NEWS

Venkat A51KV went QRT after only 880 QSOs due to the early onset of the monsoon season and the bad state of the dirt roads caused by heavy rain. He and his XYL returned to Calcutta but hopes to return to Thimpu later this year. Meantime he has repaired A51TY's rig and the latter is now reported on the air using a frequency around 14217 at 1425z. Reverting to A51KV again, if you worked him, his manager is W6KNH.

KC6SK, who was formerly KC6BK, is now active from Yap Is. in the West Carolines. He will be there for two years and uses all bands c.w./s.s.b. Stan has his old KC6BK logs, a few thousand QSLs with him and will be pleased to confirm any outstanding QSL. Send it to Stanley Kohn, Box 55, Colonia, Yap Is., West Carolines, 96943.

Some news from TY. TY1ABE is QRV from May to September 14130 s.s.b., and 14005 c.w. TY6ATE has an important change in QSL information, his cards should go to Ted Schultz, B.P. 107, Natitingou, Dahomey, and not to W4WHF as shown in the QSL manager's directory. Another frequently on the air is WB2AQC/TY3, his cards go to the home QTH.

Quite a pile of QSL information to hand for 5H stations, first of all the new calls of some former operators. 5H3HD is now 3D6AX; JJ now 5Z4JJ; KF is 9J2CS; KJ now LA6GF; MA is ET3DS; MB is WA2UYX. Some QSL managers are 5H3JL, QSL via W9NNC; 5H3JR, via W2SNM; 5H3LV, via VE3BIZ; and to abbreviate the 5H calls a little, LZ goes to G3LQP, ML via VE3ODX, MM via SM5CEU, 5H3MT to home QTH LA6PF, MV via VE7SE, NN via VE3CDX, whilst the following will go direct: 5H3FQ, Jock Greig, Box 168, Dar-es-Salaam; 5H3KA, Bob Ward, Box 939, Arusha; 5H3NO, Eric Japing, Box 20104, Dar-es-Salaam.

CURRENT ACTIVITY OF INTEREST

Here are a few stations of possible interest, together with times and frequencies where contacts have been made.

ET3JH 14235 s.s.b. Thurs. and Tues. 0330, 14205 s.s.b. Tues. at 1500 and 21335 Tues. and Sun. from 1700. QSL manager from May 1 this year is WB8ICV, prior to that cards should go to Box 2336, Addis Ababa.

FB8WW daily skeds from Crozet Is. QSL manager since start of this year is F6BFH, Alain Duchauchoy, 21 Rue de la Republique, F-76, Bihorel, France.

HB0XJL, 3527 c.w. at 1950z, QSL to DJ2BW. IM0BUP 14119 s.s.b. at 2030z, QSL to ISWL. UG6JJ QRV Tues. and Fri. 14332 s.s.b. at 0300z. VP1BH 14155 s.s.b. at 0642, manager is VE-2AKZ. VP8MX (Sth. Georgia) 14060 c.w. at 1330, manager is ZS1ACD. VS9MB has a sked Tues. and Fri. 21820 at 1700, QSL to G3KDB.

CR9AK sked 21235 at 1300z Tues. with manager CT1BH. KC6SX from Truk in East Carolines usually on 14 s.s.b. at around 1800z. QSL to his KH6HIF QTH.

PJ8WP 14024 at 0500, also on 7 and 21, manager W5KGJ. LA8YB/4W on 14210 at 0100z, manager is LA3BI.

Several stations have been heard and worked from the 7X area. 7X0GM, who is Michel F2GM, and XYL Annick 7X0GA are active on the twenty and fifteen metre bands using s.s.b., and ask for their QSLs to go via the 7X Bureau. It is to be noted that they used the 7Y prefix for July. Also active from there is 7X0JG, who is Jan OK1VJG, active from 0800-0900 most days on 14 s.s.b. He will be there for two years and wants cards to be sent through the OK Bureau.

It is noted that the ZL stations are again using the ZM prefix to Feb. 2, 1974, and it is hoped it gives the N.Z.A.R.T. the boost it did last time they used ZM.

QSL INFORMATION

Cards for the following stations should be sent to the International DX Association, Box 125, Simpsonville MD. 21150, U.S.A.: TY7ATF, AP2KS, ZK1AJ, EP2CC, KP6AL, VE8CB, K4QOS/KB6, FR7AE/E, ZK2AH, ST2SA, XT-2AA, VK0TM, FY7AF, ZM7AG, ZK1MA, VK-9NP, 8Z4A. Cards for the following should go to DOTM, Box 7388, Newark, N.J., 07107: CN8HD, CR5SP, CX2CO, DJ0VB, FM7WQ, HK0AI, HU1IE, JW1EE, KF4SJ, KV4FZ, LA1H, OY7ML, PJ7VL, PY2PA, PY2PE, VA2UN, VE8RCS, VK3BM, V3CIF, VK9JK, VK9XI, VK9XK, VP7NY, VP8JV, VP9GR, VS6DO, VK9XX, VS6DR, W4EXI, W9OLJ, XE1IIJ and 9Y4VT.

POSTSCRIPT

B.A.R.T.G. 1972 RTTY Contest results show two VKs in the list. VK2KM came 12th with 109394 points, and VK6PG lower in the list with 43848 points. The contest was won by I5MPK, scoring 209902 points from 163 contacts in 36 countries, on all bands 3.5 to 28 metres.

Alf Matthews, VK3ZT, in relation to the Mellish Reef DX-pedition organised by John Martin: VK9JW, last month asks that QSLs be forwarded direct to VK3JW and not through QSL Bureau.

* P.O. Box 222, Penrith, N.S.W., 2750.

Ionospheric Predictions

With Bruce Bathols, VK3ASE

AUG. '72

Listed below are predictions compiled from chart series "P" issued by the I.P.S. for Aug. 1972. The figures represent the predicted time when the circuit between the points listed should be open for at least 50% of the month. A single time only indicates that a sharp peak for the MUF is predicted in the chart and the circuit could open at that time for a short period. A single time together with a plus or minus number indicates a gradual rising in the MUF to the peak and then a gradual decline. The circuit should be open for the period plus or minus the number of hours from the peak. Two times hyphenated show a sharp increase and decrease of the MUF curve with the circuit being open between both times. All times stated are E.A.S.T.

VK4 is Townsville. VK0 is Macquarie Island. SP and LP are short and long paths respectively.

28 MHz.—

VK4	to	KH6		1100-1400
VK6	,,	ZS		1800

21 MHz.—

VK1/2	to	8P	SP	0700-1600
,,	,,	,,	LP	minus 1 0900 plus 2
,,	,,	W6		0600-1600
,,	,,	VK0		minus 4 1300 plus 4
,,	,,	5Z	SP	0900
				minus 1 1700 plus 2
,,	,,	5Z	LP	minus 1 0700 plus 1 1700
,,	,,	ZS		minus 1 1700
,,	,,	VU		minus 1 1200 plus 1
VK3	,,	UA		minus 5 1800 plus 1
,,	,,	G	SP	minus 4 1900
			LP	0800
,,	,,	I	SP	1500-2000
			LP	0700, 1700
VK4	,,	KH6		0700-2100
VK5	,,	JA		0800-1900
VK6	,,	W1		1000
,,	,,	ZS		1500-2100

14 MHz.—

VK1/2	to	ZL		0600-1900
,,	,,	8P	SP	0600-2200
			LP	0700-1200
,,	,,	VE3	SP	1200-1500, 2200-0200
			LP	0800-1400
,,	,,	W6		1200-0300
,,	,,	PY		0700-1700, 2000
,,	,,	VK6		minus 2 0900 plus 9
,,	,,	5Z	SP	0800-1900
			LP	1200-2000
,,	,,	ZS		minus 3 1700 plus 6
,,	,,	VU		1900-0500, 0700-1200
VK3	,,	VK8		minus 2 1000 plus 9
,,	,,	UA		1900-0500, 0700-1200
,,	,,	G	SP	2000-0500, 0700-1100
			LP	0600-1400, 1600-2100
VK4	,,	KH6		1300-0200
				0600 plus 1
VK5	,,	KH6		1300-0400, 0600
,,	,,	JA		1600-0400, 0700-1100
VK6	,,	W1		2100-0500, 0800
,,	,,	ZS		1400-2400
,,	,,	G	SP	2200-0600, 0900-1400
			LP	0800-1300, 1600-2300

7 MHz.—

VK1/2	to	8P	SP	1600-2100
,,	,,	VE3	SP	1600-2200
			LP	0800
,,	,,	W6		1700-0100
,,	,,	PY		0700, 1600-2000
,,	,,	VK0		1600-0700
,,	,,	VK6		1800-0900
,,	,,	VU		2200-0800
VK3	,,	VK8		1800-0900
,,	,,	UA		0100-0800
,,	,,	G	SP	0300-0800
			LP	1600 plus 1
VK4/5	to	KH6		1700-0300
VK5	,,	JA		1900-0700
VK6	,,	W1		minus 1 2000 plus 1
,,	,,	ZS		0000-1000

Smoothed monthly sunspot numbers predictions for Auugst 54, Sept. 52, Oct. 49, Nov. 47.

—Swiss Fed. Observ., Zurich.

Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

ATTENUATION MARKER

Editor "A.R.," Dear Sir,

Allow me to reply to the postscript to the Attenuation Marker, "A.R.," June 1972. The excuse given for inadvertently publishing that article is given as (i.) criticism, (ii.) confusion at the time of change in the "A.R." The article in question was posted on 30th June, 1971, and published April 1972. It was passed for publication by the old and the new Publishing Committee and by the Manager. What actually did stir things up was the advent of the dreaded word Laser which was uttered in April 1972 in defiance of the policy of "Let sleeping dogs lie" which had been in operation since the laser articles of Jan. and Feb. 1965.

It has come now as a rude shock to find already in our libraries a 1971 laser text book that gives a "home brew" CO2 laser that can be constructed out of odds and ends and with a few dollars. The performance of this laser is given as "capable of burning a hole in a plank of wood or a sheet of asbestos or iron." This excellent book describes the CO2 laser as being the most powerful and dangerous of all the laser family. In addition, at a wavelength of 10μ or 10.6μ at which it lases, it is quite invisible.

Now compare that output (measured in tens of watts and with pulses—tens of thousands, and more, of watts) with the milliwatt output of "safe" gas lasers. My own radiation burns with "safe" gas types got a bit mixed up when described by the Technical Editor, but were still enough to give me a cautious approach to these things.

On the question of being invisible at 10μ, the book indicates that conventional methods of detection have not been developed, being not sensitive enough and being very expensive. I suggest that 1965 type critics update their reading to the 1971 level and that W.I.A. officials sort out criticisms (in this case) into two categories, (1) those with the necessary qualifications, (2) those due to hostility whose "corns I have trodden on" in advocating greater experimental activity.

Let me pay tribute to the old Publishing Committee who gave all experimenters a very fair go. In the present situation we desperately need detectors at 10μ before inexperienced builders succeed in constructing these CO2 lasers (in my opinion there are a few snags involved that are not mentioned).

I do not know of any other Radio Amateur that works on detectors in the 10μ to the optical region, but they will profit by my own experience and keep very quiet about it. In any case, they will have understood the method quoted of increasing the sensitivity of the tube and the method of detecting the change-over to the excited state. I have spent three years on this project with a few promising results.

To fit myself for this type of work, I have copious notes taken from over 20 laser text books.

Personally, I would consider it very bad manners to publicly criticise anybody especially if I had no knowledge of that particular subject.

While the publication of that specialised knowledge was being apologised for that same knowledge was being used to fish out the latest laser text book and locate, at a very early stage, a great laser danger to our very inexperienced community. In America, according to the literature, several firms have been supplying laser outfits to the high schools for several years.

In Australia, in some sections, we don't look at lasers. We "stick our heads in the sand". That policy won't work now.

The dangerous CO2 laser is available as a "home-brew". Details are right here on our bookshelves. It is the W.I.A's responsibility now. Not mine.

—A. J. C. Thompson, VK4AT.

[The "excuse" for publishing "An Attenuation Marker", i.e. confusion at the time of "A.R." management change, is correct, time-scale notwithstanding. When the article was accepted the position of Technical Editor was vacant, and the article was not subjected to the detailed assessment which would now apply. Criticism, by readers, after the article was published, was one reason why the second article was not published in full. In no way was this criticism due to the choice of subject, but purely to the difficulty many readers had in understanding VK4AT's lengthy and rather disorganised presentation. If the description of his radiation burns in the published postscript "got a bit mixed up" this was due to the same cause. The Publications Committee agrees fully that more should be published in Australia on the techniques and hazards of laser experiments, and welcomes contributions on the subject.—W. M. Rice, VK3ABP, Technical Editor.]

AUTHOR NOW KNOWN

Editor "A.R.," Dear Sir,

In the last issue of "A.R." you published a poem "Coming Round the Bend". I was disappointed to read underneath "Author Unknown".

I spent many years in the Sydney G.P.O. operating room with the author who was Frank Spruhan, who wrote many small humorous poems over the name of Spru.

Frank retired from the operating room at the age of 65 and died at Wyong, N.S.W., at the age of 81 in 1964.

He was a colourful character—world war one soldier, marine operator on W.W.I troopships, railway telegraphist, newspaper telegraphist, goldminer in W.A., etc., etc., and P.M.G. telegraphist.

—Bill Bullivant, VK2BC.

[We also received interesting and informative letters about "Spru" from Ray Jones, VK3RJ, and Ivan Brown, VK2RY. The latter included part of a collection of Spru's poems and prose jottings and mentioned that he could be contacted on a "CTO" net on Sunday mornings at 1000 hours E.A.S.T. 7130 MHz. s.s.b.—Ed.]

TARIFFS AND IMPORTS

Editor "A.R.," Dear Sir,

Thank you for the opportunity to read the concise statement of logic written by Jim Goding, QSP June "Amateur Radio". His square look at a very round subject could be an example for others to follow.

While it can be argued that the subject of tariffs and imports into Australia is a complicated one, a realistic attitude toward incentives to local industry and good service to the consumer, should be taken. Those who are required to appraise and use equipment from the world market have seen the era of "buy British" and more recently "buy Australian made". Fair enough; but surely patriotism goes only so far and the reality of present day prices and technical advances in electronics call for something more on both sides of the producer/consumer scene. Here again the issue is complicated by sectional interest and frequently, rightly so.

There is always a case for the other fellow's point of view, but let us not lose sight of the fact that Amateurs and other non-professionals who look with envy at the magazine advertisements, have a right to some of the good service that consumers normally expect.

Page iii. of June "A.R." makes interesting reading, both in picture and print, and provides much to think about.

—Dick Heighway, VK3ABK.

Overseas Mag. Abstracts

With Syd Clark, VK3ASC

"QST"—April 1972

Double Standards (freq. stds. for h.f. and v.h.f.); Phased Verticals for 40; The Line Sampler (reflectometer type v.h.f. power monitor and u.h.f. using "flowline" components); a 10-Element Yagi for 220 MHz.; a Super-Simple 80-20 Receiver; Thermal Design of Transistor Circuits; an Audio Synthesiser (crystal controlled r.t.t.y. tone generator); VFO/Xtal Controlled Gate/Grid Dipper; High Performance Tunable FM Receiver; Strip-Line Kilowatt Amplifier for 432 MHz.; Fundamental Raser Principles (April Special); Oh, Math, Where is thy Sting?; Co-ax and Indicator-Cable Supports for Beam Antennas.

"HAM RADIO"—April 1972

Two Metre FM Transmitter; Low Distortion Two-Tone Oscillator for SSB Testing; Frequency Measuring Oscillator; Emitter Tuned Pre-Amplifier for 21 MHz.; Tuning Toroidal Inductors; Nostalgia with a Vengeance (a blonde, a kw. and a memory); Improved Selectivity for Direct Conversion Receivers; Digital Station Accessory; Audio-Actuated In-Line Squelch (he Squelcher); Beam Antenna Headings.

S.S.T.V. SPECIFICATIONS

Draft proposed s.s.t.v. specifications prepared by J. Wilson, VK3LM/T, were published on page 4 of January "A.R." A further set of draft specifications have now been received from John Wilson and these are published below for information. As this new draft has been forwarded by the Executive to the V.h.f. Advisory Committee for consideration, it is requested that comments thereon should be submitted to that Committee.

DRAFT S.S.T.V. SPECIFICATIONS

Australia—Not to exceed the band width of d.s.b., 6 kHz.

1. S.s.b. normal bandwidth, 3 kHz.
2. S.s.t.v., 2.3 kHz.
3. Tone, 1,500 Hz.p.s.
   (a) Shifted between 1,200 Hz. for sync. information.
   (b) Modulated upwards 2,300 Hz. for picture information;
      Examples: 1,500 Hz.p.s. black level.
      2,300 Hz.p.s. white level.
      Tones in between, shades of grey.
      5 m.s. burst of 1,200 Hz.p.s. equals horizontal sync.
      30 ms. burst of 1,200 Hz.p.s. equals vertical sync.
4. Horizontal sweep rate for—
   60 Hz.p.s. supply equals 15 Hz.p.s.
   50 Hz.p.s. supply equals 16.66 Hz.p.s.
5. Vertical sweep rate for—
   60 Hz.p.s. supply equals 8 secs.
   50 Hz.p.s. supply equals 7.2 secs.
6. Resulant resolution of 120 lines per frame.
7. Picture size approx. 4¼ inches square, format 1:1.
8. Direction of scan (50, 60 Hz.p.s. supply)—
   Horizontal, left to right.
   Vertical, top to bottom.

Above as per International and Australian.

S.S.T.V. INTERNATIONAL (NET) FREQUENCIES

(VK Amateurs should note that the 80 and 40 metre frequencies are outside the Australian frequency allocations and thus cannot be used for transmitting purposes.)

80 Metres — 3845 kHz.
40 Metres — 7200 kHz.
20 Metres — 14230 kHz.

Other frequencies are in use from time to time on 21 and 28 MHz.

SUGGESTED AUSTRALIAN (NET) FREQUENCIES (calling only)

160 Metres — 1840 kHz.
80 Metres — 3650 kHz.
40 Metres — 7125 or 7130 kHz.
20 Metres — 14.230 MHz. (International)
15 Metres — 21.360 or 21.340 MHz. (Internat'nal)
10 Metres — 28.660 MHz. (International)
6 Metres — 52.6 MHz.
2 Metres — 144.675 MHz.

☆

DIVISIONAL NOTES

SOUTH AUSTRALIA

There is no firm reply from the Thebarton Council about our proposed headquarters, but signs are definitely encouraging.

The South-Eastern Radio Group Convention held at Mt. Gambier last June long week-end, turned out very well. The Adelaide and other visitors thoroughly enjoyed themselves at the new style gathering. The Saturday evening Cabaret was voted an overwhelming success, and on the more technical side, there were challenges aplenty in the Sunday programme of scrambles, hidden transmitter hunts, fox hunts and meanderings. Tales of woe about the deviousness of hiding antennas inside fake P.M.G. marker poles amused us all.

A reminder about the Remembrance Day Contest this month. Let us have as many scores as possible.

—Dave VK5GZ.

☆

AROUND THE TRADE

Hy-Q Electronics Pty. Ltd. announces that Mr. T. A. Dineen, their Marketing Director, has left on an extensive tour of South-East Asia. This tour coincides with the opening of the Company's Singapore facility, Hy-Q Electronics International Pty. Ltd.

VHF UHF

an expanding world

With Eric Jamieson, VK5LP*

Closing date for copy: 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK3	144.700	VK3VE, Vermont.
	144.925	VK3ZQC/EZ, Moe South.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.300	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Albany.
	145.000	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
	145.250	ZL2VHP, Palmerston North.
	431.850	ZL2VHP, Palmerston North.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

Some good news comes via Mike VK2AM to the effect that by August it is hoped to have a 6 metre beacon operating from Sydney with the call sign VK2WI, using m.c.w. on 52.450 MHz. Soon after it is anticipated the 2 metre beacon will also be operating, no frequency details at this time. Coupled with the information that VK1VF in Canberra only awaits a licence to operate on 144.475 MHz., we are now in the position, or should be in 1972, to have Australia-wide coverage via beacons, particularly on 2 metres, and nothing but good must eventually come from this situation. When the Band Planning Committee has duly deliberated and made recommendations we should see the frequencies of operation of the various beacons in some semblance of order.

SIX METRES

Not much to report this month. Wally VK5ZWW is keeping regular skeds with Joe VK7ZGJ on 52.052 MHz. on Sundays at 0900, mainly using forward scatter, but some meteor pings. Mostly 5 to 6 seconds contact periods, sometimes up to 1 minute. Wally believes results could be better if Joe could use other than gated screen modulation.

Note with interest that YJ8BD in the New Hebrides will be looking for VK contacts on 52 MHz. s.s.b. from September 1972. Distance will be approx. single hop to Brisbane and double hop to VK5, a little further than the usual ZL signals, so something may be possible during the next DX season. It might be possible before then to obtain some information regarding operating frequency, times, etc., and let you know.

TWO METRES

Kerry VK5SU at Ceduna is building a 2 metre transmitter using QQE06/40 in the final to replace present QRP rig, and should be ready for next DX season.

After the big burst on 21st May, 2 metres has gone a bit quiet although openings between VK3 and VK5 eventuated on 4th, 14th and 15th June. While on the 2 metre scene, have I heard correctly that no 2 metre beacon is likely to eventuate from Launceston due to local opposition? And after what happened on 21st May!!!

GENERAL NEWS

It is hoped v.h.f. operators in general will try and do some extra operating to support the efforts of the VK2 V.h.f. and T.v. Group in sponsoring a v.h.f./u.h.f. contest from 4th to 20th August, similar in detail to that arranged by David VK8AU last year.

On 1296, Ron VK3AKC is testing his final using a pair of 3CPX100A5s to that beautifully constructed dish at Geelong. It is to be hoped the work Ron is about to undertake with 1296 MHz. e.m.e. will not be marred by the radar from Tullamarine Airport which is very prominent at his location. Also noted that Ray VK3ATN has his 16th foot dish up 43 feet and fitted with 1296 MHz. feed, and awaits a special 2 dB. transistor pre-amplifier from the States.

While on moonbounce, Lyle VK2ALU reports briefly on the activities of the Dapto group, who are in the process of trying to arrange an e.m.e. sked for about 1000 GMT on 15th July with OZ7UNI in Denmark, using 432 MHz. The latter have a 20 foot dish with 22 dB. gain, 1 kw. input and receiver with 1.5 dB. noise figure. The proposed date will allow about one hour for the attempt.

The South-East Radio Group Convention at Mt. Gambler went off very well over the holiday week-end, 10th and 11th June, about 52 Amateurs being in attendance. A good programme of events kept all interested, with plenty of time to natter. The small band of workers at Mt. Gambler are certainly doing their best to provide something new each time; it was rather a pity that the bus tour for the ladies was not better patronised, but it does seem most are content to follow father in the car during the fox hunts and transmitter hunts. The most successful competitor was Darrell VK3AQR, and best piece of home-constructed equipment went to Ron VK3AKC for his 1296 MHz. final.

Congratulations to the Geelong Hamfest which went off very smoothly, and with 110 registrations must surely have rewarded the efforts of the organisers, who had sufficient prizes to say that the odds of winning an event or door prize were about two to one! Best piece of home-constructed gear prize went to VK3TN.

As a result of some of my stirrings of recent months, two letters have come to hand. The first is from Kevin VK3VK and he comments on my remarks in June "A.R." regarding v.h.f. participation in contests. His thoughts are presented to set you thinking. Briefly, they are: "Of recent years, R.D. rules have been altered to accommodate v.h.f. operators. This only helps—in the main part—operators in metropolitan areas. Originally the R.D. was for interstate contacts, not intrastate. Any changes for v.h.f. participation should have been in the form of a separate section.

"A separate section for v.h.f. in the National Field Day may help interest and also prevent what is happening under present rules, i.e. stations aiming for a good score must be located near a capital city. I feel that contests which were originally intended as h.f. contests should not be spoiled by altering the rules to suit v.h.f. ops., who, for the most part, as indicated in your column, are not very interested in these contests. Separate sections or contests to satisfy v.h.f. ops. would also probably encourage operation if they feel their opponents in a contact are also limited to v.h.f. bands."

There you have it. Thanks Kevin for going to the trouble of writing. I only hope more will be stirred to action by your thoughts, whether they agree or not.

The other letter comes from Bill VK4XZ in Townsville with suggestions for allocating 52.400 to 52.500 for exclusive beacon operation, with the capital city beacons 10 kHz. apart and others in between at 2.5 kHz. intervals as required. He lists advantages of only 100 kHz. to tune, thereby more suitable for panadaptors to sweep, and by frequency readout one could tell the State the band was open too at that time. Bill suggests the proposed 100 kHz. segment as suitable due to little use. Only comment I would add here at this stage is that this area (52.4 to 52.5 MHz.) does get pretty busy during a good DX opening, especially in the southern States. However, over to you.

DX CONDITIONS

With the forthcoming VK2 Contest in August and other winter activity on v.h.f., there are no doubt some operators looking for DX contacts who are somewhat at a loss to know what effect weather may have on such DX, particularly on 2 metres. Mick VK5ZDR was probably one of the first to use the weather years ago to further his long distance 144 MHz. contacts and it seems an opportune time to present a short discourse from the pages of the "Victorian VHF-er" which is very relevant at this moment ,and sums up the situation in plain language. Study a weather map in conjunction with the article.

"An anti-cyclonic belt with cell centres over southern Western Australia and Victoria would have temperature inversions in the vicinity of these centres. The pressure situation which recently existed should produce a relatively long period of atmospheric stability in our area and hence prolonged conditions conducive to the formation of temperature inversions. The rate of decrease of temperature with altitude is known as lapse rate. When temperature rises with altitude, the lapse rate is negative, and the condition is known as an inversion. These temperature inversions are not uncommon in the troposphere but are generally restricted to shallow layers.

"At night, the Earth's surface cools by radiation, and if this cooling proceeds long enough, the air near the ground becomes colder than the air above it and what is known as "surface inversion" forms. With calm or nearly calm wind conditions, as in the centre of a 'high', air spreads upwards through a comparatively small height and the surface temperature can be quite low, thus with an appreciably higher temperature in the air layer above the ground a marked inversion should exist. On clear calm nights surface temperatures can fall considerably, giving rise to fogs and frosts in winter, which are characteristic (along with smog in some large cities) of inversion conditions. However, as we move away from the centres of these anti-cyclones, the wind speed increases, causing atmospheric turbulence which mixes the air layers and thus disperses the temperature inversions."

The above gives an outline of what is involved in such inversions. I would add the following points for the uninitiated: Get on the air early and be prepared to stay around for several hours if necessary if some weak stations indicate promise. Call at intervals, if everyone listens no contacts eventuate. Tune with b.f.o. on, and tune slowly. When you make a contact, keep it brief, others will be waiting. Finally, another pointer to an inversion is smoke. If smoke from a chimney or a factory rises quite high into the air, straight up, and spreads out at a certain height under calm conditions, then you can be pretty sure an inversion exists. One last point, inversions seem to frequently stay near the coast, areas perhaps 10 to 20 miles inland and further just cannot participate in DX created by some inversions. I know, I live 25-30 miles from the shore-line, and many times have had to sit out hours of listening to the boys in Adelaide working DX!!

That's all for this month. News has been scarce mainly because I have been away for three weeks on holidays to sunny Coff's Harbour. Thought for the month: "The unforgiving man assumes a judgment that not even the theologians have given to God."

—The Voice in the Hills.

* Forreston, South Australia, 5233.

"20 YEARS AGO"

With Ron Fisher, VK3OM

AUGUST 1952

I wonder how many readers can remember the "Rothman System of Modulation". John Clarke, VK2DZ, described it in the August 1952 issue of "Amateur Radio". It was a modified form of screen modulation and employed demodulated r.f. feedback to the screen of the modulated stage. This was designed to prevent "efficiency modulation" by providing a substantially constant r.f. angle of plate current flow which was maintained during the modulation cycle.

Many advantages were claimed for the system over normal plate and screen modulation, including elimination of the modulation transformer. However, I don't remember many people using it at the time, but it might be worth some of the 160 metre boys looking at it for portable use.

An all-band tank circuit was described by R. S. Choate, VK6RK. He used the idea of tuning two bands with the one L/C combination, the condenser being large enough to cover two adjacent bands. VK6RK stated that the L/C ratio was not optimum for phone, but that in practice it worked out well. Of course band switching and multi-band transmtiters were rare in 1952 and those that were, often used odd methods to achieve the result.

J. A. Gazard, VK5JG, dealt out some thoughts on "Sunspots and DX". 1952 was getting near the low point of the cycle, so I guess the DX men needed a little condolence. On the same subject I notice that Ray Jones, in his Federal QSL Bureau notes, stated that June 1952 was a post-war low in QSLs and was probably a reflex of the poor conditions on the international DX bands.

The August Editorial of twenty years ago reflected on some of the reasons behind the Remembrance Day Contest, and suggested that "we participate if only for half an hour as a mark of respect". That reminds me, there is another one coming up in a couple of weeks and I have to get an antenna fixed up.

KEY SECTION

With Deane Blackman,* VK3TX

The Key Section is pleased to announce that it intends to revive the President's Cup. This Cup was first awarded to the Section in 1931 by the Federal President of the W.I.A. Unlike membership of the (present) Key Section, which is awarded for consistent communicating by c.w., the President's Cup is intended to be for prowess in c.w. operating. This is not an easy quality to measure, and the proposal is that the award be based on performance in the four principal VK Contests as follows:

1. The President's Cup will be awarded annually by the Key Section of the W.I.A.
2. All VK Amateurs are eligible, however no one person may be awarded the Cup for more than three years in succession.
3. The current holder may keep the Cup, though it remains the property of the W.I.A. at all times.
4. The award will be offered by the Key Section, and it will not be necessary to apply.
5. The award for any year will be based on the results of the Ross Hull Contest concluding at the beginning of that year and the John Moyle National Field Day Contest, the Remembrance Day Contest, and the VK/ZL Contest of that year, as published in "Amateur Radio" magazine. In each case the points will be taken from entrants in the CW-Only Section or Sections of these Contests.
6. The total points for any operator will be found from: (Ross Hull points x 100) plus (N.F.D. points x 80) plus (R.D. points x 40) plus VK/ZL points.

The factors in the formula are based on scores over the past five years (except for the Ross Hull, for which there are no data) and are intended to give roughly equal weight to each Contest—you just cannot score 25,000 in the N.F.D.

The award will commence with this year's Ross Hull, and be first made about this time in 1974.

*129 Clayton Rd., Clayton, Vic., 3168.

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For full details see January 1972 "A.R.." page 23.

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Kalemunda, W.A.: Yaesu FR100B Receiver in perfect condx, $200 o.n.o. VK6HE, QTHR, Ph. (092) 93-2160.

Ashfield, N.S.W.: BC221AA Freq. Meter, best offer. A. J. Van Genderen, 15 John St., Ashfield, N.S.W.

Melbourne, Vic.: Type 3 Mk. 2, $50 for this well-loved antique. Two VFOs at $5. Bob Boase, VK3NI, QTHR. Ph. (03) 347-7491.

Sydney, N.S.W.: 3 el. full size 10 mx Beam, all aluminium construction, as new, $12. VK2BDN, QTHR, Ph. (02) 747-5149.

Sydney, N.S.W.: Collins 75S3-A Receiver, Serial No. 10090, in good working order, looks new. VK2AYT, QTHR. Ph. (02) 95-3381.

Doncaster, Vic.: Eddystone 840C Receiver, mint condition, $140.00. J. Godfrey, 2 Tiffany Crt., Doncaster. Ph. (03) 848-5079 (A.H.), 662-1825 (bus.).

Carrum, Vic.: 5 Element 20 Metre wide spaced Beam, interlaced 4 el. 15 metre separate feed. Good condition, $100. R. Flanagan, VK3CR, 51 Valetta St., Carrum, Vic., 3197. Ph. (03) 772-4039.

Melbourne, Vic.: Heathkit SB101 Trcvr., SB600 Spkr., HP23E p.s. Complete with SB200 kw. linear, cables, mike, etc. $750. VK3OM, QTHR. Ph. (03) 560-9215.

Melbourne, Vic.: Base Station T.C.A. 1674, a.m., 6/40 p.a., 6/40 modulator, 60w. out on 8 metres, $55. Pye 9 MHz. Crystal Filter, $25. VK3YAZ, QTHR. Ph. (03) 25-2689.

WANTED

Melbourne, Vic.: Buy "Radio Constructor," June 1966 or photostat article from same. Can anyone help? VK3AO, QTHR, Ph. (03) 288-2326.

Newport, Vic.: Coil Boxes for RU19 TRF Rx. VK3AIJ, QTHR. Ph. (03) 391-6025.

Canberra, A.C.T.: Single issues or whole years of "Amateur Radio Aug. 1959; Jan., Apr., 1961; Jan., 1962; "Wireless World," Oct. 1964; Dec. 1965 and May 1967. VK1VP, QTHR.

Croydon, Vic.: One only AR22R Control Box, preferably U/S. VK3AYY, Ph. (03) 725-8770 (A.H.).

Maroubra, N.S.W.: Receiver R1155, prefer mint unmodified. Also Admiralty type "Brass Pounder" Morse Key. Details, price. VK2NL, QTHR. Ph. (02) 34-6903.

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CONTENTS

COVER

Nesting terns fly above Mellish Reef with tents and beams in the background. See "The Mellish Reef Saga" on Page 19.

QSP

In America he is called a "freeloader". In Australia we also have the person who is not a member, but demands all the services given to a member. He is the Amateur who does not contribute by his subscription to the cost of representing the Amateur Service, but believes strongly that the National Radio Society should represent his views.

He is not a member and does not go to meetings to express his views. He expects, however, to be consulted on major decisions.

He points out, rightly of course, that he is an Amateur and as such is affected as much by change as the Amateur who is a member.

If he is not consulted the W.I.A. is a dictator and naturally the onus lies on the W.I.A. to find him. He may, of course, contribute a lot to Amateur Radio. He may be an active member of a local radio club, but he is not a member of the W.I.A. Do not misunderstand me, I support the whole concept of the local radio club. It fills a need in a way that, at least in our large cities, some Divisions as presently constructed are unable to fill.

But the W.I.A. fulfills a role that no other body can undertake. It can and does speak on behalf of Amateurs across the nation.

The fact is, of course, that on issues affecting Amateurs the W.I.A. does seek the view of all Amateurs irrespective of whether they be members or not. One example is the recent discussions concerning Repeater allocations, where various meetings have been open to all.

Likewise, on matters affecting Regulations, the Institute has given full weight to all views that it has received.

But the non member can hardly complain if he does not know some fact or other, simply because it was "only published in 'Amateur Radio'."

No, the Institute does try to represent all Amateurs, not just its members. It is concerned with what is good for Amateur Radio, not merely what is good for the Institute.

It would be so much easier if all Amateurs were members. Of course it would be so much fairer, as all Amateurs would be sharing the costs.

I do not like the term "freeloader". Do you?

MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

PIRATES

On 5th July two men were convicted of breaches of the Wireless Telegraphy Act in the Perth Court of Petty Sessions, were fined $10 each and their equipment confiscated. Subsequently, on 12th July in the Perth Children's Court similar charges against two youths were dismissed under the provisions of the Child Welfare Act though each was ordered to pay $10.20 costs and their equipment was confiscated. These cases have received extensive Press publicity in Perth, unfortunately under headlines referring to "Hams", though none of the defendants were licensed Amateurs and in each case the equipment seized operated on a frequency of 27.240 MHz.

The W.I.A. has pointed out that as the term "Ham" is generally used to refer to licensed Radio Amateurs these headlines are misleading.

COMMUNICATING EMERGENCIES

Pitcairn Island has no commercial telegraph or radio services to the outside world. The only radio link is Tom Christian's rig, VR6TC. June "QST" quotes an "informal and temporary" agreement between the U.K. and the U.S.A. permitting their Amateurs to exchange any medical, supplies and private matter traffic with VR6TC.

1973 CALL BOOK

A list of clubs, zones and groups is to be included in the 1973 Call Book along with meeting places, dates, times, Presidents and Secretaries. Would Secretaries please send in these details as early as possible please.

E.M.C.

Electromagnetic compatibility was discussed extensively (at I.A.R.U. Region 1 Conference in May), with special attention paid to the problem of obtaining proper protection for Amateur operation from the national authorities, who in some countries are reluctant to place the blame where it belongs: with the manufacturers of the entertainment equipment. (I.A.R.U. Calendar 84 of June 1972.)

EMERGENCIES

An Editorial in the Jan./March issue of the Radio and Electronics Society of India's "R.A.D.I.O." magazine commented on the recent emergency there. "It became apparent that when an emergency is imminent it is not the best time for organising emergency services." These sentiments appear universally applicable and tie in with current I.T.U. Civil Defence, Red Cross and other International thinking.

I.T.U.

The International Telecommunication Union announced the accession of the Sultanate of Oman to the Montreux Convention, thereby bringing the number of I.T.U. member countries to 142. ("Rad. Comm.," July 1972.)

W.A.R.C.

Preparation will commence immediately to deal with the possibility of a World Administrative Radio Conference in 1978-80. (I.A.R.U. Region 1 Conference, "Rad. Comm." July 1972.)

QSL CARDS

Several enquiries have come in lately for sources of QSL cards and the names of printers able to handle the production of them. Does anyone know of any printer specialising in this kind of work?

EX-G RADIO CLUB

Lawrie Kelsall, VK2AKV, writes that the Ex-G Radio Club (Australasian Chapter) now has two nets working. One on Wednesdays at 0900 hours Z on 3650 kHz., the other at 0500 hours Z on Saturdays on 14.347 MHz. called the Pacific Net.

TUNING LINEAR R.F. AMPLIFIERS

BRIAN RICHARDSON, VK3CCR*

● On numerous occasions Amateurs have expressed doubts about the correct way to tune their linear amplifiers. As there seems to be a need for a summary of the information necessary to understand what is involved in tuning an amplifier, VK3CCR has endeavoured to provide that in this article.

As we all know, the final amplifier in a s.s.b. transmitter should be capable of amplifying, without distortion, any signal fed to it from the exciter. To enable it to do this there are several circuit requirements; the principal ones being well regulated power supplies, and the correct load for the amplifying device. The power supplies are a matter of equipment design, but as the adjustment of the load is up to the operator, we shall examine this in more detail.

We shall assume that the transmitter is feeding a correctly terminated 52 ohm co-axial line. Ref. Fig. 1.

For it to deliver maximum power output and operate in a linear mode, the p.a. tube in Fig. 1 must see a resistive load equal to its own output impedance. A typical value would be 3,000 ohms. Most r.f. amplifiers use a Pi network to match the plate impedance to 52 ohms, because a Pi network acts as a parallel resonant circuit, and a variable ratio transformer. The resonant frequency is adjusted by C1 and C2 in series and the impedance transformation ratio by the ratio of XC1 to XC2.

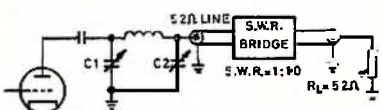

FIG 1

In Fig. 1, as the s.w.r. on the co-axial line is unity, the forward power reading on the s.w.r. bridge will indicate relative power output. If we now adjust C1 and C2 for maximum output power, the p.a. tube will be seeing the optimum load impedance as reflected by the Pi network.

With a.m. transmitters a popular method of adjusting the p.a. is to adjust C1 and C2 for a dip in anode current, experience showing how large a dip gives best results for a particular transmitter. While this method is quite satisfactory for a class C amplifier, it is not sufficiently accurate for a class AB linear amplifier, especially one employing r.f. feedback to improve linearity. The reason for this is as follows.

The plate current dip will occur at the frequency at which the output tuned circuit exhibits maximum impedance. A parallel tuned circuit which is lightly loaded and has a high Q, will exhibit maximum impedance at the same frequency at which its phase shift is zero. However, a parallel tuned circuit with a loaded Q of 10 or thereabouts, will exhibit maximum impedance at a frequency such that the phase angle between current and voltage is about 17 degrees. The correct tuning point is when the phase angle is zero, and this will be the point where maximum power output is obtained. With linear amplifiers employing r.f. feedback, if the load is tuned for a plate current dip it will appear reactive, upsetting the feedback and the amplifier will be unstable.

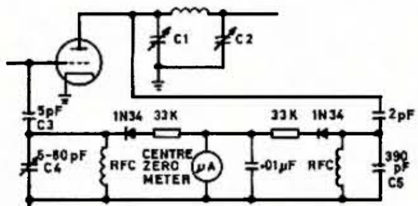

FIG 2 LOADING COMPARATOR

TUNING INDICATORS

So far we have looked at how to tune an amplifier with the only test equipment being a power measuring device. We tuned the amplifier to satisfy two requirements:

(a) To optimise the reflected load impedance, and

(b) To make the load appear resistive.

While we can tune quite accurately by adjusting for maximum power output, it is sometimes advantageous to have an indication of the state of tuning. For example, for correct adjustment of the load impedance the transmitter must be operated at full power, as the impedance varies with power level. As the p.a. tubes can easily be damaged while tuning at full power, a compromising situation may be reached. Probably many Amateurs take the safe way out and tune at low power, thereby obtaining less than optimum results. There is, however, a simple inexpensive device which will enable loading to be optimised at very low power levels. See Fig. 2.

This circuit is a comparator, comparing the relative amplitudes of the grid and anode voltages. For a given grid voltage, the anode voltage is determined by the power gain of the tube and the load resistance. If there is a change in load, the anode voltage will change. To adjust the comparator, the amplifier is carefully adjusted at full power to give optimum results, then C4 is set so that the centre zero meter is reading zero. Once balanced, this bridge will indicate zero regardless of frequency or power, as long as the tube sees the correct load impedance. In automatic systems a servo amplifier is substituted for the meter, and it would drive a motor connected to C2.

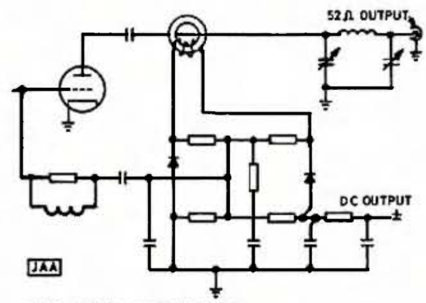

FIG 3 PHASE DISCRIMINATOR

If we wished to make the tuning fully automatic, then a circuit is required which will adjust C1 and resonate the load. Such a circuit is described in Fig. 3. This circuit is merely intended to show one approach to the problem. No component values are given, because, due to the need for close tolerance components, and effective shielding of the low level output from the high r.f. input voltages, satisfactory operation is not easily achieved. The operation of the circuit is as follows.

If the load is resistive, then the tube will have a 180 degree phase difference between the voltages on the grid and anode. A phase discriminator monitoring these voltages will give zero output. If, however, the load is reactive, then the phase difference will not be 180 degrees and the discriminator will give an output dependent on the phase angle. This can be indicated on a meter, or fed to a servo system to adjust C1. With the assistance of these circuits our transmitter can be made fully automatic, as are many commercial sets. ●

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Well known in DX circles, an Indonesian businessman and an examinee for aspiring Amateurs is Kwik YB0CJ.

A Simple Keyer

H. L. HEPBURN, VK3AFQ*

● Ever since its foundation in 1948 one of the favourites on the Moorabbin and District Radio Club's schedule of events has been the 80 metre transmitter hunt, with three or four being held each year.

So far as the equipment used on these hunts is concerned, the early years saw items of varying portability, ownership and reliability pressed into service. Since the emitted signal is keyed c.w. using the Club's call sign as identifier, a mechanical keying wheel was a very early acquisition and has been in use up to this time.

Around 1961/2 a special unit was built for transmitter hunts and consisted of a 12 volt transistorised power supply and a crystal controlled 12BY7/2E26 transmitter. It was very ruggedly built in a small physical compass and had a (relatively) low power consumption. The keying wheel on the other hand was in a box of no small dimensions and, after over twenty years' use, needed replacement with something less bulky and less current hungry.

base of a simple 2N3565 audio amplifier. Note that the characteristics of the coupling transformer are quite uncritical and just about any speaker transformer (whether ex transistor or valve radio) is perfectly satisfactory so long as the low impedance winding is across the 10 ohm load resistor.

Amplified audio is then rectified by means of a diode (just about any germanium type will do) and the resultant d.c. applied to the base of a second 2N3565. The 2N3565 emitter is directly coupled to the base of a 2N3566 switching transistor. The 2N3566 has the relay coil in its collector circuit. The silicon diode across the relay coil is a "despiking" device.

With no audio at the input no voltage is present at the base of the second 2N3565 and it draws no current. No voltage is developed across the 15K emitter resistor and no voltage appears at the base of the 2N3566 relay switch. With no voltage on its base the 2N3566 draws no current and the relay is unenergised. As soon as audio appears from the tape it is amplified and rectified by the 2N3565/diode combination and d.c. appears at the second 2N3565

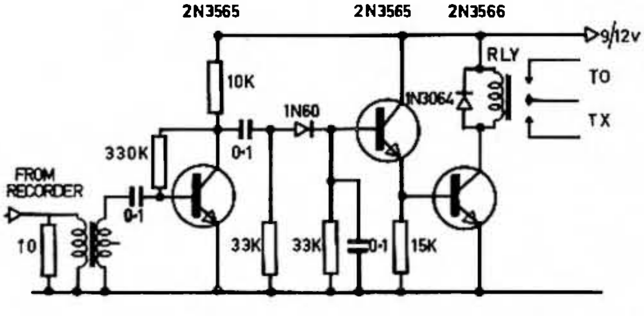

FIGURE 1 — SIMPLE KEYER

The most obvious course to follow in replacing the keyer was to examine the feasibility of using computer techniques to generate a keying wave form. This was done, and one Club member produced a design for such a generator. However, the cost involved was judged to be excessive in terms of the use the device was liable to get and a simpler solution sought.

At the suggestion of Col VK3XV, it was decided to use a cassette recorder, fill the tape with keyed audio and then use this audio to key the transmitter. This article describes the unit that was made to operate a relay which in turn earthed the cathode of the 2E26 transmitter p.a.

Fig. 1 gives the circuit diagram. Output is taken from the earphone plug of the cassette recorder and applied across a 10 ohm load resistor. A small transistor radio output transformer is used to couple the voltage developed across the 10 ohm load resistor to the

base, causing it to draw current. A voltage is developed across the 15K emitter resistor and causes the 2N3566 to draw current, thus energising the relay.

Using a $2 relay from the VK3 W.I.A. disposals committee (which had a 220 ohm coil and two sets of change-over contacts), the unit keyed admirably with a 100 mV. input from the cassette recorder.

In service the unit has proved most satisfactory and "bug" free. In the key down state the unit draws just under 60 mA. and only a milliamp. or so in the key up condition. This is a decided improvement on the amp. or so taken by the original keyer.

The whole device is built on a small strip of p.c.b. 1" wide and 4" long (including the relay) and replaces a box some 9" cube.

Whilst the next obvious step is to transistorise the complete transmitter, some problems in respect to the use of random antennae have first to be solved. Work on this aspect is in hand. ●

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CW, VOX or Semi Break-In

L. H. VALE, VK5NO*

This system, which is becoming known as "semi break-in" automatically switches the transmitter on when the key is just pressed and holds it on while the key is pressed and for an adjustable period after the key is released. If this period is adjusted to be slightly longer than the space between words, the transmitter remains on during normal sending and automatically turns off shortly after sending has finished, thus saving one operation in another. It is important that the turn-on time should be as fast as possible, otherwise part of the first dot is missed; it is probably there before the other person is listening anyway.

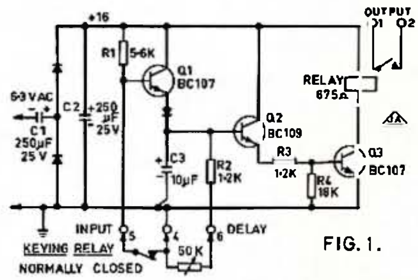

FIG. 1.

Fig. 1 is the circuit of a unit recently built here. The requirement was for the unit to be operated by a relay and for it to have relay contact output. Even though the output relay does add some delay to the turn-on time, this would probably not be more than a few milliseconds with any small relay —most of the turn-on delay would occur in the transmitter itself.

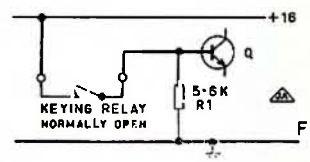

FIG.2.

The input contacts are normally closed because these were the only contacts available in this particular case. If you wish to use normally open contacts on your keying relay, change the input circuit to that shown in Fig. 2. In either case, when the keying relay is operated the base of Q1 becomes positive, drawing the emitter positive with it. This charges C3 positively, causing Q2 and Q3 to conduct, operating the output relay. C3 is charged via Q1 and the diode. This is a very low impedance circuit and the capacitor charges rapidly. However, the capacitor can only discharge through Q2 and Q3 in parallel with R2 and the delay adjustment potentiometer. The Q2-Q3 path has more resistance than the other so that the turn

(Continued on Page 10)

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ELECTRICAL MEASURING INSTRUMENTS

LECTURE 15D

C. A. CULLINAN, VK3AXU*

● Concluding the series of lectures by C. A. Cullinan, VK3AXU, at Broadcast Station 3CS for students studying for a P.M.G. Radio Operator's Certificate.

ELECTRICITY SUPPLY METERS

Sometimes it is necessary for a radio man to have some knowledge of electricity supply meters. For instance, a radio station may share an a.c. generating plant with another organisation and finds that it is desirable to know how much of the generated power should be charged to the two users, also reference has been made earlier to the occasions when a radio station's generating plant has been used to assist a supply authority in an emergency.

Therefore it is proposed to give some information on the basic principles used in measuring the amount of electrical energy taken by a consumer.

Power supply authorities may be divided into broad groups as follows:

- State (government owned).
- Semi-government owned (councils, shires, municipalities, counties and similar bodies).
- Private enterprise owned.
- Community owned.

(The latter refers to a small group of people which install a power generating plant and does not operate it for profit. These people may pay a sum of money at intervals to meet costs, but to keep down costs may not use any form of energy metering. This group will not be referred to again.)

In many cases semi-government and private enterprise may purchase the whole or part of their power from another supplier and may retail it to their consumers and they may adopt different metering methods to those of the original supplier.

Unfortunately on a world-wide basis there are considerable differences in the approach to power generation, distribution and methods of charging the consumer for the energy used, and this state of affairs exists in Australia as well as elsewhere.

There are two types of power generation, direct current (d.c.) or alternating current (a.c.). For many years d.c. was the predominant type, then a.c. began to take over from d.c., but in recent years there has been a swing back to d.c. mainly for very high voltage long distance transmission because it is more economical than a.c. even although it has to be converted from a.c. to d.c. at the sending end then re-converted back at the receiving point.

It is becoming commonplace for Australian broadcasting and television stations to send staff overseas to make programmes and because of the differences that exist in broadcasting, t.v., and power supplies, the stations may send their own equipment, with conversion plant, rather than make use of the overseas equipment. One thing that must be known beforehand is the type, voltage and if a.c., the frequency of the power to be used, assuming that there is any available.

For instance, when a member of the 3CS staff was going to S.E. Asia it was necessary to find out such details and great assistance was given by the Commonwealth Dept. of Trade, in Melbourne.

On a world-wide basis a few countries use d.c. only, whilst many have a mixture of a.c. and d.c., and to add to the confusion there may be large differences in voltages and frequencies. One country, in the latest list available to the writer, shows six different d.c. voltages and nine a.c. voltages and not all of these have the same frequency.

Again on a world-wide basis, a.c. frequencies may be 25, 42, 43, 45, 50, 60 or 100 Hertz.

Great Britain has adopted a policy of unifying electrical distribution systems with d.c. and a.c. voltages (r.m.s.) at 230 volts and the standard a.c. frequency is to be 50 Hertz.

Here in Australia we have seen the conversion of equipment in Western Australia from 40 Hz. to 50 Hz., and it is understood that the City of Melbourne has completed the conversion of its supply and distribution from d.c. to a.c.

Now all power supply authorities have to obtain their primary source of energy from somewhere. This source may be expensive or it may be very cheap, but irrespective of its cost, there are also the matters of plant, staff, maintenance and other costs to be considered in working out the tariff to be charged to the consumer.

In a.c. systems one of the hidden costs is that caused by "power factor" in the overall load because the "wattless" power caused by power factor has to be generated and passed through the distribution system.

The approach by power supply authorities to power factor differs greatly. Here are some examples.

One authority takes the average power factor of its load as being 0.8 and in working out its tariff **adds in an allowance to cover this power factor.** This authority does not demand power factor correction by consumers, and does not make any rebate if a consumer does make use of power factor correction equipment in his plant.

One fairly large authority generates approximately 3,500 megawatts of power (apparent) using a rather expensive primary source of power. If we assume that the power factor of the load is 0.8, then the true power consumed by the load is 3,500 × 0.8 = 2,800 megawatts, then 700 megawatts of unusable power has to be generated, and distributed, then paid for ultimately by the consumer because the tariff includes an amount (rate) to cover the cost of the "wattless power" although the consumer is probably not aware of this.

On the other hand, in order to reduce the waste of primary energy some authorities adopt different approaches, one of which may be the use of special watt-hour meters which register the total or apparent power taken by the load.

Yet another large authority encourages its customers to install power-factor correction and makes a slight rebate. Sometimes the capital cost of the p.f. correction equipment is recouped in two years, then starts to show a profit.

The usual form of power-factor correction is to connect static condensers in parallel with the load. In practically all cases of low power factor the cause is lagging current in the load and is corrected by injecting leading current into the system so that the inductive portion of the load is neutralised by a capacitive load. It is rather rare to find a consumer with loading power factor in his load and I doubt that any authority would ask for correction of this as it would be helping to correct the lagging power factor in the authority's system.

In many power stations it is the practice to run one or more synchronous motors with little or no load, as such a motor takes leading current, if over-excited, thus these motors inject leading current into the system to help neutralise the general lagging current caused by a power factor which is less than unity.

Such motors are known as "synchronous condensers".

In most cases, too, the a.c. generators, if operated into a resistive load, would have a lagging power factor, because of the inductance of the generator windings, and synchronous condensers may be used in a power station to ensure that as far as the power station is concerned the power factor of the power leaving the station will be unity if operated into a purely resistive load.

Normally it is not practical for a consumer to install synchronous condensers so fixed condensers, known in the electrical trade as "static condensers," are used.

The capacitance required is given by the formula:—

$$C \text{ in } \mu F. = \frac{K.V.A. \times 10_{0}}{2 \pi f \times V^{2}}$$

where K.V.A. is the output of the capacitor in kilo-volt-amperes, f is the frequency, and V is the voltage.

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For example a set of three-phase condensers for 100 K.V.A., 600 volts, 50 Hertz, would have a capacity of 295 micro-farads per phase, or 885 μF. total capacity.

Then for another example there is a very large authority, using very expensive primary energy, which requires all industrial consumers to have a power factor of 0.95 or better and takes steps to penalise those who cannot reach 0.95.

Electricity supply meters fall into two main classes, that for measurement of the electrical energy used by a consumer in a d.c. system, and that for the electrical energy consumed in an a.c. system.

The power supply authority wants to know how much electrical energy (power) was consumed over a period of time. Therefore it is the usual practice to install for each consumer what are known as "watt-hour meters," which are integrating meters.

In Australia the unit of electrical energy is the kilowatt-hour, i.e. one kilowatt of energy consumed over a period of one hour is one unit.

It must be realised that the meter registers only when power is flowing into the load to which it is connected as the object of using the meter is to obtain the sum of the electrical energy used over any period of time. Some authorities charge a rental for the meter and some of them refund the rental charge if a certain amount of power has been consumed over a definite period of time.

D.C. Watt-Hour Meters

There are two types known to the writer. One of these is a special type of electric motor having both voltage and current coils, with the armature driving a train of gears to which are attached registering dials or pointers. Compensation is made in the meter for the friction losses in the bearings and gears. The energy shown on the dials is the product of the voltage and the current. It is usual for the dials to be calibrated in decades.

The second type is, strictly speaking, an "ampere-hour meter" as it measures only the current flowing through it, the voltage being assumed to be constant.

In this type a disc of copper is rigidly attached to a vertical spindle, near the top of which is cut a worm to drive a train of gears which operate the registering device, such as decade dials or pointers. The disc rotates in a mercury bath. A very powerful permanent magnet is arranged so that its pole-pieces almost touch the disc above and below it. The pole-pieces are insulated from the mercury, which in turn is insulated from the rest of the instrument.

Current is fed into the mercury on one side of the instrument, through the mercury, which has a relatively high resistance, then through the low resistance of the copper disc, to the mercury on the other side of the disc. Because the disc has far lower resistance than the mercury, very little current flows from one side of the instrument to the other through the mercury.

As the current flows through the copper disc, the latter rotates owing to the fundamental action by which torque is produced when a current flows at right angles through a magnetic field.

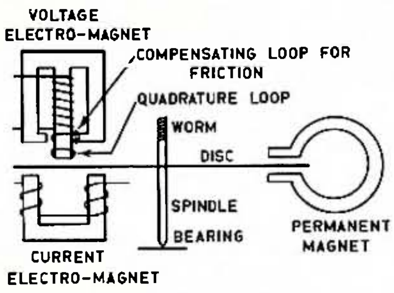
In some meters of this type the current flows through a small coil wound on an iron core and this is adjusted to compensate for the friction losses in the meter.

Such a meter may be calibrated to read in "ampere-hours, or in watts when it must be used only on the voltage for which it was calibrated.

There is a variation of this type of meter in which a U shaped electro-magnet is mounted immediately below the copper disc. The magnetic circuit is completed by an iron ring immediately above the copper disc and the pole faces of the electro-magnet. The electro-magnet is connected across the d.c. line, thus it is a voltage or pressure magnet. Compensation is used to overcome friction losses. Also a small permanent magnet is used as a brake to ensure that the speed of the copper disc is exactly proportional to the voltage and current at all times. This is a true watt-hour meter as it reads and registers the number of watts per hour.

Usually watt-hour meters, whether for d.c. or a.c., are marked kWh. meters, in many of them the smallest dial is divided into 10 units, although one sometimes finds a dial divided into 1/10th of a unit.

D.c. ampere-hour meters are frequently used in battery charging installations and sometimes are fitted with an automatic cut-out device to stop charging when a battery is fully charged.



BASIC INDUCTION TYPE OF SINGLE-PHASE A.C. WATT-HOUR METER

FOR CLARITY IN DRAWING ONLY ONE OF THE PERMANENT MAGNETS HAS BEEN SHOWN. NOTE THAT THE CENTRE POLE OF THE VOLTAGE COIL IS LONGER THAN THE OUTER LEGS.

FIG. 16

A.C. Electricity Supply Meters

Throughout the world the induction-disc principle is being adopted as the basic pattern for all types of integrating meters as watt-hour meters in a.c. systems.

Although the basic principle is used there are many variations in design by different manufacturers and there are many designs for specific purposes.

In the basic single-phase watt-hour meter a disc, usually of aluminium, is rigidly attached to a vertical spindle which runs in low-friction bearings. At the top of the spindle a worm is cut to drive a train of gears to operate dials, pointers or a digital read-out.

The digital or cyclometer type of read-out is easier to read and is replacing the older types of dial and pointers although the friction loss is higher, thus one of the important aspects in the design of electricity supply meters is to ensure that each meter consumes a minimum of power, therefore all possible attempts are made to reduce frictional losses to a minimum. Typical watt-hour meters have a driving torque of 10 to 15 g/cm. at marked load watts. With the use of light alloy wheels, burnished pivots and the choice of dissimilar metals for the bearings, the friction losses can be kept to below 0.5% at 1/60th of the maximum load. As stated earlier, the cyclometer type has slightly more friction.

In the basic type of induction watt-hour meter there are two electro-magnets and usually two permanent magnets.

One of the electro-magnets uses a number of E type stampings for the core with the centre pole projecting slightly further than the outside legs. A coil of many turns of fine wire is wound around the centre leg and is connected across the power line as a voltage or pressure coil. Small leakage gaps ensure that the electro-magnet is highly inductive. This electro-magnet is mounted just above the aluminium disc.

Below the disc, and below the position of the voltage electro-magnet is mounted a current electro-magnet. This is made of U shaped stampings and has a coil of a few turns of very heavy gauge wire on each leg. These coils are wired in series. This electro-magnet is connected in series with one leg of the power line so that all the current passes through it. The coils of this electro-magnet have very little inductance so that the current is virtually in phase with the voltage.

Now as the voltage coil is highly inductive, the current in it will lag almost 90° behind the voltage.

The magnetic flux produced in the voltage pole lags in phase approximately 90° behind the voltage whilst the magnetic flux produced in the current coils is virtually in phase with the voltage but is of opposite polarity.

The flux of the voltage coil is therefore approximately 90° behind the flux of the current coil and the reaction between them causes eddy-currents to be produced in the aluminium disc and these produce a driving torque which is proportional to the power which is flowing, therefore the disc rotates.

However it is impossible to make the voltage coil so that the current flowing in it will be exactly 90° lagging behind the applied voltage, therefore some method of compensation must be used.

This is known as quadrature or power factor adjustment. Frequently it consists of a short-circuited turn of copper wire which is placed over the end of the pole of the voltage electro-magnet. Alternatively strips of copper are placed in the magnetic circuit or several turns of wire are wound around the centre pole, as near to the aluminium disc as possible. A variable resistance is connected across the ends of this coil and adjustment for power-factor compensation made by adjusting the resistor.

When initial adjustments of a completed meter are made it is usual to test with normal voltage at 100% full load current at zero power factor, lagging. The quadrature adjustment is made so that the disc remains stationary. The meters are checked again for either 0.5 lagging p.f. or any other power factor that the purchaser may specify. If the initial adjustment has been done correctly, then the meter will register "true power" irrespective of the power factor of the load.

Special generators are available in which the angle between voltage and current may be varied from 90° to zero degrees so that any power factor may be duplicated when the watt-hour meter is loaded with a non-reactive load.

Compensation for friction may be obtained by placing one or more short-circuited loops in the leakage air-gaps of the voltage electro-magnet.

One of the problems of this type of meter is that the speed of the rotor (disc) may not be exactly proportional to kilowatt hours. Therefore it is usual to place one or two permanent magnets in suitable positions with their pole-pieces above and below the disc. As the disc rotates between the poles of the magnets an e.m.f. is produced which is equal to the flux cut per second and this produces eddy-currents which co-act with the permanent magnet flux to make a retarding torque on the disc. This breaking torque increases in direct proportion to the speed of the disc and in square relation to the flux.

As the result of proper positioning of the permanent magnets the disc revolves at the correct speed for all values of power.

Another correction to be applied to the meter is the low-load adjustment. The disc must not revolve if no current is flowing in the current coils whilst the voltage coil is energised. In the usual application the voltage coil is continuously across the line, whilst the current coils are in series with the line and current flows through them only when the load is connected. This is a generalised statement as in some cases the current taken by the voltage coil passes through the current coils in which case the low-load adjustment takes this into consideration.

On the other hand the disc must revolve when only a small current flows in the current coils.

Temperature compensation may be included as well.

The three main adjustments for calibration are:—

(a) Full-load speed, adjusted by the brake magnets.

(b) Quadrature, to obtain 90° phase difference between the two driving fluxes.

(c) Low-load adjustment.

Watt-hour meters cannot be tampered with, without the tampering being obvious.

Poly-Phase Watt-Hour Meters

Again there are considerable variations in design by various manufacturers.

In one type a single disc is used, with two meter assemblies opposite each other. In this type a circular piece of glass is bonded to the vertical spindle and the aluminium disc is spun on to the outside edge of the glass.

In another type two watt-hour meter assemblies are mounted one above the other, but using a common spindle.

As mentioned earlier some power supply authorities require the consumer to have a power factor of 0.95 or better.

As the types of watt-hour meters just described do not register the reactive power caused by power factor, because of the quadrature adjustment, and the design of the voltage electro-magnet, another type of watt-hour meter is used.

This is a KVArh meter, meaning kilo-volt amperes reactive hour meter.

A simple direct method of measuring K.V.A. has not been discovered. If the voltage remains constant, then a measurement of the current may be considered as proportional to K.V.A. Alternatively if the power factor of the load can be maintained at a constant value, then it is possible to calibrate a quadrature adjusted watt-hour meter to register the "apparent power" by over-compensating the quadrature adjustment.

METERS DESIGNED TO MEASURE K.V.A.

This type of meter, which may frequently be referred to as a watt-hour meter, mechanically combines the readings of a kWh meter and a KVArh meter by means of complicated gearing and certainly is not a simple device.

The KVArh meter registers the reactive component of the power. This meter is similar to the previously described watt-hour meter (quadrature adjusted) except that it has a voltage element with the current and voltage in phase so that the flux in the voltage electro-magnet is in phase with the flux of the current electro-magnet and produces a torque which is proportional to VI sin ϕ.

If for any reason the power factor is leading then the connections to the voltage coil are changed automatically.

The KVA meter registers the "total" or "apparent" power used by the consumer, hence the consumer has to pay for the "wattless" power in his load as well as the "true power", and as he does not get any work from the "wattless power" he will soon do something to improve the power factor of his load in order to reduce his costs.

There are a number of varieties of both single and poly-phase watt-hour meters. These include pre-payment, or "coin-in-the-slot", also dual-rate meters. For instance, one authority will allow an industrial user a lower tariff between 11.30 p.m. and 7 a.m. the next day. The watt-hour meter is fitted with two registers. At 11.30 p.m. an electric time-clock switch will change the gearing in the watt-hour meter from the normal rate to the lower one until 7 a.m. following morning.

ELECTROLYTIC METERS

There are several different types, but they will not be described as it is considered unlikely that they will be encountered in radio work.

PRIMARY SOURCES OF ENERGY

Finally, it may be of interest to compare some sources of primary energy and a fine article on this appeared in the July 1970 A.N.Z. Bank Quarterly, "Survey".

Hydro-electric, direct solar, wind, tidal and geo-thermal sources were not considered as they represent only a very small contribution on a world scale.

In the list of energy contents of typical fuels, we quote the two extremes:

Brown coal: 9.2-9.9 million BTUs per long ton.

Uranium oxide in fast-breeder reactor: 46,000,000 million BTUs per long ton. ●

ACKNOWLEDGMENTS

In concluding this series of lectures, I would like to thank the many readers of "Amateur Radio" who have expressed to me personally their appreciation of the series and to "A.R." for publishing them.

I would also like to thank the following people who assisted in the typing and checking of the lectures, as without this assistance it may not have been possible to submit the series for publication as they existed only in my somewhat illegible handwriting.

Misses J. Black, J. Glenister, H. Haycroft, B.Sc.; Messrs. M. P. Black, A. Gray, W. Titheradge, also Associated Broadcasting Services Ltd., for their permission to submit the series to "A.R."

S.S.T.V.

JOHN WILSON,* VK3LM/T

● Over the last six months, the growth rate of S.S.T.V. has been rapid. Up to 300 letters and STD calls have been received from all over VK and ZL enquiring about components, circuits, tubes and many other aspects of S.S.T.V.

A Slow Scan Group has been formed in VK3 under the auspices of the Eastern and Mountain District Radio Club (E.M.D.R.C.) and meets every second Friday evening in the month at the Mooroolbark Technical School, Reay Road, Mooroolbark. The average attendance at these meetings has been 35-40 and all Amateurs and S.w.l's are welcome to attend.

The Group has made available an s.s.t.v. alignment tape which contains signals from an s.s.t.v. generator and includes black and grey scales, sync. information, linearity patterns and pictures of average contrast including some cartoon line work. The tape runs for 35 minutes and can be recorded for any interested person. Details are given at the conclusion of this article.

The E.M.D.R.C. has made available components, boards and tubes for slow scan builders and as for the tubes, they can supply 8" or 11" tubes re-gunned and re-phosphored in either P7 or E26 phosphor.

The P7 phosphor is the normal long persistence phosphor in green and can be used for both black and white and high quality multi-colour pictures.

The E26 phosphor is a special coating of white (P4) and P26 applied to the tube in such a way as to alter the tube characteristics to enable daylight viewing or direct viewing under normal room light conditions. With this tube the phosphor cannot be activated by room light but only from the electron beam within the tube. The P7 type, however, must be viewed under low room lighting levels. Having the 8" or 11" tubes available has enabled the builder to have a larger screen on his monitor.

The disadvantage of the disposal type tubes is their diameter, resulting in smaller pictures and on many occasions, lower light output coupled with lower contrast. Most of the disposal tube sources have dried up and the prices of the few still available have been elevated to a ridiculous level.

Letters arriving from the VK4 and VK2 areas indicate that some components are difficult to obtain in the country areas—some claim that even some transistor type numbers are unheard of. However, because we are dealing with low frequencies almost any three-legged device can be used. Other items reported scarce in the north are t.v. yokes and oscillator coils.

Since publication of the previous construction article, I have tried all types of t.v. yoke assemblies and have found that all types will work. Experimentation with correct linearity and size will have to be done by each constructor.

In the early article, iron cored yokes were specified, such as those used in the old Bush Simpson, Classic, etc. The reason these were selected is because of the **low scanning currents** required to give normal deflection. This resulted in lower current transistors being required in the output circuits. Using other type yokes may require output circuit transistors capable of handling higher scanning currents (e.g. in the order of positive 800 to negative 800 milliamperes).

Printed circuit boards have been developed for the VK4NP monitor. Norm's monitor runs parallel with the W9LUO described in "A.R." of March, 1972—the basic difference being the mono-stable multivibrators used in both frame and line circuits. Boards can be obtained from the E.M.D.R.C. (details given at the conclusion of this article).

excellent and this monitor can provide excellent colour pictures for those wishing to have a go at colour s.s.t.v. Further information on this type of equipment can be obtained from Stan Dixon, VK3TE, 73 Cole St., Elwood, Vic., 3184, phone 96-1877, or by contacting the author. (See photograph of Stan at the controls of his "Robot".)

S.S.T.V. FLYING SPOT SCANNERS VERSUS S.S.T.V. CAMERA

Many operators have built the flying spot scanner in preference to the s.s.t.v. camera. The basic reason here lies in the availability of the basic hardware and major components.

Probably for versatility, the camera is the most practical answer as you can shoot live any picture or title card that may be on hand. The most practical solution is to use a standard fast scan camera fitted with fast scan output into a conventional t.v. receiver.

Stan VK3TE at the controls of his "Robot" camera and monitor. This camera has facilities for fast scan output, a good feature for rapid focus and set-up.

OTHER TYPES OF S.S.T.V. MONITORS

Several people have constructed, or are in the process of constructing, monitors of other design. Some have been home designed around disposal indicator units, whilst others are quite sophisticated. I know of about four or five people building the Mike Tallen "MXV" monitor and would certainly be interested to receive reports on s.s.t.v. equipment that you have constructed or are using. Many other people are interested in this field, but are unable to make up their minds whether to build or buy.

On the market in VK3 is the American s.s.t.v. camera and monitor known as the "Robot," which uses 10 integrated circuits and about 23 transistors and 15 diodes. The c.r.o. tube is a 9" rectangular t.v. type tube with P7 phosphor and orange filter. Picture detail, contrast and linearity are all

Construction of a fast scan to slow scan converter board using sampling techniques allows us to have a fast scan camera with slow scan output for direct transmissions.

By the above method, rapid setup facilities are available to the operator, instant focus changes, etc., being seen on the fast scan monitor. Using the normal slow scan camera results in a longer setup time for focus, etc., due to the length of time required to produce a single frame on the monitor.

The flying spot scanner is the next alternative to a live camera. Here negatives, positives or photo prints can be installed into the carrier and direct scanning of these prints is available. Clear sheets can be used and instant drawings or written comments made and inserted into the scanner.

Which type of scanner is the best? The direct scan through a negative or positive piece of film or the reflective

* 14 Merrilong Street, Ringwood East, Vic., 3135.

type where the scan is reflected from the print to the photomultipliers? Well, both look good and you will hear the boys argue for hours on this subject. Why not try it for yourself?

One very good device to fit to your camera or scanner is a switch to enable you to—

(a) Reverse scan, e.g. right to left.
(b) Reverse colour, e.g. was white on black, now switch to black on white.

Under some poor conditions, white letters on a black background are more easy to identify, showing less noise lines and adjacent channel interference. As for reverse scan, the uses for this are left to the imagination of the operator. Have you ever watched the weather map on GTV9, then you will know what I mean.

ACTIVE SLOW SCANNERS IN VK

A slow scan net has been established by Barry VK5BS and is held on Sunday morning at 0100z on 14230 MHz. If you are a slow scanner and don't operate too regularly, then come up on Sunday mornings.

Detailed below is a list of known active slow scanners on the h.f. bands in VK and ZL—

VK2GR	VK3AQL	VK6CS
VK2BRA	VK3ARD	VK6ES
VK3EG	VK3YEO*	VK7JV
VK3LM	VK4NP	VK7TB
VK3PB	VK4XY	VK8CW
VK3TE	VK5BS	VK8KK
VK3ABM	VK5MF	ZL1DW
VK3AMC		ZL1AOY

* v.h.f. only

SLOW SCAN HANDBOOK

The first edition of the Slow Scan Handbook has come off the press at "73" Magazine and contains many construction articles and much information relating to slow scan that has not previously appeared in print.

At the time of writing, we have not received our copy, but will review it when it arrives per "A.R." The book is written by Don C. Miller, W9NTP, and Ralph Taggart, WB8DQT, and sells in the United States for $4.95 paperback or $6.95 in a hard cover. [This will become available through the W.I.A. at an early date.—Ed.]

SLOW SCAN COLOUR

The first Australia-to-United States of America two-way s.s.t.v. colour transmission took place on 6th June, 1972, between Bill W2DD in Fairport, State of New York, and John VK3LM in Ringwood East, Victoria.

To the best of our knowledge, this contact is not only the first W to VK, but the first continent to continent in colour on s.s.t.v.

Other colour transmissions have been used in U.S.A. since 1969.

I have since transmitted slow scan colour to Doug VK8KK, Norm VK4NP, Barry VK5BS and Ian ZL1AOY. I am on the look out for any Amateur interested in a two-way colour contact.

Lengthy articles on the production of colour slow scan have appeared in both "73" Magazine and "Ham Radio". The process is quite long and requires a good sound knowledge of colour techniques and photography. Under closed circuit conditions the picture detail and resolution is fantastic. Using a good colour film such as Ektachrome or similar colour, balance is excellent.

To enable you to produce colour s.s.t.v., your c.r.o. tube phosphor must be capable of reproducing red, blue and green as a deficiency in any of these areas will result in lack of colour in that particular region.

An up-to-the-minute report on colour s.s.t.v. is being published by Bill W2DD and should appear in "CQ" Sept., 1972. Details on how to transmit, receive and produce colour frames will be given. (Previously published data on colour is given at the conclusion of this article.)

We would like to contact interested Amateurs willing to tackle colour s.s.t.v. experiments. This will then enable other colour s.s.t.v'ers, both here and overseas, to have two-way contacts with VKs and ZLs in colour.

Similar colour transmissions took place between the moon and the U.S.A. on one of the recent manned space operations.

WILL S.S.T.V. REMAIN ALIVE LIKE S.S.B.?

We would certainly like s.s.t.v. to become as popular as s.s.b., however this can only happen if you, the interested Amateur, comes up on the band calling "CQ SSTV".

In the U.S.A., about 800 to 1,000 operators exist on s.s.t.v. and interest is actively growing in G, SM, VK, ZL, PA, F and many other countries. Already some JA operators have equipment viewing pictures and are waiting for their government to give the green light for transmission of s.s.t.v.

If you are interested in receiving more information about s.s.t.v., just write to me. The E.M.D.R.C. can supply circuits, reprints of s.s.t.v. articles, components, etc.—in fact any help or information available on s.s.t.v. Also, if you would like to see slow scan news regularly in "A.R.," drop me a line giving details of your activities and equipment (including photos). I am also interested in photos of outstanding or interesting pictures received on your monitor. ●

GENERAL INFORMATION

Alignment Tape

Send tape and speed required (reel to reel) or cassette to E.M.D.R.C. (Return postage cost should be included.) Running time, 35 minutes.

Printed Circuit Boards

For monitor in "A.R." and Norm VK4NP's version of "A.R." monitor.

Articles on S.S.T.V. Colour

"Ham Radio," Dec. 1969; "73" Magazine, Nov. 1969; "73," May and June 1970; "CQ," Sept. 1972.

Address correspondence to the Slow Scan Group, C/o. E.M.D.R.C., P.O. Box 87, Mitcham, Vic., 3132.

Acknowledgments

To my wife, Joan, typing; Jack Smith of Ringwood, photography; William H. De Witt, Fairport, N.Y., W2DD.

CW, VOX or Semi Break-In

(Continued from Page 4)

off time depends upon the setting of the potentiometer and is adjustable to almost a second, which is more than sufficient.

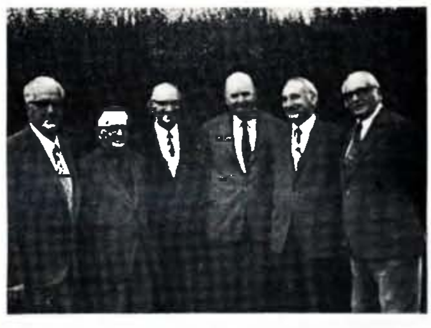
The power supply enables a 6.3 volt filament winding to be used as the primary power supply; almost any type of power rectifier can be used. The diode at the emitter of Q1 can be a power type also—the only requirement is that it can handle a peak current of up to 500 mA.

If it is required to operate the unit directly from a change in voltage such as that available from a keyer, it is suggested that a 741 operational amplifier be used to drive Q1. A choice of op. amp. inputs and bias resistors should enable almost any input conditions to be accommodated. ●

PRE-1940 CONVENTIONS

At Springwood, Blue Mountains (N.S.W.), in May 1972, members of the 1935-1938 W.I.A. Federal Executive gathered with their wives for a re-union. Some members had not met for over thirty years. F.H.Q. at that stage was located in Sydney. The re-union was organised by VK2VN and all members of the then F.E. were present.

The Divisional Delegates to the 14th Annual Federal Convention of the W.I.A., held in Sydney in 1938, were Wal Ryan, VK2TI; Vaughan Marshall, VK3UK; Arthur Walz, VK-4AW; Doc Barbier, VK5MD; George Moss, VK6GM, and Jack Batchler, VK7JB. Representing N.Z.A.R.T. was their President George Petrie, ZL2OV. That Convention was part of the World Radio Convention conducted by the I.R.E. and was officially opened by John Logie Baird, t.v. pioneer, after receiving a welcome from Sir Ernest Fisk, President of the I.R.E. and Past President of the W.I.A. N.S.W. Division. This Convention was financed by the N.S.W. Government as part of the 1938 Sesqui-Centenary Celebrations.



Left to right: Federal President Bill Moore, VK2HZ; Federal Secretary, Harry Caldecott, VK2DA; Ron Cohen, VK2TF; Eric Colyer, VK2BEL (ex VK2EL), Morrie Meyers, VK2VN; Peter Adams, VK2JX.

ADDING F.S.K. TO THE FT200

GEO. FRANCIS, VK3ASV*

● It is a very simple matter to add FSK to your very popular FT200 Transceiver, without changing the circuit or printed boards in any way, thus not affecting the re-sale value.

The method[1] used to key the transmitter by shifting the frequency of the v.f.o. is to make use of the existing clarifier varicap diode normally used for the receiver offset tuning. This article deals specifically with the FT200 but could be applied to other transceivers with similar circuitry.

The receiver clarifier control VR6 allows the receiver frequency to be offset from the transmit frequency by up to ±5 kHz. if required, by controlling the d.c. voltage on the varicap diode 1S145 (D401) on the v.f.o. board. Incidentally, the source of this voltage is from the 9v. regulator board. Normally, during transmit, the bias on the varicap diode is taken from the centre connection of the voltage divider R39 and R40 so that the transmit frequency is not varied by the setting of the clarifier control. This is automatically done by the send/receive change-over relay contacts PL1.

When the clarifier is switched in for receiving, another voltage divider network comprising R37, VR6, R38 and VR7 is paralleled with R39 and R40 (see Fig. 1). The circuit to be added is actually another voltage divider in parallel externally (in the f.s.k. adaptor) that shifts the v.f.o. during r.t.t.y. operation, using the internal varicap D401, in such a way as to allow the "receiver offset tuning" (or clarifier) and the "frequency shift" adjustment to remain as completely independent controls.

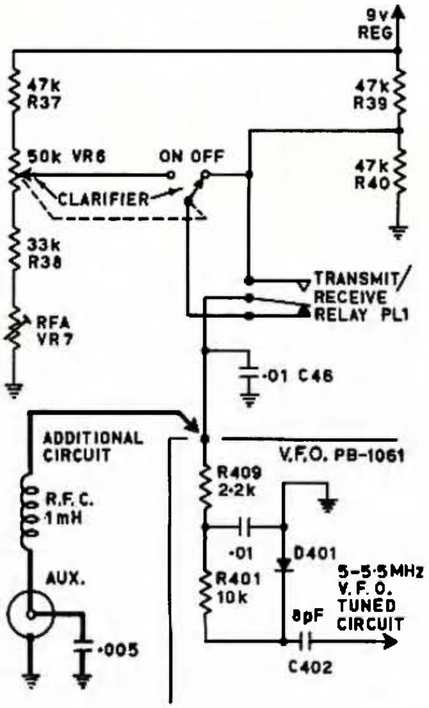


FIG 1
FT200 CLARIFIER CIRCUIT

TRANSCEIVER MODIFICATION

Lay the cabinet on its left side on a piece of felt and remove five PK screws and washers from the bottom of the cabinet. Slide the cabinet away from the chassis, out forwards, and place the chassis bottom side up on the bench.

Now checking Fig. 1, the simple "modification" (shown in heavy lines) is simply to mount an R.C.A. phono-socket (chassis type) in the vacant hole at the rear of the chassis marked "Aux," mount a single or double tag strip at the socket, solder the r.f. choke between the centre connection of the socket and tag strip, and by-pass the centre of the socket to earth with the disc ceramic condenser (to by-pass any strong r.f. going past the socket in either direction).

Run a short length of hook-up wire from the tag strip at the other end of the r.f. choke round and up through the chassis to the clarifier connection on the side of the v.f.o. box as per Fig. 2.

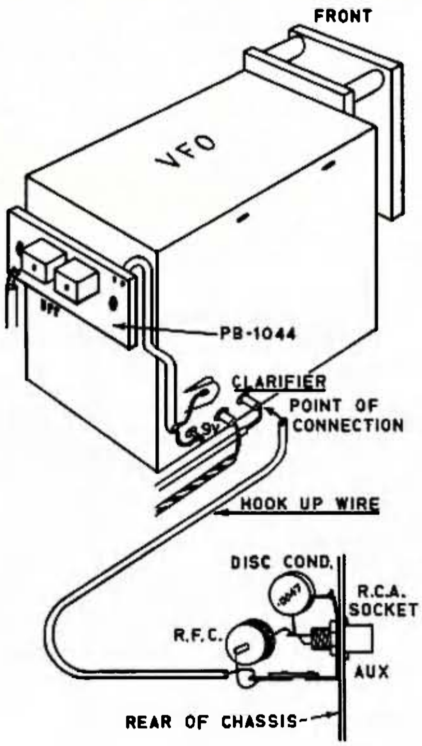


FIG 2
FT 200 V.F.O. CONNECTIONS

There are no component changes to the FT200. This completes the transceiver "modification". The control box may now be assembled. The transceiver v.f.o. alignment is not affected.

F.S.K. ADAPTOR

The f.s.k. adaptor control box can be contained in a die-cast box or similar. The 500K pot. and the d.p.d.t. switch are mounted on the front of the box, and three jacks are mounted on the rear. See Fig. 3 for the circuit. Wiring is not critical, as we are dealing only with switching of d.c. potentials. Suitable patching cables, preferably shielded, must be made up to match your choice of jacks.

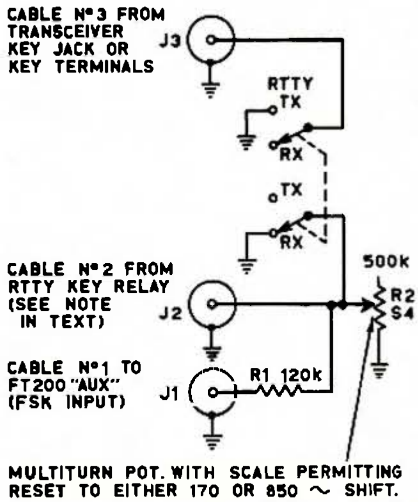


FIG 3
CONTROL BOX CIRCUIT

Cable No. 1 from J1 on the control box runs to the FT200 "Aux." socket just fitted for frequency shift (f.s.k.). Cable No. 2 runs from J2 to the r.t.t.y. transmit keyer.

Warning Note. This circuit should be keyed only by a polar, keying or mercury relay, or directly from the keyboard alone. **Do** not attempt to key directly from the normal d.c. loop to the printer magnets. Any voltage on the key line may damage S145 diode.

See Fig. 4 for a suitable keying circuit. The author used a plug-in "keying" relay from a Wireless Set No. 11 (similar outwardly to a Ferrocart vibrator).

Cable No. 3 from J3 may be plugged into the FT200 key jack, or can be clipped across the c.w. key terminals at the key.

ALIGNMENT

Alignment of the control circuit is merely a matter of setting the shift pot., R2, for the desired frequency shift.

(Continued on next page)

* 31 Donald Street, Morwell, Vic., 3840.

With the FT200, this adjustment will hold for all bands as the v.f.o. is of the heterodyne type.

With all the patching cables connected, turn on the transceiver and check the receiver for proper operation. Whilst the plug is in the "Aux." jack, the transceiver "Cal." locking knob has to be used to re-set dial calibration in conjunction with the 100 kHz. calibrator, as per instruction handbook on page 6.

Tune up the transmitter as you normally would for a.m. operation, as c.w. operation would exceed the rated 150 mA. plate current. I use a small fan at the rear of the FT200 for f.s.k. and a.m. operation to circulate air around the final tubes. Even during long transmissions no overheating takes place. Remember that r.t.t.y. is continuous carrier, or key-down operation, and things will run very warm indeed unless you provide for increased cooling.

After the transmitter is tuned, throw the switch on the f.s.k. control box to r.t.t.y. transmit position. The transmitter should now be keyed, and the plate current should be the same value that you adjusted for earlier. The frequency shift should now be adjusted by opening and closing the r.t.t.y. key line to the control box J2 and adjusting R2 to the standard wide 850 cycle shift, or the narrow 170 cycle shift.

Use a good quality pot. for the shift control, such as a ten-turn precision potentiometer with a counter dial to allow high accuracy set and re-set. These are now available in Australia.

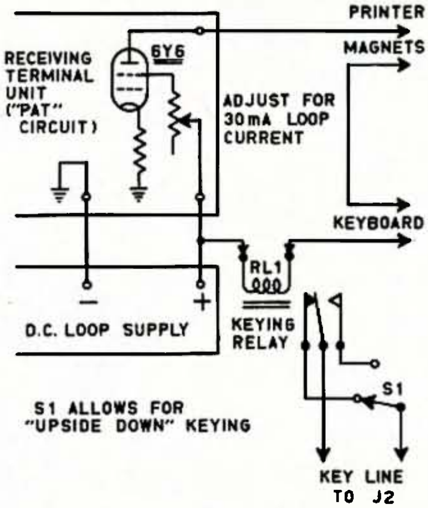


FIG 4
KEYING CIRCUIT

If you want to use the FT200 transceiver without the r.t.t.y. control box, make up a jumper plug consisting of a R.C.A. phono plug with a 120K 5% resistor connected from the centre pin to the plug case, or ground. Simply insert this in this f.s.k. jack ("Aux.") on the rear of the transceiver. The jumper plug maintains v.f.o. alignment.

This arrangement has been in use here for nearly a year and enjoyable contacts have been made with excellent reports received. Using the receiver for receiving f.s.k. will be covered in a future article. See you on r.t.t.y. f.s.k. soon. ●

REFERENCE

1. "FSK for the Transceiver," W9TKR, "CQ," Dec. 1969.

BOOK REVIEW

73 DIPOLE AND LONG WIRE ANTENNAS

73 VERTICAL, BEAM AND TRIANGLE ANTENNAS

Edward M. Noll, W3FQJ

Two of a series of books designed to encourage Amateurs to construct some of their equipment. Each book presents seventy-three variations of the types listed in the titles using a minimum of theory and calculation. Commonly available materials and simple hand tools are used for construction. An appendix describes simple measuring methods and inexpensive instruments essential to ensure maximum performance. Types to suit every Amateur from flat dwellers to graziers are described.

Australian Price: $5.60 and $6.00 respectively. Available from McGill's Authorised Newsagency (see advertisement).

"RADIO DATA REFERENCE BOOK"

3rd Edition

Modern Radio and Electronics techniques requires the use of a large and increasing amount of reference data. One of the publications which has stood the test of time in filling the needs of Engineers, Technicians and Amateurs is the "Radio Data Reference Book," the third edition of which is now available. This particular edition is noteworthy for the inclusion of improved design information pertaining to Pi and LPi couplers to ensure proper matching of valves and semiconductors.

Publisher: Radio Society of Great Britain. Compiled by G. R. Jessop, C.Eng., M.I.E.R.E., G6JP. Available from Magpubs, Box 67, East Melbourne, Vic., 3002, or from technical book sellers.

Commercial Kinks

With Ron Fisher,* VK3OM

Help. If you are one of the many who tried a 100K ohm resistor in the cathode of your FT200 product detector and found that it would not work, try a 10K resistor. This will have the desired effect.

THE FT200, Part 2

I wonder if any reader has successfully modified an early model FT200 for use with an external v.f.o., in particular the Yaesu FV200? It appears on the surface to be a fairly complicated job. If you would like to give it a try, I can supply all the circuit modifications that would be needed. Any takers?

I am also after a volunteer to design an effective noise blanker, but here I regret that I cannot supply any details.

Now back to our service notes as supplied by Mr. Fred Bail, of Bail Electronic Services, the Australian Agents for Yaesu.

Symptom: R28 plate dropping resistor burns out. Probable cause: Intermittent internal short in V3. Cure: Replace V3.

Symptom: Vox relay intermittent and erratic in operation. Probable cause: Diode D2 and/or valve V8. Cure: Replace D2 which is a type SH1 silicon diode. Check both valves V8 and V9. The voltage across the vox relay should be approximately 60 volts. Trouble in the vox section will show up in both the vox and p.t.t. positions as most of the circuitry is common to both. If you tend to use vox either on s.s.b. or c.w., trouble may initially show up as a shortening of the vox delay time to the point where you cannot adjust for enough delay on the delay control. Any low voltage silicon diode is suitable in this section. An EM401 100 p.i.v. diode is typical.

Symptom: V.f.o. jumping in frequency after warm up. Probable cause: Component and lead-in wire eyelets on v.f.o. printed circuit board not soldered to copper laminate. Cure: Remove board and re-solder all eyelets and components.

Symptom: V.f.o. jumping in frequency during tuning. Probable cause: Bad contact between tuning condenser wiper forks and shaft. Cure: First try cleaning with pressure-pack contact cleaner. If there is no improvement, remove the forks, re-tension and replace them in position.

Symptom: V.f.o. jumping in frequency during mechanical shock. Probable cause: Dry joint or loose mounting screws on v.f.o. printed circuit board. Cure: Solder joints on the board and tighten screws where necessary.

Symptom: Pulling or f.m. of v.f.o. frequency on voice peaks, also may show up as frequency shift on c.w. Probable cause: Defect in voltage regulator causing slight variation in regulated voltage to the v.f.o. Cure: Locate the voltage regulator which is on a printed circuit board under the chassis to the rear of the v.f.o. box. Check the regulator components and also the input and output voltages. The output should be 9 volts and this can be adjusted by means of VR501. If the fault exists only when operating on 12 volts d.c. power supply, check that the battery voltage is normal at the d.c. 200 input terminals.

Symptom: Calibrator signal weak or intermittent. Probable cause: Faulty connections or dry joints on the calibrator printed circuit board. Faulty diode D103. Cure: Check voltages on the board. Re-solder eyelet rivets to supply voltage tags. If D103 is faulty, this can cause low or no output on the higher bands. Replace with a small germanium diode, a 1N60 is typical.

Symptom: Receiver loses sensitivity. Probable cause: Break in continuity of antenna to r.f. coil L12. Cure: Check continuity, especially at junction of co-ax cable and receiver r.f. coil L12. Also check the antenna change-over relay and clean the contacts if necessary.

There is still quite a bit to go with the trouble shooting, but I think I might hold them over until next month and perhaps use the space left to cover a few simple modifications.

C.w. operators will have noticed that there is no control over the carrier power when switched to the c.w. position. As it is possible to vary the carrier level in the a.m. position with the a.m. carrier control at the rear of the chassis, all that is necessary is to wire this control to the c.w. position on switch S3e. Cut the connection to position four and then bridge to position five. Now you can adjust the c.w. level to give 150 watts d.c. input.

Key clicks seem to be a problem with the FT200. If you are having trouble try this one. Remove the 470K resistor from pin 1 of the 7360 balanced modulator tube. Replace this resistor with two 220K resistors in series. Connect a 0.01 μF. paper condenser from the junction of these two resistors to earth.

The ZL FT200 Club. If you own an FT200 could I suggest that you consider joining this live-wire club. Their object is to keep members informed of current improvements and modifications to the FT200. They do this by means of a well presented monthly newsletter. The annual subscription is only 75c. Further information can be obtained from the Secretary, D. J. Parkinson, ZL1BJP, 36 Western Road, Tauranga, New Zealand.

I will be back next month with more on the FT200 plus more on the Trio 9R 59D and a 160 metre modification for the R1155 receiver. In the meantime the Editor is still pondering on how many sharp eyes managed to miss "Sympton". ●

Bill Sebbens, VK4XZ, at the Townsville Civil Defence casualty state board. Bill, along with several other Townsville Amateur Radio Club members, is active with the Civil Defence organisation. Main communication links were manned by Amateurs immediately after Cyclone "Althea" wrecked Townsville.

* 3 Fairview Avenue, Glen Waverley, Vic., 3150.

NEWCOMER'S NOTEBOOK

With Rodney Champness,* VK3UG

OVERHAULING AND CONVERTING OLD DOMESTIC RECEIVERS FOR AMATEUR USE

By necessity my suggestions on this subject must be generalised as the various sets available differ considerably. The types of sets to be discussed are the b.c. or preferably the d.w. or triple wave mantel or table sets produced post war. A suitable set will have at least five valves with converter, i.f. amp., detector/1st audio, audio output, and power rectifier. It will be even better if the set has an r.f. stage or two stages of i.f. amplification. Old 32 volt sets will make ideal sets for conversion—having been designed for weak signal strength areas.

The vibrator power supply of the 32 volt set will need to be replaced by an a.c. power supply giving similar h.t. voltages, which can vary from as low as 32 volts to about 200 volts, at currents up to about 40 or 50 mA. It would be wise to make the supply capable of handling in excess of this so that converters and other ancillary equipment can be powered without power supply stress. The heater lines will need to be re-wired to suit either 6 or 12 volts. Some of these sets use 25 or 35 volt valves, so re-wiring of these is impractical. The h.t. lines of these sets can be fed with up to about 50 volts and the audio section with upwards of 100 volts. Care is necessary here as the power valves in vibratorless sets use little bias, so alterations to the bias network to increase bias and keep the current drain of the output valves to a reasonable level is necessary.

When overhauling any of these sets, either 32 volt d.c. or 240v. a.c., it will be necessary to replace all paper capacitors as most will be leaky. In non-critical positions such as cathode bypasses and h.t. bypasses, slightly leaky capacitors are satisfactory. Use polyester capacitors of similar values and voltages to those replaced. In the a.g.c. line lower voltage rating capacitors such as the 100v.w. Greencaps could be used. It might be noted that the a.g.c. voltage can be as high as —40 volts in some sets, and as low as —4 to —5 volts in some other sets. This depends mainly on the a.g.c. characteristics of the particular valves in use.

I have made it a habit to collect old valve radios which have been "pensioned-off". These may be available from relatives, friends or hopefully cheaply in "as traded" condition from radio retailers.

Before working over a set it will pay to sit down and work out just what sort of job can be reasonably expected of such a set. It must be borne in mind that these sets were designed and built before s.s.b. became all the rage, which means that physical stability of the tuning system does leave something to be desired. The tuning system will no doubt have backlash, and fairly direct tuning. Many tuning gangs are mounted on rubber grommets. This is to prevent acoustic feedback on short wave. If the speaker is to be mounted externally these grommets can be removed, giving an improvement in the tuning.

What kinds of jobs can be expected of a converted set? With suitably rewound or doctored r.f., aerial and oscillator coils it should be possible to obtain quite satisfactory performance on the 160, 80, 40 metre bands even for s.s.b. For use on higher bands converters ahead of the receiver would be desirable for best results. If s.s.b. or c.w. is not contemplated, a tuneable i.f. of 14 to 18 MHz. would be suitable for 6 and 2 metre converters. Once again I must emphasise that the ideas expressed in these articles will not help you immediately to get a station capable of working Moonbounce.

Should your set have only the b.c. band, you would have to decide what band(s) you want to rewind the coils for, or maybe you are going to use the b.c. band as a tuneable i.f. with converters ahead. This latter system I do not recommend as breakthrough from strong broadcast stations is more than likely unless you are prepared to shield the whole receiver very extensively.

As straight out receivers on Amateur bands, 3.0 to 8.0 MHz. would suit 80 and 40 metres. These are rather wide tuning ranges which would suit the general S.w.l. more than the newly licensed impoverished h.f. Amateur who will likely want bandspread on the Amateur bands only. Bandspreading usually makes all the mechanical tuning instabilities—mostly backlash—not so apparent. S.s.b. and c.w. will be easier to tune. An easy method of bandspreading can be achieved by putting a one or two plate small variable capacitor across the existing oscillator tuning capacitor. This simple modification will make fine tuning of s.s.b. so much easier. Modifications to the existing tuning system are unlikely to achieve as much success.

Some sets have upwards of four or five controls on the front panel. The only controls which are necessary are: on-off/volume, tuning and bandchange (if fitted). This means that up to two spare positions are available for controls on new facilities, such as a mode switch to switch between a.m., s.s.b./c.w. and f.m., or to switch converters in and out. An r.f. gain control and an a.g.c. time constant control could be fitted to mention just a few. These things can be fitted without altering the outward appearance of the set. Some of the potentiometers could be of the dual concentric type, but make sure you can get knobs to suit. If you are going to discard the cabinet, the fitting of some form of rigid adaptor plate to the front edge of the chassis would be desirable. The speaker could be removed and fitted into a separate box. This will give more room in the set for modifications.

Depending on what modifications have been done in regard to the bands to be tuned will depend what modifications will be necessary to the tuning dial. If none of the scales are to be used, the print can be washed off on most of the glass dials. The plastic dials may succumb to the same or with a razor blade. If this is not successful a dial could be made out of thin perspex sheet cut to size. The actual markings on the dial can be done with Letraset or similar lettering transfers. A method I have used extensively is to paint the markings on with red or black paint using an old steel nibbed pen. This is not quite as neat but it is cheap and effective.

The coil data is not given as the coil formers that you have on hand will be of various diameters and the exact bands for which you wind them will vary. Data for winding coils and the formulae for determining tuning range will be found in the R.S.G.B. and A.R.R.L. Handbooks. It will not be too hard to work out what values of series and parallel capacity will be necessary to give bandspreading of particular bands you may wish to tune.

The above information is, as I have already stated, very generalised. I have talked of tuning a.m., c.w., s.s.b. and f.m. These modes will mean the fitting of a product detector, possibly audio derived a.g.c., carrier insertion oscillator, S meter, etc. Would you care to drop me a note on what requirements you could reasonably need, for use in compiling a future issue? ●

* 24 O'Dowds Road, Warragul, Vic., 3820.

"20 YEARS AGO"

With Ron Fisher, VK3OM

Back in September 1952 Federal Executive must have been a mystery to quite a few of our members; the Editorial of that month stated: "With a view to creating and stimulating interest in our organisation, Federal Executive believes that, in addition to weekly broadcasts and the news distributed at meetings, members should have available to them some record of what is being done by Federal Executive on their behalf." So a new feature appeared, "Federal Executive Proceedings". Little of interest was reported in the first edition but we will keep an eye on later issues and trace the history of "F.E."

VK5 was well represented with technical articles. E. A. Charles, VK5YQ, presented an "Economical Design for a Simple Standby". Using two tubes in the r.f. section full coverage from 80 to 2 metres was achieved by using crystal control on 80 to 6 and then turning the final into a modulated oscillator on 2 mx. The line up was a 6AG7 or 6SH7 oscillator driving a QQC04/15 p.a.

C. H. Castle, VK5KL, discussed "Radio Control of Model Aircraft". Strangely a subject we see very little about in Amateur publications, however as VK5KL stated, "Much credit can be given to our fellow Australian, the late Ross Hull, who, whilst on the staff of 'QST' over a period of years made a close study of radio controlled models and his development of a simple actuator and escapement is still used today in simple types of control and is most reliable."

The "Effects of Electricity on the Human Body" are fully covered in an article presented by courtesy of the Victorian State Electricity Commission.

Both the DX and VHF notes reported a very quiet month, a few Europeans however were reported worked on the new 15 metre band. It seems that VK2AWU might have made the first VK/Europe contact on this band. Any contenders?

The Hamads for September 1952 made good reading and included in the for sale section, 75 feet of 300 ohm feeder, an AR7 receiver and a 3BZ transmitter. Type A Mark III. transceivers head the wanted to buy column with someone wanting a copy of a BC348 instruction manual. I wonder if he got it. Of course, Commercial Kinks was not a part of "A.R." in those days, today he would have no trouble at all.

TECHNICAL REVIEW

By "A.R." Technical Assistants

THE YAESU FT75 TRANSCEIVER

● The Yaesu Company of Tokyo, Japan, has established itself over the last few years as one of the world leaders in the manufacture of Amateur equipment. Many items of Amateur gear designed and produced by Yaesu will go down in Amateur history. Their progressive approach to Amateur design is exemplified in the new FT75 transceiver. As the illustration shows, this little rig sets a new approach to the format of compact s.s.b. transceivers.

DESIGN FEATURES

The most obvious difference between the FT75 and more familiar transceivers is the size. It measures 210 mm. wide, 80 mm. high and 300 mm. deep. Converting to more familiar units, this works out at 8¼ by 3 by 12 inches. The total weight of the transceiver not including power supply is 3.8 kg., which is just under 8½ lbs. The transceiver is supplied with a push-to-talk 10K ohm dynamic microphone of excellent quality. Also supplied with the d.c. power supply is a mobile mounting cradle. On either side of the transceiver are slotted aluminium rails which are designed to slide into the mobile cradle to mount the transceiver firmly in position. Provision is made to clip the mobile power supply under the cradle.

An a.c. power supply with built-in speaker is available and is contained in a cabinet of identical type and size to the transceiver. The d.c. supply, which also has a built-in speaker, is somewhat smaller, at 8¼" wide, 2½" high and 6¾" deep. The weight including cables is 1.46 kg. or 3½ lbs. Both the transceiver and the a.c. power supply are finished in a speckled grey enamel. The transceiver front panel is finished in a smooth dark grey enamel with white lettering; the knobs are black with chrome inserts. Above each of the push-button controls is a miniature red indicator light. So much for the external finish. Let us look inside and see what makes it work.

TECHNICAL FEATURES

The FT75 differs from the normal transceiver in that it does not contain a v.f.o. Instead, a v.x.o. is provided. Readers may remember the older Yaesu FT50 transceiver and the FL50 transmitter, both of which also embodied this feature. The v.x.o. of the FT75 has been improved over the earlier models, and has provision for a total of fifteen crystals with push-button selection of three for each of the five bands covered. There is also a push-button to select an external v.f.o. to provide complete coverage of each band from 80 to 10 metres. The v.x.o. control allows a frequency variation of 3 kHz. on 80 metres, 6 kHz. on 40 metres, 3 kHz. on 20 metres, 20 kHz. on 15 metres, and 12 kHz. on 10 metres.

The unit is fully transistorised except for the transmitter driver and final stages. In all, it contains a total of 16 transistors, 6 FETs, 3 ICs, 23 diodes and, of course, the two valves. All the features normally expected in modern transceivers are incorporated. These include a noise blanker, and effective fast attack a.g.c. and squelch on reception. On the transmit side, provision is made for c.w. operation with a separate carrier generator. With s.s.b. operation an effective a.l.c. system is used to reduce the possibility of flat-topping. The transmitter is designed to run a power input of 50 watts on both c.w. and sideband. Other features include low level r.f. output for driving a transverter, switching for a linear amplifier and switching for remote band change of either a mobile or home station antenna.

All connectors used on the transceiver are top grade commercial quality which are well suited to rugged mobile and portable use. The microphone uses a five-pin screw-on type plug, while the main power connector is a sixteen-pin lock-on type. Antenna connection is via a standard Amphenol SO239 socket for which a matching PL259 plug is supplied. The controls of the FT75 are designed for the utmost simplicity of operation. Transmitter tuning is peaked with a preset adjustment for each band on the rear apron of the transceiver. The effectiveness of these adjustments will be discussed in a later section of this article. Transmit/receive operation is push-to-talk there is no provision for v.o.x.

CIRCUIT DESCRIPTION

The heart of any sideband transceiver is the filter. In the FT75 it is centred on a frequency of 5173 kHz. and has the following characteristics. Bandwidth at —6 dB. is 2.3 kHz., at —60 dB., 4.5 kHz. This gives a 6/60 dB. shape factor of 1.95, which is excellent by any standard. As the transmitter and receiver sections use very little common circuitry, we will look at them independently. Where there is a common path, some most interesting kinks are employed.

Careful design has been used in the receiver front-end and as we shall later see, this has really paid off. The r.f. stage uses a dual gate FET. Separate high Q coils for each band provide input coupling. Between the primary of each of these and the antenna input is one section of a two-gang r.f. gain potentiometer. This provides a degree of r.f. attenuation along with the more normal r.f. gain. An i.f. rejection trap is connected to the input gate of the r.f. stage and a.g.c. voltage is applied to the second gate. The output from the FET mixer goes to the first two receiver i.f. stages with the noise blanker connected around the second of these. The blanker uses quite simple circuitry with two diodes to generate the pulses and two transistors to amplify them. The filter comes next in line and it is interesting to note that the received signal goes through in the opposite direction to the transmit signal. Extensive use is made of diode switching to isolate the various functions. After two more stages of i.f., the second of which is an integrated circuit, the signal is fed to the transmitter balanced modulator, which is used as a product detector. Carrier re-insertion is provided by the transmitter carrier oscillator and the resultant audio output is fed to the audio amplifier—another integrated circuit—via a set of relay contacts so that the balanced modulator can be switched back to the transmit function.

The transmitter line-up is straight forward, but in order to facilitate tune up and c.w. operation a second carrier generator has been provided. This is on a frequency of 5173.2 kHz. which puts it right into the bandpass of the filter. This also gives an 800 Hz. offset for c.w. reception because the normal s.s.b. carrier oscillator is still used for reception. Two transmit i.f. stages are used to drive the transmit mixer, followed by the 12BY7A driver and the 12DQ6B final. The final matches into a fixed 52 ohm load. The circuit is quite normal except that a separate final tuning condenser is provided for each band. These are of the screwdriver adjust type. Metering for the final is provided on the edge type front panel meter in two ways. Either final cathode current or relative r.f. output. The functions are selected by a slider switch on the rear apron, the meter reverting to S units in the receive mode.

The frequency of the v.x.o. crystals are selected by taking either the sum or difference of the i.f. and output frequencies. For the various bands they work out as follows: 80 mx, 8672.4 kHz. to 8872.4 kHz.; 40 mx, 12172.4 kHz. to 12322.4 kHz.; 20 mx, 8827.4 kHz. to 9176.4 kHz.; 15 mx, 15827.6 kHz. to 16274.6 kHz.; 10 mx, 11413.8 kHz. to 12262.3 kHz. The crystal frequency is doubled on ten metres and because of the offset on c.w. a crystal chosen for this mode should be 1.2 kHz. higher. Four crystals are supplied with the FT75 as standard, and these are on output frequencies of 3536, 7085, 21400 and 28550 kHz. Other channels can, of course, be ordered from the distributor.

POWER SUPPLIES

The a.c. and d.c. supplies are designated FP75 and DC75 respectively. Both are arranged to deliver the following voltages: 300 or 400 volts high tension for the 12DQ6B final amplifier, 150 volts for the final screen and the 12BY7 driver plate and screen supply, 100 volts of bias for the transmitter valves and 13.5 volts d.c. for the transistorised section. The FP75 utilises one transformer of quite small dimensions. It is about the size of a normal 100 mA. transformer. Four secondary windings deliver the required output as follows: The 300/400 volts and the 150 volts derive from a bridge rectifier across a 115/140v. a side winding, the 150 volts from the centre tap in the usual way. A bridge rectifier across an 11 volt winding delivers 13.5 volts and a single diode in a half-wave circuit across a 100 volt winding provides the 100 volt bias. 12.6 volts a.c. for the transmitter filaments complete the supply. Apart from the transformer, all the components are mounted on a small printed circuit board. During the tests we carried out, the supply ran very cool even after many hours of operation.

The DC75 uses two type 2SD67E transistors to deliver the high voltage requirements. Only two secondary windings are required, one for the 100 volt bias and one for the 300/400/150 volt output. Both the transmitter filaments and the transistorised portion of the rig are supplied direct from the battery. The DC75 operates from a nominal 13.5 volt negative earth battery supply. An internal relay switches the high votlage supply on during transmit periods.

The power consumption of the FT75 with its associated power supplies for d.c. is 5.5 amps full output transmit, 3.5 amps. standby and 1.4 amps. receive with transmitter filaments off. On a.c., the power drain is 80 watts transmit and 50 watts standby.

THE FT75 ON AIR

For the on-air tests we were provided with the optional external v.f.o., the FV50C. It was thus possible to test the transceiver across the entire width of each band. The receiver proved to be a surprisingly good performer. Having had rather disappointing results from transistorised receivers in the past, the first test was to check for front-end overload and cross modulation. The 80 mx band was chosen on a night when a couple of the local Amateurs were operating. With the r.f. gain full on no trace of either cross modulation or overload could be detected. The a.g.c. action proved most pleasant in action. A very fast attack time eliminated all tendency to hardness, while the decay time was long enough to reduce pumping effects to a negligible amount. With a signal running an estimated 20 dB. over S9, the decay time was about four seconds. S meter readings on the FT75 under test appeared to be somewhat optimistic, but as an S meter sensitivity preset control is provided, owners will be able to adjust it to suit their personal taste.

It was noted that if one of the v.x.o. channels was switched in with the external v.f.o. connected, signals could still be heard on the v.f.o. frequency, indicating some stray coupling across the switch contacts. Under the same conditions a spurious signal was present in the transmit mode. It is therefore necessary to make sure the v.f.o. is disconnected when v.x.o. operation is used. The noise blanker proved to be only moderately effective. Noise of the sharp pulse type such as car ignition was reduced by about 15 to 20 dB. in level. The action of the blanker reduced the overall signal level by 3 dB., but did not introduce any noticeable distortion on the received signal.

The squelch control worked very well. As the control was advanced the threshold level was gradually increased up to a level where only an S9 plus signal would open it up. The slow decay on the a.g.c. meant that it could take two or three seconds for the squelch to operate. This seems to be a feature to which the operator would have to become accustomed to over a period of time.

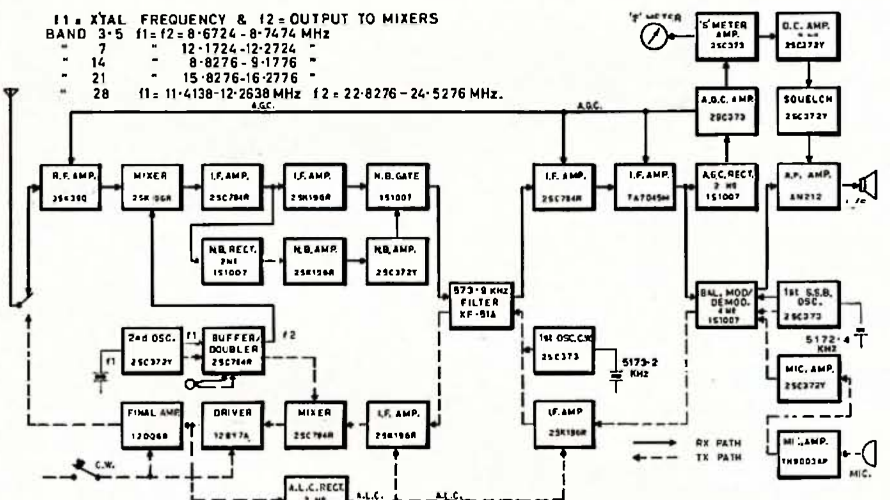
Transmitter output (p.e.p.) was measured with the following results: 80 mx 30w., 40 mx 29w., 20 mx 28w., 15 mx 27w., and on 10 mx 33 watts.

At the same time tests were made to determine the bandwidth of the final amplifier. The room temperature at 20 degrees C. On 80 mx there was a 1.25 kHz. drift over the first five minutes, and a further 0.5 kHz. over the next half hour. On 40 mx the drift was 4.5 kHz. over the first five minutes with 2.5 kHz. over the next 50 minutes back towards the starting frequency. On 20, 15 and 10 mx the drift averaged 1.25 kHz. over the first five minutes with a further 1 kHz. over the next half an hour. In view of the 40 metre performance, this unit was returned to the distributor and a second unit obtained. This one showed an improvement with a total drift of just over 1.5 kHz., most of which occurred over the first five minutes.

Dial linearity was fair. With the reading corrected at the low end of the band, an error of 4.5 kHz. and 6.5 kHz. occurred at the 100 and 200 kHz. calibration points on the 80 and 20 metre bands. 15 metres was somewhat better with an error of 1, 1, 3 and 6 kHz. at successive 100 kHz. points. 40 metres proved the best with less than 0.5 kHz. variation between each 100 kHz. point. The dial linearity was not checked on ten. Bump testing the cabinet of the v.f.o. produced no variation of beat note on 80, 40 and 20 metres, but there was some warble on 15 and 10 metres.

CONCLUSIONS

The FT75 transceiver is an excellent little rig. It will no doubt see most use as a compact, easy to operate mobile setup. However, it should not be overlooked as a home station for use where space is limited. The FT75 used in our tests was kindly supplied by Bail Electronic Services of 60 Shannon Street, Box Hill North, Vic., 3129, to whom all enquiries should be directed.



BLOCK DIAGRAM of FT-75

80 mx band was chosen because any specific frequency change here represents a greater percentage variation. The results were surprising. The output dropped off by 1.5 dB. when the frequency was changed by plus or minus 10 kHz. After this there was no detectable difference in output from one end of the band to the other. For this test the output was initially peaked on the v.x.o. frequency of 3565 kHz. The higher bands proved to be just as good with an even smaller drop in output off the resonant adjustment.

FV50C V.F.O.

Looking back to the review of the Yaesu FL50 transmitter in the October 1968 issue of "Amateur Radio," mention was made of the FV50 v.f.o. but no data was published on the performance. Firstly a description of the unit. A separate tuned circuit is provided for each of the five bands, the output frequency being over the same range as the v.x.o. crystals except in the case of the ten metre band where the v.f.o. operates on twice the crystal frequency, that is from 22827.6 kHz. to 24524.6 kHz. The dial calibration is arranged so that there is an identical tuning rate on all bands from 80 to 15 metres. The ten metre band tunes at twice this rate, that is two kHz. for one on the lower bands.

Considering that the v.f.o. is switched and that frequencies of 8.6, 8.8, 12.1, 15.8 and 22.8 are involved, the stability is very good. Tests were made from a cold start on each band with

OBITUARY

GORDON COLE, VK2DI

New South Wales lost one of its prominent DX'ers when Gordon Cole, VK2DI, passed away on 13th July, 1972, due to a heart attack.

Gordon obtained his Amateur licence in November 1935 and broadcast operator's licence the following year. He joined one of the Sydney stations, working there on the technical side for a number of years.

For the past 17 years he combined his technical knowledge with commercial activity in the audio engineering field, which took him abroad on a number of occasions.

His Amateur station was at all times kept in first class order and being a perfectionist, it was difficult to distinguish between his home-brew and commercial equipment. His prowess as a DX'er is displayed in the following certificates: W.A.Z. No. 42, D.X.C.C. No. 168 with approx. 335 countries worked, D.U.F. No. 38, and Empire D.X.C.C. obtained in 1949.

Gordon served as Honorary Treasurer of the N.S.W. Division of the W.I.A. for two years—1945 and 1946.

We extend to his XYL Jean and family our sincere sympathy.

Two Big Wheels in Phase

or Muscle Mobile

By N. WESTE,* VK5ZFE

Not deterred by the recent oil strike and hence the ban on sale of petrol in VK5, a small R. & D. team in Adelaide decided to extend the capabilities of the average mobile Amateur. This was easier said than done. However, being recent engineering graduates, the problem as will be seen, was solved conclusively, the solution not deserving the fate which befell it.

It was not until the transceiver was being mounted on the treadly (state of the art term for novel method of conveyance) that the wonders of this solid state age were really brought home. No half ton lead acid cell for this gem, instead, a super-light energy source—two No. 509 cells—terrific! The mind may well boggle at such simplicity.

Finding a suitable antenna posed an interesting problem, as there were a number of avenues open to approach. The thing was to find the most effective system. Initially, the thoughts were fairly standard—a ¼ wave whip or half wave dipole poking out the back. An unforeseen problem occurred here during the road tests. Inquisitive motorists (there still were some) insisted on edging right up until they had the required effect of bending the elements. Thoughts on a Yagi version were shelved as a result of this.

A more fiendish idea had to be found. It came in a moment of inspiration. Why not commutate to the two wheels and stub match them to the transceiver? Unbelievable! Two big wheels in phase! The necessary adjustments were made and, with the aid of an r.f. bridge, 50 ohms non-reactive load resulted. Did the r.f. transistors like this? It was their first taste of 50 ohms. No more 5 to 1 s.w.r.'s, no more inductive indigestion or capacitive clots. This was heaven!

Being a mobile article, the results of field tests must be presented. It was at this point that the day turned black—to a certain extent anyway. Quite free of the mains and any source of a.c. ripple in the supply, reports of hum were received. The scourge of all power engineers—commutator action—had claimed its toll.

At this point most experimenters would have gone inside, put their feet up, degassed some 807s and discussed the pros and cons of methods used. Not this group—not on your Nelly—they started thinking. You may have heard of a think-tank, well, the word tank being barred, this was dubbed a think-tube.

Whatever its name, it had the required effect, when one participant eclipsed all other suggestions with one which should surely go down in the annals of engineering as an all time masterpiece.

By sectioning the frame below the seat, and inserting an insulating block here, the whole frame could be fed as a vertical dipole. (At this stage we would forgive the reader if he paused in wonder at such a startling innovation.) Quick calculations with the ever-present slide rule showed that the handle-bars occurred at a node, and hence in no way affected the performance of the antenna.

With this device the group was ready to claim world wide Amateur markets. However, the crunch had to come, the success had been so marked. On the day of commissioning the news came that petrol was available. Within minutes the gathered crowd had scattered, leaving only the dedicated R. & D. crew with their contribution to a pollution free world.

Do not lose faith fellow Amateurs, all was not lost. The chief engineer, an avid Amateur, did not waste this chance. Sitting at 50 feet at his home QTH are three super-elliots in phase.

His colleagues laugh, but he knows . . . one day . . .

* 2 Fowlers Road, Glen Osmond, S.A., 5064.

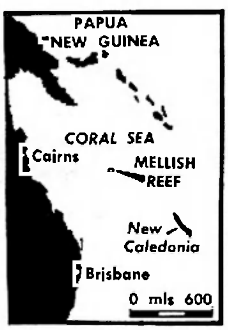
THE MELLISH REEF SAGA—VK9JW

By DON MARSHALL, VK4ZAF*

● Four Australian operators have added a new chapter to the history of Amateur Radio. They are John Martin, VK3JW, of Bairnsdale, Vic.; George Down, VK4XY, of Everton Park, Brisbane; Keith Schleicher, VK4KS, of Aspley, Brisbane, and Roy Baxter, VK4EJ, of Camp Hill, Brisbane.

When John used the special call VK9JW to contact JA1KW on 20 metres s.s.b. at 0910z on July 13 last, Mellish Reef became yet another country to be worked by Amateur operators. The contact and another 11,000 in the following six days was a triumph for organisation and co-operation by the Amateur operator with limited resources. "The buzz of stations calling that night was music in our ears," party leader and prime mover of the expedition, John, said.

But why Mellish Reef?—a tiny 900 ft. by 600 ft. atoll in the Coral Sea some 560 miles north-east of Bundaberg and roughly 700 miles east of Cairns (see map).



John was a member of the group which last year reached Willis Island but failed to get to Mellish Reef. He felt he owed something to the Amateur world, so set about organising his own DX-pedition.

The problems, not to mention the cost of such an operation, were formidable. But John had a sense of national pride which pushed him into making the effort.

Early this year, he and his friend Alf Matthews, VK3ZT, in Melbourne, started making plans. Six months of letter writing and calls followed for assistance of various kinds. Alf was to go along with John. Keith and Roy were invited to join in. Alf worked on official details in Melbourne while George, Keith and Roy sorted out the essentials in Brisbane. John was fortunate to receive a VK9 call sign with his VK3 letters. He also arranged for the services of launch skipper and owner Bob Poulson, a man very experienced in the treacherous Coral Sea waters and an expert navigator.

Who was to know what was on a coral sandbank a long way from anywhere? What were the dangers? As far as possible, all had to be foreseen. John spent a week in Brisbane arranging food and cooking, water, shelter, bedding, a liferaft and communications had to be planned, not to mention the stations, beams, power supplies and fuel.

One beam came from Laurie VK3BBX and another from VK4XK. John VK4QA provided a pole and both Alf and Arthur VK4PX each lent a tent, poles and pegs, with S.w.l. Ray loaning a tent and furniture. At the last minute, Alf had to pull out for family reasons and George took his place.

All details hopefully solved, the party drove to Bundaberg and left at 2 a.m. on July 11. Mellish Reef is a speck in the ocean yet the navigator was only one-third of a mile out when the reef and the Herald's Beacon islet were seen about 11 a.m. on Thursday, July 13. The 40-mile radar picked up the islet at only five miles. Yet the waters were treacherous with coral bommies and pinnacles and it was not until 4.30 p.m. that the first dinghy load reached shore with the launch half a mile off. The four worked by torch light to erect two tents, beams and stations and fill and start the generator before that first call. George's 80 metre aerial stretched from high tide mark on the east to high tide mark on the west! It was midnight before 20 metres and the JAs and Ws dropped out. But what an achievement.

The weather, the governing factor of the DX-pedition, was good — probably the best period of the year so far — and remained fair for most of the stay.

Friday was a busy day. The rest of the gear including hundreds of yards of power and co-axial cable was brought ashore by dinghy with the great help of the launch crew and the operation went into full swing.

John had his Swan 500 with an outboard v.f.o. feeding a TA33 junior beam, George his FTDX-100 feeding a folded dipole on 40, 80 and 15 metres, and Roy his FT101 with outboard v.f.o. also feeding a TA33 junior beam.

For power, there was a 2½ k.v.a. generator and a 1 k.v.a. generator as a spare. Seventy gallons of fuel was available for days and nights of hard working.

Terns occupied the southern half of the islet with nests among sparse vegetation and a stench that had to be smelled to be believed. And did they squawk! The tents were set up therefore at the bare northern end about 100 yards apart on the flat-topped coral bank only a few feet above sea level, spots probably awash during cyclones.

Then the calls from an eventual 103 countries started pouring in and some 3,000 contacts were made in the first two days! Unlike expeditions in the past, two or three transmitters were operating simultaneously. Frequencies were re-set and were adhered to wherever possible to facilitate monitoring by Ws and VEs.

Trouble came on the second day, almost in darkness. The carburettor on the main generator fell off after a stud broke and VK9JW was off the air. Chaos! By torchlight they worked. The remaining stud was tightened and a hefty piece of copper wire inserted and twisted home. Then the power was on again and there were no more failures.

The average day started at 5 or 6 a.m. with contacts on 20 metres to Europe. Despite repeated requests, there were dogpiles all the time so that a total of only 400 to 500 Europeans was reached.

Breakfast was taken during a quiet time around 7 a.m. Roy then operated c.w. on 15 metres up to 4 p.m., though 20 metres was the band in the afternoon. Operators pulled out for lunch when they could or worked through.

Early afternoons were particularly good for South America and Mexico with 5 and 9 signals. Then came dinner.

Keith worked many JAs on 15 metres between 7 p.m. and 11 p.m., during which time the American phone band was also open with many Canadian and American contributors contacting him. Europeans were coming through as late as 1 a.m. with 5 and 9 signals on the last day.

Keith and John normally worked on the Swan s.s.b. with George and Roy on c.w. George was heard around 3660 kHz. at 8 p.m. each night reporting to VK4 on the day's progress. As one operator got tired, another took over. Cooking (on a gas stove) and other chores by John and George, such as re-filling the generator regularly was not an easy job in the wind. But the exciters were on for 99 per cent. of the time.

Most contacts were made on 15 and 20 metres though there were some openings on 10 metres where about 500 to 600 contacts were made. Operating was of a very high standard and immediately stations got a report they would clear the frequency. There was no time for the operators to chat with friends. But reports indicated that the Mellish Reef expedition was the most well-organised DX-pedition yet heard.

Of course, Mellish was not all Amateur Radio, but partly a holiday and the operators had their fun. The fishing had to be seen to be believed. Anything under 2½ or 3 ft. was thrown back and all stopped fishing when they realised the fish would only have to be left on the beach. A big coral trout caught on the first day provided so many meals they were almost sick of it! The water was so clear you could choose your variety. Keith caught a 5 ft. moray eel by dropping a line down its open mouth.

There were no health problems. Fresh water was limited so the operators were pretty dirty with a splash in the shallows the only safe bathing. Temperatures were decidedly tropical and operators merely wore shorts and took on mid-winter suntans.

A south-east wind gusting to 28 knots caused some chaos. Have you ever tried working Europe when one end of the beam is in the sand? Coarse coral sand provided little anchorage for the pegs used for the beams and tents. Some hefty gannets perching on the beam elements did not help either! A wrecked Spanish galleon, some wrecked Japanese trawlers and shell collecting were other diversions.

The DX-pedition was recorded on scores of slides and 250 ft. of movie film.

Too soon did the weather indicate it was time to leave Mellish. The honour of the last contact went to George who had done so much of the organisation and was with K8RTW at 1220z on the 19th. He called a KW8 about 1245z on Wednesday, July 19, to end almost a week of operation.

The party returned to Bundaberg safely on Sunday, July 23. When the logs were checked, all continents had been worked and a few rare African countries were among the list. The highlight had been the call from VK0CR. With not as much time as at Willis Island, twice as many calls were made. There had been no equipment failure and only 17 gallons of fuel for the generator remained.

For the operators, Mellish was the culmination of their Amateur Radio careers. In all, the DX-pedition was most successful and something Australian Amateurs can be proud of as a group.

Now John has the job of preparing the special QSL card. Be patient if you have to wait a while. Hundreds of QSLs are arriving for him daily.

When John is through, he hopes to get working on another DX-pedition still on the secret list!

From left: John Martin, VK3JW; George Down, VK4XY; Keith Schleicher, VK4KS; and Roy Baxter, VK4FJ.

* 23 Karowara Street, The Gap, Brisbane, 4061.

you and DX

With Don Grantley*

Times: GMT

Another trip to VK4 has further curtailed my already meagre activity, and for this month's news I have to rely entirely on Geoff Watts DX News Sheet, which as usual is a wealth of DX information. Before going on to the news, I would like to say that I am about to change QTH once again. This time I will be moving up to Gympie or thereabouts. This shift is due to transpire on or about the end of September. It will mean starting all over again for my award hunting activities as most of the ones I am interested in require all operation to be from the one call area.

Towards the end of June we saw the WB6CZB/WB6ZSZ doings in A35 and KS6, also 5W1. The entire operation covered almost two weeks, and all QSLs for the events go to WB5BHN.

XV5AC now active from Saigon using a KWM2 and being reported on 14090 and 14050 c.w. He is W4EVG and asks for all cards to be sent via his manager W1YRC. As a matter of interest, the Director-General of Posts and Telegraphs in Vietnam has notified I.T.U. that XV5AC may communicate with stations outside the Vietnam limits, thanks to the efforts of HS3DR and friends.

9M6AB was activated by Ed. KH6GLU from June 4 to 6, and QSLs for his 500 odd QSOs on those three days should go to K3RLY and not JA2KIT who normally handles the 9M6AB chores.

XU1AA has been quite active in the past weeks, but by the time you read this he should have gone QRT. However, John VE7IR/9M2IR/9M6AA goes to Phnom Penh every month and may operate XU1AA whilst there. He has a copy of that station's log from March 5 of this year and if you need a card subsequent to that date send a s.a.e. plus three IRCs to 9M2IR, Box 262, Johore Bahru, Malaysia. A further word is that John, together with two brothers, may go to XZ shortly.

The prefix S2 now used by East Pakistan has been heard of late with S2IIR and VE7IR/S2 operating from Dacca up to June 19. Several Red Cross HB9 and LA operators have been in Bangladesh for the past three months and hope to be on the air soon, while Geoff Watts suggest we watch for OR4 stations from that locality.

Les PY2ERS and PY2MI have been very busy of late. They were on from St. Peter and Paul Rocks as PT0MI and 0WH, then were to go on to Fernando de Noronho as PQ0MI and WH, then they hoped to try Rocas on the return journey as PR0, having made an unsuccessful attempt to land there on the way out. QSLs for 0WH operations to Box 19073, Sao Paulo, and 0MI activity to Box 19094, Sao Paulo, Brazil.

A few odd prefixes to report this month. These include EI0DI from Dalkey Is. on July 28 to 30, QSL manager is EI7CC. FC6ABP from Corsica, QSLs to Jean-J. Fillipi, Box 44, L'Ile Rousse, Corsica, France. WI7UKE July 29 to Aug. 4 from the International Esperanto Conference at Portland Oregon. 7X7G is quite active, cards to the bureau, whilst 7X7Y goes to I0IJ. Both count as prefixes only. Robert OR4ES is with a scientific expedition to the Dasht-I-Lut Desert in Iran—manager is ON4VL.

A South America to Asia "first" was recently completed when EP2BQ worked PY1DVG on 160 metres on July 7 and July 8. EP2BQ now needs only Oceania for his 160 mx WAC and to this end is looking for VK6 contacts. His sunset is about 1530z and he usually listens on 1877 kHz. What about it George?

There has been some activity from Andorra over past months. C31CD, C31FE, C31FH were on from July 9 to 19, the operators were DJ9ES, DL2PU and DL2SZ, the manager being DL0LJ, Box 211, D-4132. Kamp Lintfort. Another was C31FI whose QSLs go to F6ACU, whilst C31FN operated by a group from PA0, from July 5 to 20, ask for their cards to be sent via PA0PMP, P. M. Patings, Mgr v Schalkstr 5, Den Bosch.

There has been some confusion as regards the managership of FB8WW, but F5QE now asserts that he will continue to handle the QSLs and that any cards received at F6BTH will be forwarded to him. FB8XX is still on the air most days from 0500z on the 15 metre band. He has been on 3788 at around 2200 on occasions. His manager is F2MO.

A few more strange calls for prefix hunters. JY4IA, Ibrahim, with 15 and 20 metre band contacts at 2000 or thereabouts. Address is Box 2353, Amman. LZ9OD (that is LZ nine zero D) on 15 metres in the evenings local time, manager is LZ1KVV, Box 90, Sofia. WD4USA on from the National Democratic Convention, Miami Brach Florida during the week-end of July 10 to 13 asks for QSLs to be sent via Box 501, Miami Beach, Fla., 33166, U.S.A. Two more special stations from the States were WJ4ULY on Independence Day, July 4, QSL to W8TO or the bureau, whilst WR5OAR goes to WA5ZNY, and WS0EJ goes to Box 291, Omaha, Nebraska.

News to hand that Sam Rees, MP4TDM, is back in circulation once more in Ras-Al-Khaimah since June 6. He now has an improved signal since the introduction of a TH3-Jr. beam and has a regular sked with GW3-AHN on 14265 s.s.b. Fridays at 1800z. His manager is K1DRN.

Rado SM0EEJ has been operating as YU-3GP/P from Dalmatin Is. quite regularly in the 15 metre band on about 21289, usually around 0800z or later. All QSLs should be sent to his home QTH.

That's about all I have in hand this month. My thanks to I.S.W.L. members and Geoff Watts for details.

* P.O. Box 222, Penrith, N.S.W., 2750.

Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

Editor "A.R.," Dear Sir,

May I add to the remarks of VK1AU re inadequacy of the 5 w.p.m. Morse test which, if adopted, I would suggest should confine the licence to c.w. operation until such time as 15 w.p.m. was attained.

Regarding an extra class licence, this would be a good starting point for those intending to enter the final education for a commercial licence, a good reference to a prospective employer, and most importantly, the great number of Amateurs who desire a goal for their advancement in the Amateur Radio fraternity.

—Kel Phillips, VK4OD.

Editor "A.R.," Dear Sir,

It is with gratification that I read in Don Grantley's "You and DX" in the July issue of "Amateur Radio" his para on Intruders, and his method of dealing with them.

This coincides with my contention, and my letter in the January 1972 issue reference the formation of a "QRM Brigade". It is good to know that others have the same opinions and it is interesting to learn that some Amateurs are actually taking the matter further in so far as acting on the suggestion laid down.

There are a few dedicated members in Australia who are having great success in QRMing these Intruders and moving them off the bands; at the same time they are having fun in doing it and a lot of satisfaction too.

—Alf Chandler, VK3LC,
Intruder Watch Co-ordinator, W.I.A.

A correspondent in VK3 (name and address supplied) complains of the injustice being done to the image of Amateur Radio by a minority of operators on the local Ch. 1 Repeater. He lists some most undesirable examples as—

1. Swearing on the air.
2. "———" copper behind him.
3. Telling a schoolboy operator unsuccessful with CQs to "knock it off" and "one call every five minutes is enough".

Believing most of the breaches occur through thoughtlessness rather than deliberate self-destruction, he offers the following suggestions:

1. Do not use bad language on the air.
2. If you have nothing to say, keep quiet.
3. If you do have something to say, do not be long-winded about it.
4. Don't discuss driving problems, thus making the obvious even more obvious.
5. Encourage school clubs, etc.
6. Only use Ch. 1 if you cannot use a simplex channel.

He ends by saying that Repeaters are a great asset to Amateur Radio, but let our operating ability match our technical knowledge.

Ionospheric Predictions

With Bruce Bathols, VK3ASE **SEPT. '72**

The predictions for Sept. from charts, Series P, supplied by the I.P.S.D. are listed below.

As from next month, it is hoped to supply greater detail in the predictions, as a new type of chart in numerical form, and produced by computer, has been devised by the Ionospheric Prediction Service.

The predictions for this month are much the same as for the last month. However, the M.U.F. is showing a gradual increase, with the result that a little more activity is possible in the 10 metre band.

It should be noted that these predictions are workable for at least 50 per cent. of the month —but not all days.

VK4 is Townsville, VK0 is Macquarie Island.

All times stated are now G.M.T.

28 MHz.—

VK1/2	to	W6		minus 2 2300 plus 2
VK3	..	JA		minus 2 0100 plus 2
VK4	..	KH6		2200-0600
VK5	..	JA		2300
VK6	..	SU		0700

21 MHz.—

VK1/2	to	8P	S.P.	2000-0700
..	..	8P	L.P.	minus 1 2200 plus 3 1000
..	..	VE3	S.P.	2000-0100
..	..	VE3	L.P.	2300
..	..	W6		1900-0500
..	..	PY		minus 2 2400 plus 2
..	..	ZS		0500 plus 5
..	..	VU		0100-1100
VK3	..	VK0		minus 1 0300 plus 3
..	..	JA		2000-0900
..	..	G	S.P.	0600-1100
..	..	G	L.P.	2100, 0800
..	..	UA		0300-1100
VK4	..	KH6		2000-1300
VK5	..	JA		2100-1200
VK6	..	W1		2300 plus 2
..	..	ZS		0400-1200
..	..	SU		0300-1300

14 MHz.—

VK1/2	to	8P	S.P.	2000-0900, 1000-1400
..	..	8P	L.P.	2000-0100
..	..	VE3	S.P.	1200-1700, 0400
..	..	VE3	L.P.	2100-0300
..	..	W6		0100-1200, 1500-1900
..	..	PY		2000-1300
..	..	VK6		2300-0900
..	..	ZS		0300-1400
..	..	VU		0900-0100
VK3	..	VK8		2100-1000
..	..	VK0		2100-1000
..	..	JA		2100-1800
..	..	G	S.P.	0800-1900, 2100 plus 3
..	..	G	L.P.	2000-0200, 0700-1300
..	..	UA		0800-1800
VK4	..	KH6		0400-1600, 2000
VK5	..	JA		0600-1800, 2100-0100
VK6	..	W1		1200-1900, 2100-2300
..	..	ZS		0100-1700
..	..	SU		1300-2000, 2300-0300

7 MHz.—

VK1/2	to	8P	S.P.	0600-1100
..	..	8P	L.P.	2100
..	..	VE3	S.P.	0700-1200
..	..	W6		0700-1300
..	..	PY		0700-0900
..	..	VK6		0800-2200
..	..	ZS		1500-2100
..	..	VU		1200-2100
VK3	..	VK8		0800-2200
..	..	VK0		0700-2100
..	..	JA		0700-1700
..	..	G	S.P.	1600-2100
..	..	G	L.P.	0700
..	..	UA		1300-2100
VK4	..	KH6		0700-1700
VK5	..	JA		0900-2100
VK6	..	W1		0900-1200
..	..	ZS		1500-2400
..	..	SU		1500-2300

Smoothed monthly sunspot number predictions for Sept. 55, Oct. 53, Nov. 51, Dec. 49.

—Swiss Federal Observatory, Zurich.

VHF UHF

an expanding world

With Eric Jamieson,* VK5LP

Closing date for copy: 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK1	144.475	VK1VF, Canberra.†
VK2	52.450	VK2WI, Dural.†
VK3	144.700	VK3VE, Vermont.
	144.925	VK3QZ, Traralgon.†
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Albany.
	145.000	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
	145.250	ZL2VHP, Palmerston North.
	431.850	ZL2VHP, Palmerston North.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

† Denotes additions or alterations this month.

Included with the beacon list this month are the new beacons for VK1 and VK2. It appears almost certain these will be in operation by the time you read these notes so they are included. With their inauguration this now gives Australia wide beacon facilities. The VK1VF beacon is a solid state device running 15 watts to a BLY89 transistor and omni-directional antenna. The VK2 beacon operates with an m.c.w. ident. at 30-second intervals at 7 w.p.m. The call sign is not confirmed at this stage. The companion 2 metre beacon may be delayed for a while until a new tower is erected at Dural to accommodate the various antennae anticipated for repeaters, beacons, etc. The Eastern Zone of VK3 beacon is off the air for a period having an overhaul, but should be operational by Dec. from Traralgon and running 10 watts with a new call sign VK3QZ, that of the custodian of the beacon. It is anticipated the new beacon will be running higher power and A1.

The former Mt. Barker 2 metre beacon VK6VE is now operational from a site about 100' a.s.l. three miles from Albany and should now be sited much better propagationally! Four element beams are pointing on Perth and Adelaide and are 35 feet high. Later it is hoped to change these to 10 element beams, at least to Adelaide anyway. The beacon is on the air during the winter months from 0730 to 0030, and probably with continuous operation during the summer months.

The VK2 V.h.f. and T.v. Group have published elaborate details of recommendations for Amateur beacons. It is not proposed at this stage to discuss the various pros and cons of their recommendations in these notes, most of you will have read about them by the time this is published. However, there is one matter in which I personally am particularly interested and with the backing of plenty of VK5s as well. This is the matter of frequency allocations.

I quote from their disseminated material: "A 100 kHz. segment of each desirable band should be set aside (by gentlemen's agreement) **exclusively** for Amateur (Beacon) Service. This segment should be in a regularly tuned portion of the band, i.e. 400-500 kHz. from the (low) band edge. This ensures that all with tuneable equipment can tune the beacon segment. Putting beacons in areas where nobody tunes is pointless. Each beacon can be assigned a frequency which will be exclusive although channel sharing is permissible in certain cases. Future expansion has been allowed for as adequate channels for allocation to existing and proposed beacons. It also allows for simple equipment for checking band openings. With the increasing use of tuneable equipment covering 500 kHz. segments only, this enables these operators to make use of the beacon service."

* Forreston, South Australia, 5233.

May I make the following comments. (1) Because modern transceivers tune in 500 kHz. segments is no justification for setting up beacons in the first 500 kHz. of either the 6 or 2 metre band. There is plenty of activity between 52.400 and 52.500 MHz. during the DX season and just enough operation there at other times to foul up a receiver when someone is trying to monitor a distant beacon. The same applies, in VK3 particularly, on 2 metres where stations are spread right up to 144.500 and beyond (check Ron VK3AKC's frequency!). The 500 kHz. equipment so mentioned does not tune only one such segment. Most transceivers cover the full 28 MHz. band for the sake of purchasing an extra crystal or two, and the only effort to check for beacons between 144.500 and 144.600 is the flick of a switch! They will then be on the low end of the tuning range of the next segment anyway, the area which is most tuned by the DX types, so if you are hunting around 144.000 to 144.100 for weak signals, flick the switch and you can hunt away amongst the beacons!

(2) The type of person most likely to make use of the beacons is hardly likely to confine himself to only 500 kHz. of any band, so another segment will not worry him, and there will be plenty of time to turn that switch if he is the DX type because it is not uncommon to monitor a weak signal for an hour or more waiting for modulation content to rise out of the noise!

(3) Yagi antennae are still quite efficient up to 144.600 even when cut for the low end of 2 metres, so there will not be much gain loss difference between 144.500 and 144.600.

(4) Mixing and overload problems for those living close to powerful beacons (and they can be very powerful in good locations with line-of-sight conditions) tend to be reduced with every increase in frequency away from the operating area—and this is a very valid point which a few people might consider very seriously, particularly if you have not lived in an area experiencing such problems; the areas which have not had beacons before are those with the least idea of just what can be involved in these matters.

(5) Those operators who **must** use only a 500 kHz. segment of a band other than 28 MHz. for tuneable i.f. purposes need not despair, the addition of an extra crystal which can be switched into the converter oscillator circuit will still allow the second 500 kHz. segment to be tuned. I have used this idea for years on 6 metres to allow me to tune either 52 to 54 MHz. or 51 to 53 MHz.—no problems!

That will be enough on the matter for now to start some rumblings, and I don't mind receiving your correspondence on the subject. If you have something satisfactory to say, you might get into print!

CONTESTS AND V.H.F.

Further to my comments re v.h.f. participation in contests (June "A.R."), Geoff VK3YER advises the VK3 V.h.f. Group have discussed the matter and agreed there should be two sections in the National Field Day in February, (1) h.f. and (2) v.h.f. They add that v.h.f. operators are only competing against each other and are more likely to be recognised in the form of a place in the results as a reward for their efforts. Their views are being forwarded to the Federal Contest Committee chairman, Peter VK4PJ. Would other Groups like to talk about it and pass on their views? Similar thoughts might well apply to the Remembrance Day Contest, particularly if v.h.f. entries had a separate scoring system, and the result added to the States total. Very interesting!

METEOR SHOWER CONTACTS

Wally VK5ZWW reports quite a burst of activity during the Aquarids meteor showers from 26th to 31st July. Rod VK2ZQJ had daily contacts with Joe VK7ZJG between 0600 and 0630 and Wally then had a turn with Joe from 0630 to 0700. Wally advises that with his 9 element beam pointing mid-way between Sydney and Launceston he could often hear both sides of the contacts between Rod and Joe, and has some copy on tape. These 6 mx contacts to VK7ZJG were mostly very good, and extending after the shower had set. All this has resulted in Joe furiously taking up the construction of s.s.b. equipment.

Will this grind to a halt in September when Joe walks up the aisle to receive the fetters of marriage to Mary? Best wishes to you both, there will be those hoping Amateur Radio will not cease from now on. Wally also mentions working Ian VK7ZIF in Hobart, and his attempts to work David VK3ANP has resulted in David re-building his transverter!

NEWS FROM NEW ZEALAND

David ZL4PG advises there will be at least four Amateurs operating from ZL4 this coming DX season on 6 metres: Stan ZL4MB, Peter ZL4LV, Bernie ZL4IS and David ZL4PG. Operation will be outside t.v. hours, which means up to about 1130 EST. David and Bernie are considering a portable operation just after Christmas and will advise details later. This should all be good news from the rather rare ZL4 district and means more chances for VKs to secure another call area. David also mentions quite an upsurge in interest in 144 MHz. s.s.b. and advises a national calling frequency in New Zealand of 144.200 MHz.

ANTENNA TESTING

Much interest is centered on the VK3 V.h.f. Group antenna testing day on 27th August. Equipment will be available to test on 52, 144, 432 and 576 MHz., for gain measurement and possibly s.w.r. If someone could be persuaded to prepare a full-sized article for "Amateur Radio" outlining details of the best antennae in each class and section it would be of considerable value to VK Amateurs. Results of previous such antenna days have always made interesting reading and many are showing interest in Swan and Quad Yagis, which are receiving all the publicity at present.

That's the news for this month. We are slowly passing out of the winter v.h.f. doldrums for brighter things to come. Ending with the thought for the month: "A skilful politician is one who can stand up and rock the boat and make you believe he is the only one who can save you from the storm.'

Magazine Index

With Syd Clark, VK3ASC

"73" Magazine—May, 1972

SSTV Monitor the Easy Way; A 40w. 6 mx FM/CW Mobile Transmitter; Quick Band-Change Mobile Antenna; A Hi-Fi IC for Amateur Modulators and Receiver Audio (Philips TAA300); How to get the stuff into the House; Anti-CW Autostart; IC TV Sync. Generator; Radio Astronomy and Amateur Radio (Part 1 of two).

"SHORT WAVE MAGAZINE"—May 1072

Self Protecting Stabilised Power Supply Unit (6-18v. at 1.5a.); Low Pass Filter for Audio; Practical Electronic Keyer.

"AUSTRALIAN E.E.B."

Readers are asked to note that Leo Gunther, VK7RG, is again publishing his excellent little magazine. Subscription is a modest $1.55 for six issues. Enquiries should be made to P.O. Box 177, Sandy Bay, Tas., 7005.

CONTESTS

With Peter Brown,* VK4PJ

I hope you enjoyed the Remembrance Day Contest and are looking forward to next August. Don't forget to let me have your comments even if it is just an okay. If your log is not on the way, get cracking!

Now that you have the set running warm give it another run and help fly the Australian flag in the VK/ZL Contest. We can do with some additional entries over last year. To my mind this is a pretty good all round contest and for those who have yet to get D.X.C.C., you get quite a few new countries.

It is a pity that the R.S.G.B. 21/28 MHz. Phone Contest is on the same date. This is a contest that I have enjoyed for some years, but conditions are not good from this QTH for 10 metres, although I have heard VK6s working Gs with ease, and on 15 metres it is hard to break through the Japanese operators who participate strongly. At least you can be sure that there will be some Gs on 15 metres, and possibly 10 metres.

Take a look at these dates—

Oct. 7 1000z to 8th 1000z—Phone, VK/ZL Contest.

Oct. 7 0700z to 8th 1900z—Phone, R.S.G.B. 21/28 MHz. Contest.

Oct. 14 1000z to 25th 1000z—C.w., VK/ZL Contest.

Oct. 21 to 22—C.w., R.S.G.B. 7 MHz. Contest.

Oct. 28 to 29—Phone, "CQ" W.W. DX Contest.

Nov. 25 to 26—C.w., "CQ" W.W. DX Contest.

Dec. 9 to Jan. 21, 1973—V.h.f., Ross Hull Memorial Contest.

Feb. 10 and 11, 1973—Phone/C.w., John Moyle Memorial National Field Day Contest.

October is a real contest month.

February seems to be a long way off—but it is later than you think. What stage have you reached in planning for the 1973 National Field Day? Your team, location, accommodation, food, and equipment? If you have the necessary there are no problems, but if you have to obtain all or part you had better start now—some alternative locations too. If you have never been on a field day and wish to go, it is your next move. At this time I am considering that fixed stations should be separate from mobiles, as a section. Do you agree?

Ross Hull V.h.f./U.h.f. Contest.—I am hoping that you have some suitable gear and will be putting in a log for the 1972/1973 contest.

By now the VK2 V.h.f. and T.v. Group's Contest will have finished. I did not have opportunity to comment last month. I hope all enjoyed themselves. I consider that local contests, provided that they do not detract from major contests, have quite a value. In my case I look forward to the VK4 Sunshine State Jack Files Memorial Contest as it is a good opportunity to meet so many friends I would not otherwise meet on the air, as most contests do not cater for contacts within call areas.

A contest just finished is the N.Z.A.R.T. 80 metre Memorial Contest. This is a two-evening (four hours each) contest and quite a few VKs join in and are made welcome. I will remind you next year.

As time permits I will write for details of other overseas contests. Let me know of those in which you have an interest. The European phone DX Contest is on the 9th and 10th Sept. No details. I have details of the OK Phone/C.w. DX Contest which takes place on the second Sunday in November, 0001z-2400z, and will be pleased to forward details to you if interested.

Again **Please don't forget** to enter the VK/ZL Contest. Key club members should boost the c.w. section this year.

Stop Press.—1971 "CQ" W.W. DX Phone Contest single operator all-band top scorer was 6D1AA with 3,541,714 points; fourth was VK6HD with 2,911,224 points. 6th on 28 MHz. was VK9XK and 2nd on 7 MHz. was VK6CT. In the WPX Honour Roll, no VK is listed in the top 30 on mixed (1162 is the top), none in the tops for s.s.b. (1075 heads the list), and only VK3AHQ in the top 20 on c.w. (950 is tops here). (August "CQ")

* Federal Contest Manager, Box 638, G.P.O., Brisbane, Qld., 4001.

KEY SECTION

With Deane Blackman,* VK3TX

I hope you had an enjoyable R.D.

I have been frustrated in a few QSOs recently with mobiles on 160 mx because they had not equipped their elegant h.b. gear with a b.f.o. This set me researching, and while I knew the Marine Service on 600 mx, where there is not much more bandwidth than we enjoy in our 160 mx band, use A2 (m.c.w., if you like), the I.T.U. regulations only forbid A2 above 4 MHz. Not everyone uses a transceiver on 80 mx, practically nobody does on 160 mx, not to mention those who listen to these bands using transistor broadcast receivers. And m.c.w. could solve my problem very nicely. The regulations presently permit m.c.w. on the Amateur bands above 52 MHz. So, if anyone has thoughts one way or the other of the idea of allowing m.c.w. on 160 and 80 mx, I would be interested to hear from you.

I have been asked several times on the air what you must do to join the Key Section. The full rules appeared in "A.R." for November 1971, complete with printing errors, but in brief you must have 50 c.w. QSOs lasting at least 15 minutes, all obtained since 1st Jan., 1971. The 50 stations must all be different and at least 25 of them must be VK. Send your application to me, or if you prefer, to your Divisional Key Section Co-ordinator, who will QSP. Now you know, you can get right on applying.

* P.O. Box 382, Clayton, Vic., 3168.

DIVISIONAL NOTES

SOUTH AUSTRALIA

All quiet on the headquarters front, the local Council must have appointed a sub-committee. Sub-committees are popular items, the Interference Committee has been reformed under the chairmanship of Peter VK5ZPS to provide technical expertise in methods of dealing with interference from Amateurs to consumers' equipment such as t.v., tape recorders, p.a. systems, etc., and also interference to Amateurs from other sources. This service is expected to supplement the Amateur's own knowledge when the going becomes difficult.

No one can be an expert on tx, rx, aerials, operating, v.h.f., slow scan, teletype, etc., and interference as well, so specialisation is obviously necessary. This committee should do well, it has a fair sprinkling of experts, both by accident and design.

The Broadcast Committee has also been formed to maintain the Sunday morning broadcasts. The load is now spread to enable operators and editors to share the somewhat difficult task of compiling an interesting broadcast of the required quality. The format pioneered by previous VK5WI operators such as Harry VK5MY and Colin VK5XY has been maintained by Jim VK5NB and the present compilers Adrian VK5AV and Kevin VK5ZKT.

The sharing of the load should enable a reasonably smooth transition to operating from our future headquarters, when a roster of operators will become necessary. The use of the repeater on 2 mx f.m. should enable a quality broadcast to be heard widely, and comments on its effectiveness will be appreciated.

Please don't forget to send the R.D. logs in early as it helps our State and the Contest Manager. While on the subject of contests, the postponed VK5 intrastate contest is on 1st October—this is a reminder. 73, Bart VK5GZ.

REPORTED STOLEN

Yaesu FTDX-400 Serial No. 68111188 whilst under transport from Adelaide to Port Moresby. Information please to VK9EJ, ex-VK5EJ, c/o. P.O. Box 1486, Lae.

AWARDS COLUMN

With Geoff Wilson,* VK3AMK

New Award: The New Zealand Association of Radio Transmitters Inc. (N.Z.A.R.T.) are issuing the **"British Commonwealth Games Award"** to help promote the Commonwealth Games to be held in Christchurch between January 24 and February 2, 1974. The ZM prefix will be available to New Zealand stations from June 3, 1972, until February 2, 1974.

Rules: 1. QSO with one station in Christchurch (venue of 10th British Commonwealth Games) and in addition with one station from each of the four districts in New Zealand—ZM1, ZM2, ZM3, ZM4 **plus** one British Commonwealth station from each of the three I.A.R.U. Regions.

2. Send list of stations contacted (QSLs not required to be held) certified by two other Amateurs with four IRCs to Award Manager, Box 1733, Christchurch, N.Z. Award will be posted by airmail.

3. New Zealand stations may use the prefix ZM instead of ZL during the period 3rd June, 1972, to 2nd February, 1974, and so this will be the duration of the award.

Region I. Countries: England, Gambia, Ghana, Gibraltar, Guernsey, Jersey, Kenya, Malawi, Malta, Isle of Man, Mauritius, Nigeria, Northern Ireland, Scotland, Sierra Leone, Swaziland, Tanzania, Uganda, Wales, Zambia. Region II. Countries: Antigua, Bahamas, Barbados, Bermuda, British Honduras, Canada, Ceylon, Dominica, Grenada, Guyana, Jamaica, St. Vincent, Trinidad and Tobago, Windward Islands. Region III. Countries: Australia, Brunei, Fiji, Hong Kong, India, Malaysia, Papua-New Guinea, Singapore.

AUSTRALIAN D.X.C.C.

Deleted Country: KR6, 8—Ryukyu Islands (Okinawa). D.X.C.C. Credit will only be given for KR6, 8 as a separate country where contacts took place prior to 15th May, 1972. Stations located in the Ryukyu Islands have now been allocated the prefix JR6, U.S. Military personnel will use the prefix KA6. From 15th May, 1972, JR6 and KA6 count as for JA—Japan.

All D.X.C.C. members claiming KR6, 8 have had their totals amended accordingly.

"W.A.V.K.C.A." AWARD

The following stations have received this award during the period 1st July, 1971, to 30th June, 1972:

Cert. No.	Call	Cert. No.	Call	Cert. No.	Call
486	ZL4BO	501	G3LPS	515	UK5KAA
487	VE7TL	502	JH1MTR	516	UA6KAE
488	I3RC	503	JA8ARA	517	UT5HP
489	WB6SFA	504	JA0COV	518	UA0LH
490	JA5MG	505	C21AA	519	W3ZUH
491	JA3FD	506	K6IPV	520	SM5BNX
492	JA6YAF	507	ZL2GJ	521	K0PMZ
493	I1SF	508	ZL1AIW	522	SP3DOI
494	VE3FES	509	JA3QOQ	523	LA2B
495	UA0DG	510	UA0FD	524	KL7HDB
496	UF6CR	511	UK2BBB	525	W7JJI
497	UA0DL	512	UW0IQ	526	JA1XIQ
498	UK3AAO	513	UA0ZS	527	JA1FGB
499	DJ4PI	514	UA0ZB	528	ZL2BCJ
500	JH1JGX			529	G3KYF

* 7 Norman Avenue, Frankston, Vic., 3199.

NEW CALL SIGNS

MAY 1972

VK3BL—C. E. Middleton, 7 Shamrock Ave., Cheltenham, 3192.
VK3RD—H. V. Amor, 16 Konrad St., East Bentleigh, 3165.
VK3AFF—J. D. Williamson, 7 Menzie Gr., Ivanhoe, 3079.
VK3AFL—Aust. Air League Lilydale Squad, Community Centre, Castella St., Lilydale, 3140.
VK3AMC—J. R. Caldwell, 5 Frank St., Doncaster, 3108.
VK3AMR—Monash University Radio & Electronics Club, University Union, Monash University, Wellington Rd., Clayton, 3168.
VK3AYH—H. S. Young, 60 Orange St., South Oakleigh, 3167.
VK3AYL—N. J. Boyle, 37 Shakespeare Ave., Preston, 3072.
VK3BGR—G. R. Boyle, 37 Shakespeare Ave., Preston, 3072.
VK3BHP—H. W. Poxon, 1 Mountain Ave., Frankston, 3199.
VK3CCM—L. Morcinek, 374 Balwyn Rd., North Balwyn, 3104.
VK3WIA/R6—Wireless Institute of Australia, Station: Rooks Rd., Vermont, 3133; Postal: 478 Victoria Pde., East Melbourne, 3002.
VK3YGQ—J. J. Sadauskas, 28 Gardenia Rd., North Balwyn, 3104.
VK3YGX—I. M. Wiseman, 1207 Mair St., Ballarat, 3350.
VK3ZAK—Scoutair Bendigo, Londonderry Reserve, Vine St., Bendigo, 3550.
VK3ZGQ—P. W. Duddy, 2/18 Holroyd Ave., Balaclava, 3163.
VK3ZOK—K. F. Baxter, 1A Buttler St., Essendon, 3040.
VK3ZTL—A. J. Cox, 1 Inverell Ave., Syndal, 3149.
VK3ZVE—L. K. Curling, 24 Brougham St., Box Hill, 3128.
VK3ZVJ—J. D. Hunt, 7 Tiffany Ave., Cheltenham, 3192.
VK4AX—A. G. Nunn, 26 Waratah Dr., Clontarf, 4019.
VK4EO—R. S. Rice, 119 Ridge St., Northgate, 4013.
VK4GM—G. L. Adams, 81 North St. Extended, Rockhampton, 4700.
VK4IA—N. J. Walden, 8 Kruger St., Ipswich, 4305.
VK4NE—R. P. Jonasson, 16 Poinciana St., Kingston, 4205.
VK4OK—J. B. Grimes, "Wirra," Banana, 4715.
VK4QI—E. C. Roberts, 39 Amaroo Close, Gleden, Gladstone, 4680.
VK4XH—E. R. Hardman, 226 Broadwater Rd., Mt. Gravatt, 4122.
VK4ZAF—D. I. Marshall, 23 Karowara St., The Gap, 4061.
VK4ZRT—R. G. Gralow, 4 Sneyd St., Mackay, 4740.
VK5IU—K. C. Barroll, C/o. Waikerie Gliding Club, Waikerie, 5330.
VK5LM—L. M. Earl, P.O. Box 23, Mallala, 5502.
VK5LX—M. J. Bloodworth, 16 Pamela Dr., Para Hills, 5096.
VK5NQ—C. R. De Combe, C/o. Superintendent, Reg. & Lic., Eng. Div., 30 Flinders St., Adelaide, 5000.
VK5ZN—C. J. W. Cook, 28 North Pde., Kingswood, 5062.
VK5ZCP—P. L. Christie, 20 James St., Adelaide, 5000.
VK5ZFG—G. C. Fisher, 177 Shepherds Hill Rd., Eden Hill, 5050.
VK5ZTS—T. Scholten, 175 Lacey St., Whyalla, 5600.
VK5ZTW/T—T. J. Lloyd, 21 Somerset Ave., Cumberland Park, 5041.
VK6RQ—R. A. Gray, Station: Admiralty Gulf; Postal: 37 Dudley St., Midland, 6056.
VK6XE/T—W.A. Institute Technology (Dept. Electrical Engineering), Hayman Rd., South Bentley, 6102.
VK6CIL—P. H. Long, Station: Portable; Postal: 150 Woodford Rd., Elizabeth North, S.A., 5113.
VK6ZHR/T—R. K. Henderson, 85 Flora Tce., North Beach, 6020.
VK6ZJK—J. Kemp, 29 Leverburgh St., Ardross, 6153.
VK7ZAQ—G. E. Rand, 185 Tarlton St., East Devonport, 7310.
VK7ZIE—I. E. Ellings, 28 Turton St., Devonport, 7310.
VK9KE—T. J. Fishpool, C/o. P. & T., Burns House, Port Moresby, P.
VK9ZDG—E. Guthrie, P.O. Box 301, Rabaul, N.G.

☆

LICENSED AMATEURS IN VK

MAY 1972

	Full	Lim.	Total
VK0	6	1	7
VK1	92	28	120
VK2	1387	529	1916
VK3	1321	674	1995
VK4	531	207	738
VK5	517	215	732
VK6	364	137	501
VK7	153	67	220
VK8	35	12	47
VK9	90	14	104
	4496	1884	6380 Grand Total

SILENT KEYS

It is with deep regret that we record the passing of—

VK2DI—G. F. Cole
VK2FQ—C. H. Collinge
VK3LZ—C. A. Ellis
VK3ZGD—A. C. Stebbing
VK4GG—G. Heilbronn

A DX'ERS NIGHT-TIME MUSE

(or an Insomniac's Lament)

Lo, it is night and half the world sleeps,
In ignorance; but DX sweeps,
Through great spans of space and falls,
Like symphonies from vasty music halls.

A thousand swinging keys discordant bawl,
Greet each stanza from a rare exotic call,
As Hams shout on in passionate ferment,
All this I hear and listen, in content.

Straining ops perform with speed "uptight",
To make their QSOs 'ere day's first light,
Robs them of their sweet and global game,
To which the night gave sound and name.

The cock crows and notes begin to fade,
Into spaces' pre-dawn muted glade.
Like violins tucked away, the signals go,
And I sit alone at the Radio.

—Alan Shawsmith, VK4SS.

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- Exceptions only by PRIOR arrangement.

For full details see January 1972 "A.R.." page 23.

FOR SALE

Townsville, Qld.: Two 522 Tx VHF 832A. Best offer. 6 Robinson St., Belgian Gardens, 4810.

Oatley, N.S.W.: AR88LF and 20-40-80 mx SSB Tx, 6DQ5 output, full working order, $200 or sell separately. VK2BSG, QTHR, Ph. 57-8705.

Gove, N.T.: Inoue 700 solid state Rx, Tx and 240v. AC/12v. DC PSU/Spkr. unit. Cables and manuals. 1969 model, spare tx tubes. As new. Air freight free to Darwin. $350. Write VK8KG, QTHR.

Rosetta, Tas.: Swan 500, 14XDC/230XAC PSU, 14XDC never used. Neg. earth. Accept Aust. AC PSU suit SW500 part payment. Sell 14XDC separately if necessary. Price, details, VK7TR, 160 Marys Hope Rd., Rosetta, Tas. Ph. 72-8606.

Greenwich, N.S.W.: $525 o.n.o. for Galaxy GT550 with P/S and remote VFO. VK2AGO, QTHR. Ph. (02) 43-2427 A.H.

Hobart, Tas.: Power Transistors OC24 Mullard 15w. PNP, brand new, original packaging, top grade, 60c ea. or five for $2.50. Encl. 7c stamp. Write VK7TA, QTHR.

Townsville, Qld.: Channel Master Antenna Rotator complete including cable and new alignment bearing. Suit v.h.f. beam, $30. VK4FO, QTHR.

Brisbane, Qld.: Collins 75A4 Receiver in almost immaculate condition with instruction book. VK4FP, QTHR.

Sydney, N.S.W.: Three 4CX250B Valves and one socket, $25, as new. Will sell valves separate, $6. VK2ZAH, QTHR, Ph. (02) 47-4421.

Woodlands, W.A.: 3CX100A5/7289 Eimac, brand new, factory sealed pack, $10 plus reg. post. VK6NE, N. Penfold, 388 Huntriss Rd., Woodlands, W.A., 6018. Ph. 092463232.

Melbourne, Vic.: Swan 500C and Power Supply, FLDX-2000 Linear. Ph. Bus. 24-1231, A.H. 20-6135.

Footscray West, Vic.: Trio 9R-59 Rec., 9 tubes, 0.55 - 30 MHz., S meter, ANL, b/spread, Q mult., inst. book, good cond., $60. VK3ZM, QTHR. Ph. 689-3135 (A.H.).

WANTED

Melbourne, Vic.: Johnson Match Box. Also small oscilloscope or home brew device suitable monitoring output signals. Ph. (03) 85-4952 or write 80 Hill Rd., North Balwyn, Vic., 3104.

Glenroy, Vic.: Modulation Transformer with multi-tap prim./sec. and power capacity 60 watts, typically Woden UM2 or UM3. Peter Simpson, VK3ZWG, QTHR. Ph. (03) 306-5456.

Mordialloc, Vic.: A.R.R.L. Handbook 1968, xtal 8161.5 kHz. or near, Hallicrafters S40 or similar. Details and price to VK3ZFI, QTHR, Ph. (03) 90-5347.

Melbourne, Vic.: 1922 (or 1st) call sign list/booklet of VK licensed experimenters and call signs for copying or photocopy thereof. Please contact Business Manager.

For DU7ER, Philippines: Schematic for AMR-101 Rcv. A.W.A., SC-CD-412-44-2352 and PSU 4H13501. Reply to Editor please.

Balaklava, S.A.: Swan 500C with 14-230 AC-DC Power Supply, new or mint condition. State price, model (cash). VK5CY, QTHR.

Melbourne, Vic.: Trio External VFO-5 for TS500 Transceiver. VK3BCY, QTHR. Ph. (03) 848-4775.

Buronga, N.S.W.: Front and/or rear covers for A.W.A. BS50A base station. VK2ZVJ, QTHR.

Geelong, Vic.: FT200 or similar Tcvr. with AC Power Supply. Must be A1 cond. with manual. VK3ANR, QTHR, Ph. (052) 9-9966.

Toukley, N.S.W.: 9 MHz. Crystal Filter with USB and LSB xtals. Also Yaesu sideband generator assy. Will buy or swap for high-band Carphone Jnr. with transistorised PSU or low-band MR20A complete with all accessories. VK2GP, C/o. 23 Yaralla Rd., Toukley, N.S.W., 2263.

Sandringham, Vic.: 2 mx FM Receiver (240v.). Price and information to B. Boyce, 146 Abbott St., Sandringham, Vic., 3191.

Melbourne, Vic.: Oscillator Box BC348, Model R, or BC348-R for wrecking. VK3YAZ, QTHR, Ph. (03) 25-2689.

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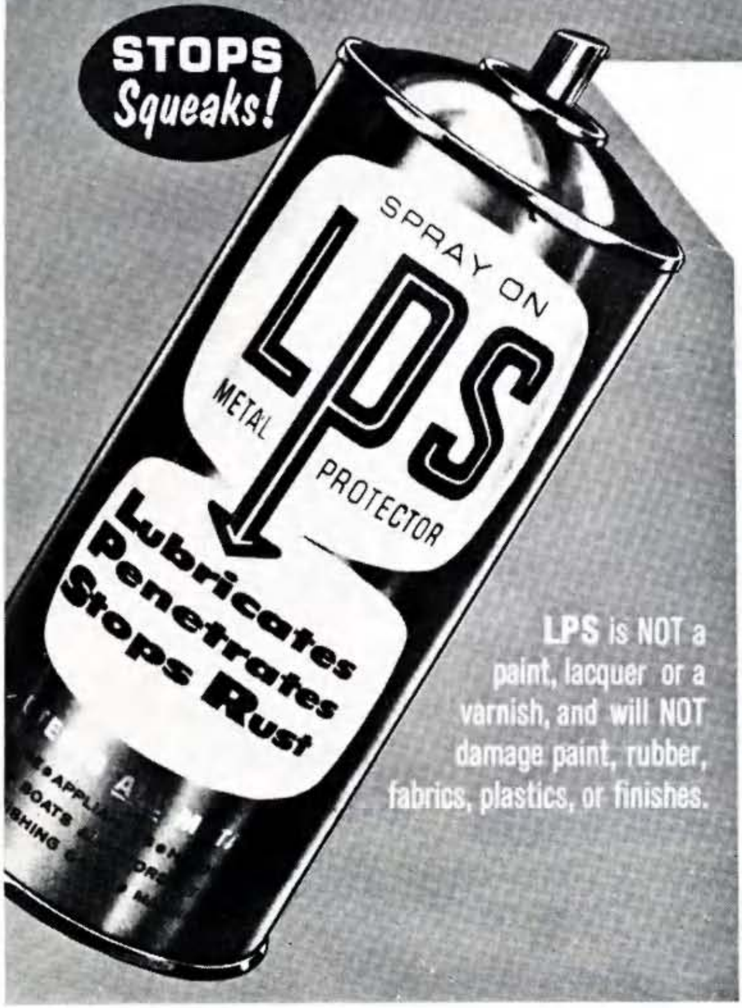

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Dielectric Strength per ASTM D-150:
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Dielectric Strength volts/inch, 320,000 volts.

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Mil. Spec. C-23411, Passed.

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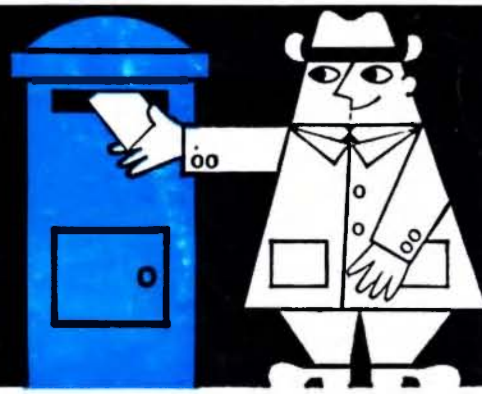

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A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.012, 0.3, 6, 60, 600, 12A.
OHMS: 1 Ω to 20 MΩ in 4 ranges.
SIZE: 7" x 5¼" x 2½".
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MODEL SK7: 4K O.P.V.
D.C. V.: 10, 50, 250, 1,000.
A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 0.25, 10, 250.
OHMS: 10 Ω to 2 MΩ in 2 ranges.
SIZE: 4⅞" x 3½" x 1½".
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MODEL M303: 30K O.P.V.
D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 2".
PRICE: **$17.50** + 15% sales tax.

MODEL SK120: 20K O.P.V.
D.C. V.: 0.6, 3, 12, 60, 300, 1,200.
A.C. V.: 6, 30, 120, 300, 1,200.
D.C. mA.: 0.06, 6, 60, 600.
OHMS: 2 Ω to 8 MΩ in 4 ranges.
SIZE: 5¾" x 3¾" x 1¾".
PRICE: **$14.50** + 15% sales tax.

MODEL F75K: 30K O.P.V.
D.C. V.: 0.25, 2.5, 25, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500.
D.C. mA.: 0.05, 10, 250.
OHMS: 1 to 8 megohms in 3 ranges. Inbuilt Signal Injector.
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MODEL TP5SN: 20K O.P.V.
D.C. V.: 0.5, 5, 50, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 5, 50, 500.
OHMS: 0.5 MΩ in 4 ranges.
PRICE: **$15.00** + 15% sales tax.

MODEL 500B: 30K O.P.V.
D.C. V.: 0.25, 1, 2.5, 10, 25, 100, 250, 500, 1,000.
A.C. V.: 2.5, 10, 25, 100, 250, 500, 1,000.
D.C. mA.: 0.05, 5, 50, 500; 12A.
OHMS: 1 Ω to 8 MΩ in 3 ranges.
PRICE: **$25.00** + 15% sales tax.

MODEL MVA5: 20K O.P.V.
D.C. V.: 5, 25, 50, 250, 500, 2,500.
A.C. V.: 10, 50, 100, 500, 1,000.
D.C. mA.: 2.5, 250.
OHMS: 1-6 MΩ in 2 ranges.
SIZE: 4½" x 3¼" x 1⅛".
PRICE: **$12.00** + 15% sales tax.

MODEL TS-60R: 1K O.P.V.
D.C. V.: 15, 150, 1,000.
A.C. V.: 15, 150, 1,000.
D.C. mA.: 1, 150.
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OCTOBER, 1972

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OCTOBER, 1972
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Copy is required by the third of each month. Acknowledgment may not be made unless specially requested. All important items should be sent by certified mail.

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CONTENTS

COVER

These two Cubs from the 1st Glen Waverley Group were caught getting in some early practice at a local Amateur shack for the 15th Jamboree-on-the-Air to be held on 21st-22nd October, 1972.

(Photo VK3ZU)

QSP

The Net Frequency Syndrome

One of the unique aspects of the Amateur Service is the ability of an operator to select his own working frequency within the allocated band. Most other Services are confined to spot frequency or net operation and it is only since the advent of s.s.b. on h.f. and carphones on v.h.f. that this net frequency type of operation has become popular amongst Amateurs. By its nature, net operation is a community affair and as such, certain disciplines must be exercised if all are to enjoy the benefits of the net. However, with people being people, there will always be someone to cause a disturbance by not abiding by the necessary disciplines—a "net nit". "QST" had something to say about this problem recently.*

"All of us take a crack at psychology at one time or another, in one way or another and in the case of deliberate repeater or simplex frequency interference we can look at it two ways. One is from the stand-point of the person causing the interference—a person whose sick mind is intent on attracting attention to himself in this manner. Just as the deliberate interference is irritating to those affected, **deliberate** and **studied** ignoring of it is irritating to the person doing it. Initially such an action will result in making it worse as the maniac intensifies his efforts to call attention to himself. Ignore him—don't even mention his presence on the air—don't even admit that you are hearing him. Creeping frustration will result and eventually, if you stick to your guns he will go away, possibly to cause interference elsewhere where he can get some attention—or perhaps ride naked down the street on a motorcycle.

"The second way of looking at the interference problem is from the stand-point of the people on the receiving end of the interference. The interfering operator may be called an idiot, a moron, an imbecile, is threatened, vilified and in every way possible is let know that his efforts to disrupt the net are being **successful**—this by operators on the net who want to call attention to **themselves**. For example, an operator may take over the net frequency and tell the interfering operator off, another invites him to call on the phone and even reverse the charges, still another offers to pay the interfering station so much an hour to stay on the air so that monitors can triangulate. This delights the interfering operator by satisfying his ego and at the same time makes the other operators feel big also because they are doing something about it. But what do these actions and reactions do for the public image of Amateur Radio?

"So if someone does get on a net frequency for the avowed and admitted purpose of causing interference, there are only two ways to get rid of him. First by ignoring him. If that doesn't work, perhaps monitors can be brought into the act. Neither of these methods is instantaneous and neither is foolproof, so the third thing to do is simply to grin and bear it, and remember that it takes all kinds of people to make a world—and Amateur Radio."

D. H. RANKIN, VK3QV,
Federal Vice-President, W.I.A.

* Adopted from "QST" for April 1972 with acknowledgments to W1NJM, W4IIA and W0CRO.

Stop Press: AO-C now due to be launched on October 15 or 16

COMMUNICATING: WHY NO "A.R."?

Amateurs seem to be notorious about communicating changes of address, call sign or other essential details to their Division and/or to "A.R." Each month an average of about 10 "A.R's" are "returned to sender" by the Post Office. When this occurs the mailing service is told to remove the address plate forthwith. It stays out until a new address comes to hand. Please advise any address, call sign or other changes promptly and indicate whether the change of address applies to "A.R." only or to the Call Book as well.

ANOTHER SPECIAL PREFIX

In a letter from A.R.S.I. advice is given that the Indian authorities have allocated an optional call prefix VU25 to Indian Amateurs for the period 15th August to 31st December, 1972, to mark the 25th anniversary of Independence.

HANDY BEARING CHARTS

William D. Johnston, WB5CBC, writes in an article to "A.R." about the availability of computer charts for forward and reverse bearings between any two or more places on the face of the globe. The present availability of great circle maps based on various Australian centres is good, but if anyone would like more details please write to the author at 1808 Pomona Drive, Las Cruces, New Mexico, U.S.A., 88001.

MICROWAVE BAND LETTERING

In response to the August QSP on this subject ("Those Lettered Bands"), VK2ZKQ writes about the confusion which exists in the lettering system in use. From the tables included with his letter, it seems desirable to talk about frequency ranges in terms of GHz. until the various ranges become specifically identified or universally accepted in abbreviated forms.

RECIPROCAL LICENSING

In clarification of the correspondence published in August 1972 "A.R.," page 17, the P.M.G. Radio Branch has confirmed in writing that the "attached statement" refers only to overseas applicants visiting Australia for a temporary period exceeding 12 months or who intend to settle permanently in Australia. It was also confirmed that visitors issued with a "temporary" period licence shall be subject to Australian terms and conditions applicable to the kind of licence (e.g. Full or Limited) they possess.

STUDENT EXCHANGE

Plans have been finalised with A.R.R.L. to send two Indian Radio Amateurs for training in the U.S.A. on Amateur Radio for a period of about six months. The trainees pay their own fares to and fro but "expenses in the U.S.A. will be arranged by A.R.R.L." on this first phase of the "pilot" scheme. (Indian Radio Amateur, Feb. 1972.)

Using the Plessey SL600 Series Integrated Circuits in Transceivers

JAMES M. BRYANT,* G8FNT

● **The SL600 series comprises r.f. and i.f. amplifiers with low cross-modulation and good a.g.c.; a.f. amplifiers with and without a.g.c.; high performance balanced modulators; speech a.g.c. generators; and a complex circuit containing a.m. and s.s.b. detectors and a c.w. operated a.g.c. system.**

This article describes some transmitters and receivers that can be built from SL600 devices, but does not cover either the audio sections (except as they may affect the operation of the rest) or, in the case of transmitters, the high power r.f. amplifiers. It is divided into two sections, the first describes a variety of systems using the circuits, the second gives circuit details and comments on some potential causes of trouble. A printed circuit layout of one system is illustrated as an example.

RECEIVER SYSTEMS

The Synchrodyne

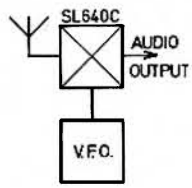
The simplest receiver that can be built from SL600 devices is shown in Fig. 1a. It is not the most common, being a synchrodyne, or direct conversion, receiver. Such receivers may be used for the reception of a.m., s.s.b. and c.w. The v.f.o. is tuned to the carrier frequency in the case of a.m. and s.s.b., and to a few hundred Hertz away in the case of c.w., this results in the demodulation of the a.m. and s.s.b. and an audible beat with the c.w.

Upper and lower sidebands are equally well detected by this receiver and, if the audio passband is limited, it is very selective. If, however, it is used to receive, say, an upper sideband s.s.b. signal with a carrier frequency f kHz., then another such signal with carrier frequency of (f — 2 or 3) kHz. will, if present, be detected, though not intelligibly, and cause interference. Such interference may be removed, and one sideband only detected, by use of the phasing system in Fig. 1c.

* Linear Applications Engineer, Plessey Co. Ltd., Cheney Manor, Swindon, Wilts., U.K.

The system in Fig. 1a is, of course, only a detector and as such is not very sensitive and has no a.g.c. A more complete system, illustrated in Fig. 1b, has r.f. filters to minimise cross modulation, an r.f. amplifier (or r.f. amplifiers), a.g.c. and perhaps an S meter. Depending on the sensitivity required and the a.f. gain available, one or two r.f. amplifiers can be used.

The SL610 has gain of 20 dB. and frequency response of at least up to 146 MHz. (N.B.—This performance, which exceeds that of the data sheet, depends on very careful layout, very short leads, and very great attention to coupling and decoupling of supplies and a.g.c.; however, Amateurs who use these devices on the two metre band—144-146 MHz.—find their performance at these frequencies satisfactory.)



BASIC DIRECT CONVERSION RECEIVER–FIG. 1a

The figures for the SL611 and SL612 are 26 dB. and 80 MHz., and 34 dB. and 15 MHz. respectively.

Which amplifier is used, here as in all the other systems to be described, depends on the frequency and gain required. The SL612 has the extra advantage of a lower current consumption and slightly lower noise figure.

Fig. 1(c) shows a more complex direct conversion receiver which employs r.f. and a.f. phasing to cancel one sideband so that it is a truly single sideband receiver. It is necessary to have accurate phasing of the signals and well matched gain in the two audio channels before the summing stage. Upper or lower sideband may be selected by reversing the phasing of the audio (or the r.f., but audio is easier). The system illustrated detects l.s.b. when the upper channel phase shift is positive.

The Conventional Superhet.

A much more conventional superhet. receiver is shown in Fig. 2(a). It consists of an r.f. stage with a.g.c. (which would probably be an SL610), an SL640 (or 641) mixer, an i.f. filter which could be LC, crystal or ceramic, an i.f. amplifier with a.g.c., and a detector. The i.f. amplifier could be one or two stage. depending on the sensitivity required, but would normally have a.g.c. applied to one stage only. For the s.s.b. and c.w. detector an SL640 (or 641) with a beat frequency oscillator would be suitable followed by an SL621 to provide audio a.g.c.; for a.m. an SL623 is used which also generates carrier a.g.c. and, with a b.f.o., detects c.w. or s.s.b. An SL432 or an SAA570 will detect f.m., but a separate carrier detector is required to provide a.g.c.

A more complete superhet., with front end and both a.m. and s.s.b. detection, is shown in Fig. 2(b). The audio stage's input is switched between the outputs of the two detectors of the SL623. The a.g.c. line, which also drives an S meter, is switched between the c.w. a.g.c. output of the SL623 and the audio derived a.g.c. of an SL621 connected to the s.s.b. output of the SL623. The i.f. filter may also be switched, a narrow bandwidth one being used for s.s.b., a wider one for a.m. To detect n.b.f.m. a detector such as the SL432 or the SAA570 is connected to the output of the second SL612C. During n.b. f.m. reception a.g.c. should be taken from the SL623.

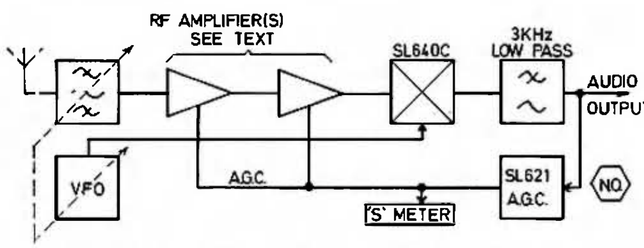
Double Superhets.

Double superhets. may also be designed using SL600 devices but with modern filters double superhets. are rarely needed except at u.h.f. or where complex tuning systems are used. Inasmuch as the same techniques are used as in single superhets., no such systems will be described, but it should be noticed that SL600 devices have high gains, and too many amplifying stages should be avoided.

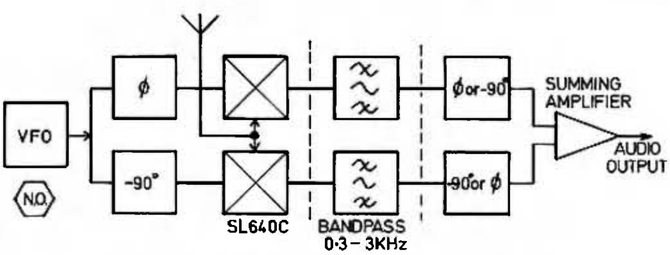
TRANSMITTER SYSTEMS

Filter Type S.S.B. Exciters

There are two types of s.s.b. generators commonly used: filter systems and phasing systems. A basic filter system



PRACTICAL DIRECT CONVERSION RECEIVER–FIG. 1b



S.S.B. DIRECT CONVERSION RECEIVER - FIG. 1c

is shown in Fig. 3(a). The audio and a low radio frequency from an oscillator (the b.f.o. if the system is part of a transceiver) are mixed in an SL640 which, as a result of its good carrier rejection, gives as output a clean d.s.b. suppressed carrier signal. This is passed through a narrow bandpass filter to remove one sideband, in this case the lower. The s.s.b. (in this case u.s.b.) remaining is converted to the final frequency by another SL640 and the image is removed by a filter. The output goes to the transmitter linear amplifier.

Fig. 3(b) shows a more complete filter system. It has an internal amplifier which is controlled by an a.l.c. (automatic level control) signal which, in most cases, will be derived from the final linear amplifier—either by a threshold detection system or by grid current detection in the output valve.

R.F. Clipping

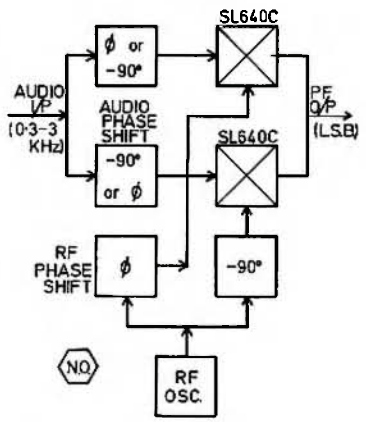
The envelope of an s.s.b. signal does not resemble the audio producing it. Therefore audio limiting and clipping are not useful techniques for increasing the average to peak power ratio of an s.s.b. transmitter, although audio a.g.c. (derived, perhaps, from an SL622 vogad circuit) is. If clipping is carried out it must be performed on the sideband signal itself in the transmitter and, furthermore, the sideband must be filtered afterwards to remove splatter. Such a system needs careful initial adjustment but yields remarkably good results. One is illustrated in Fig. 3(c).

The input audio, which should be controlled by a.g.c., is converted to s.s.b. as in the basic system and is then clipped by a symmetrical peak clipper. The signal is then re-filtered to remove splatter at 2f, 3f, etc., and passes through an a.l.c. amplifier and conversion to the final transmitter frequency. The level of the audio input or the clipping level must be adjusted so that the received audio is of adequate quality—i.e. clipping must not be excessive (but see below for a fully clipped system).

If the clipper is replaced by a Schmitt trigger and the audio input given 12 dB./octave pre-emphasis above 1 kHz., the output may be fed to a class C rather than a linear amplifier and the signal received as s.s.b. though with slight distortion. This gives a peak power equal to mean power during speech and, if carrier leak is allowed to occur during pauses, so that the transmitter is always delivering the same power to the antenna, t.v.i. is much reduced. In this case a.l.c.—and hence the SL610C—is not needed.

S.S.B. Phasing Exciters

A phasing system is shown in Fig. 4. Audio, which must normally be of limited bandwidth, is phase shifted so that two audio lines of equal amplitude



PHASING EXCITER FOR SSB
FIG. 4

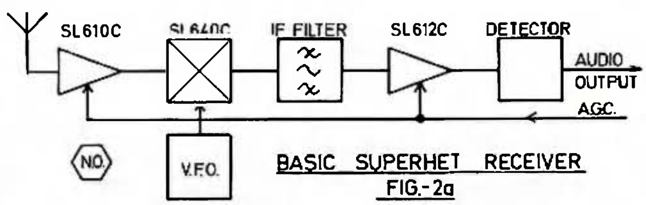
but 90° phase shift are obtained. These audio signals are applied to the signal inputs of two SL640s and r.f. reference and quadrature signals are applied to the carrier inputs. The two outputs are summed. If audio reference and carrier reference are applied to one modulator and audio and carrier quad to the other the l.s.b. outputs will be in phase and will add and the u.s.b. will be out of phase and will cancel—thus l.s.b. is obtained. Similarly if audio reference and carrier quad are applied to one and audio quad and carrier reference to the other, u.s.b. is obtained.

This method appears attractive in many respects and has the advantages that no expensive filters are used and that the carrier frequency may be varied so that further conversion may not be necessary. It is compatible with the direct conversion s.s.b. receiver illustrated in Fig. 1(c) and a very simple transceiver can be built using the two systems. The drawback is that to keep the second sideband 40 dB. below the desired sideband the phasing, both audio and r.f., must be very accurate—in fact within 2°. Also, the amplitude of the carrier applied to one modulator must be adjusted to minimise second sideband generation. Carrier leak must be minimised on both the modulators.

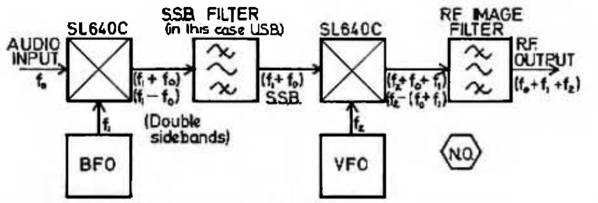
Despite the adjustment problems, this method of s.s.b. generation is very popular—probably because of the saving of expensive filters.

Amplitude Modulation

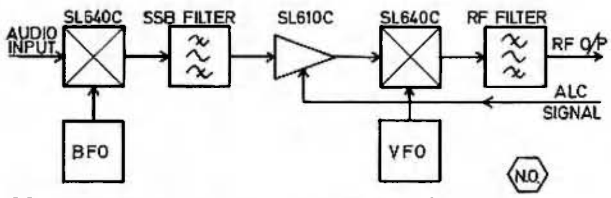
Since a.m. is merely d.s.b. with carrier an SL640 may be used as an amplitude modulator if its carrier leak is increased. If a 15K resistor is connected between pin 2 of an SL640 and earth (as in Fig. 5) there will be sufficient carrier leak for the output of the SL640 to be a.m. By switching in and out the resistor a.m. or d.s.b. may



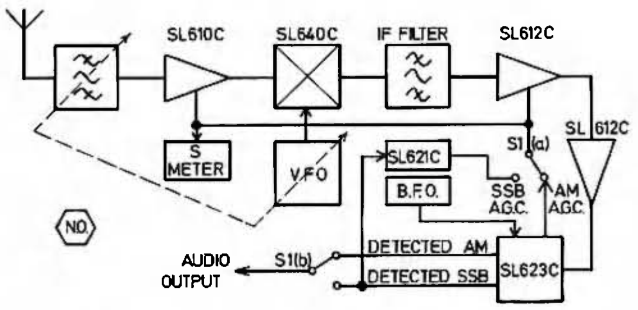
BASIC SUPERHET RECEIVER
FIG.-2a



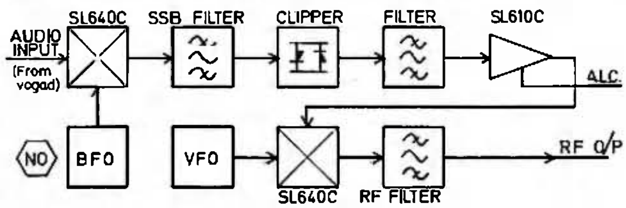
BASIC FILTER TYPE SSB TRANSMITTER - FIG. 3a



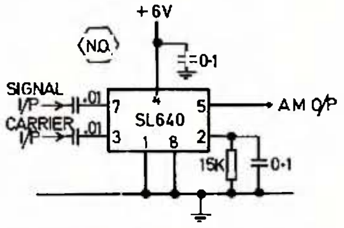
SSB TRANSMITTER WITH ALC. — FIG 3b.



COMPLETE AM SSB SUPERHET RECEIVER - FIG. 2b



SSB TRANSMITTER WITH RF CLIPPING - FIG. 3c be produced—if the filters following the SL640 are also switched a.m., d.s.b. or s.s.b. may be obtained from the same SL640 with the same inputs. This enables a multi-mode transmitter to be made with very few components.



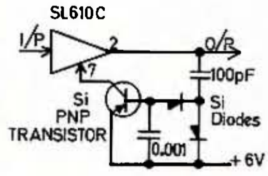
AMPLITUDE MODULATOR - FIG. 5

TRANSCEIVER SYSTEMS

As is evident if Fig. 2(b) and Fig. 3(b) or Fig. 1(c) and Fig. 4 are studied together, s.s.b. transmitters and s.s.b. receivers of the same type are very similar. Therefore, by a little signal switching, it is possible to make one set of SL600 devices perform both as a transmitter and as a receiver—i.e. as a transceiver. This, of course, saves both on SL600 integrated circuits—which in any case are quite cheap—and on filters which are not. Fig. 6 shows the block diagram of an s.s.b. transceiver. Similarly a phasing transceiver uses far less parts than a phasing transmitter plus a phasing receiver.

Carrier A.L.C.

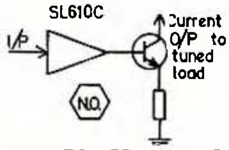
Fig. 7(b) is an a.g.c. system designed to stabilise the amplitude of an r.f. carrier.



CARRIER AGC SYSTEM
FIG. 7b

Linear Amplifier

A low power, but simple, linear amplifier is shown in Fig. 7(c). The emitter resistor depends on the transistor used.



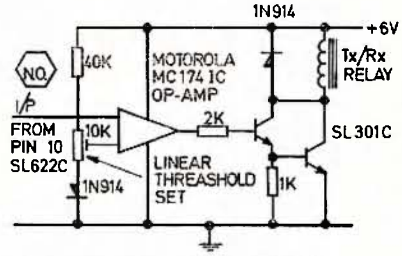
LOW POWER LINEAR AMPLIFIER FIG. 7c

Squelch

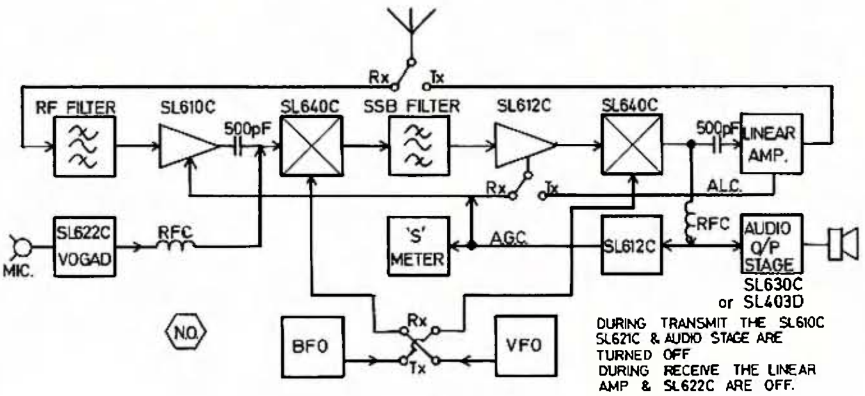
If audio squelch is required in a receiver the system in Fig. 7(d) will provide it. If pin 7 of an SL630 audio amplifier is earthed the circuit is muted—the circuit illustrated, when on, ensures that the SL630 is muted until the a.g.c. reaches a preset level. This prevents unwanted receiver noise when no station is being received. The a.g.c. may be derived from an SL621, and SL623 or other sources. Any high beta silicon NPN transistors are suitable—an SL301 monolithic dual transistor is illustrated.

Vox

Similarly a vox (voiced operated transmitter) system may be added to a transceiver using the SL622 as its microphone amplifier. A possible circuit is shown in Fig. 7(e), it consists of an op.-amp. which is switched by the a.g.c. voltage of the SL622 and in turn switches the transmit/receive relay of the transceiver. The transistor can be any high gain silicon type which can carry the relay current—a Darlington arrangement must be used to ensure that the relay turns off again as the minimum output of the op.-amp. can sometimes be greater than 0.7v. above the negative line.



VOX FOR USE WITH SL622C
FIG. 7e



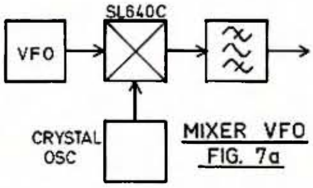
SSB TRANCEIVER - FIG. 6

OTHER SYSTEMS

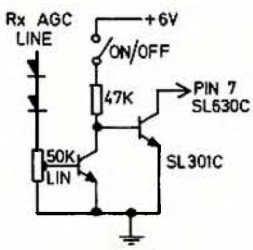
SL600 devices may also be used in various other parts of transceivers. Some examples are shown in Fig. 7.

Mixer V.F.O.

Fig. 7(a) shows a mixer v.f.o. which mixes the output of an l.f. v.f.o. with a crystal derived frequency to produce a stable h.f. v.f.o. In a multiband receiver several crystals may be used to tune several bands with one v.f.o.



MIXER VFO
FIG. 7a



AUDIO SQUELCH SYSTEM - FIG. 7d

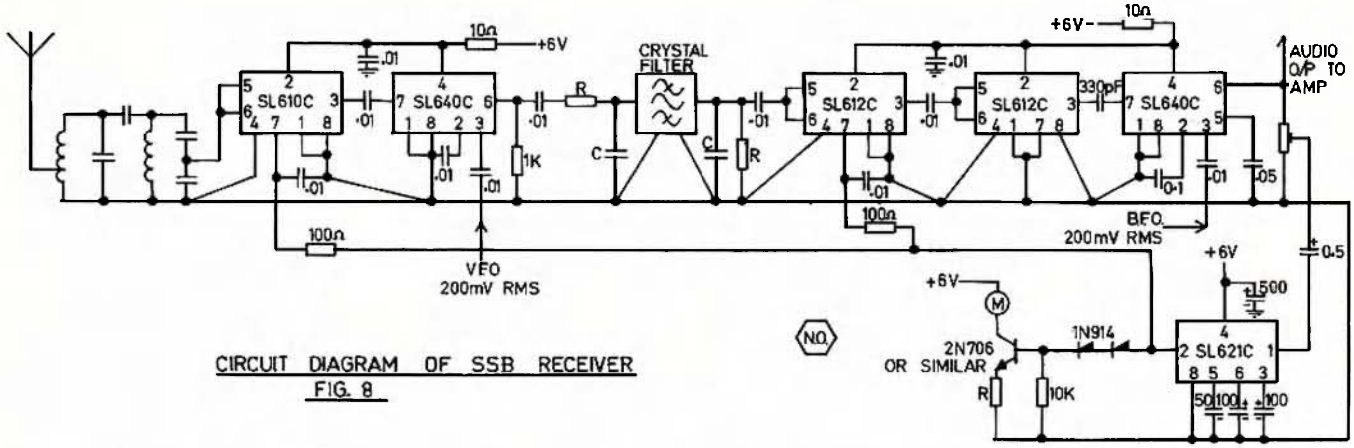
USING THE CIRCUITS

Fig. 8 is the circuit diagram of the receiver in Fig. 2(b). The simplest way of explaining the use of the SL600 family is to describe the circuit and its operation in detail.

The input filter depends on the band being tuned and the i.f.—it must be sufficiently narrow to give rejection at the image frequency—i.e. that frequency on the other side of the local oscillator from the wanted frequency and spaced the same amount from it. If such a frequency passes the input and mixes with the local oscillator it will produce an unwanted output at i.f. The method of coupling is chosen so that the SL610 input is never inductively terminated and also so that the tuned circuit is not loaded enough to reduce its Q. If an SL610 input looks inductive, instability is possible. When an SL610 is driven from a source which might be inductive the source should either be shunted with a few kilo-ohms or a few hundred ohms should be connected in series with the input.

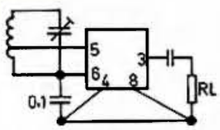
The SL610 is biased (as are all the other r.f. and i.f. amplifiers in this receiver) by connecting its bias pin directly to its input pin. If coupling is made to an SL610, 11 or 12 as in Fig. 9(a), slightly lower noise will result but this is not usually worth the extra complication. It is important that the input and output earths of these devices are kept separate—output currents flowing in input earth leads tend to produce instability.

Both the a.g.c. line and the SL610 positive supply (which is shared with the SL640 mixer) are decoupled to earth. Ideally, this is not necessary but r.f. on h.t. and a.g.c. lines can cause trouble with some layouts (the SL640 supply is not internally decoupled



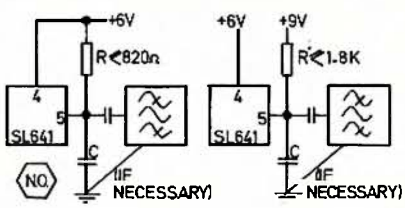
CIRCUIT DIAGRAM OF SSB RECEIVER
FIG. 8

although the SL610 is) and where expense does not rule it out it is recommended. To minimise the output current loop of the SL610 the earth of the SL640 should be as near to the output earth (pin 8) of the SL610 as possible.



LOW NOISE COUPLING TO SL610, 11, 12.
FIG. 9a

The SL640 acts as the first mixer and its output drives the input of the filter. The filter must be terminated by the correct impedance (pure resistance or resistance shunted by capacity) and if the resistive component is low enough the SL641 may be used on one of the circuits in Fig. 9(b). This is the case wherever SL640s are used: they may be replaced by SL641s in certain circumstances. When output pin 6 of the SL640 is used an external load of >560Ω is required. This output is an emitter-follower of low Z_{OUT} and must not be used to drive capacitive loads. Some filters have wound inputs with low (<10Ω) d.c. resistance to earth. In this case the terminating resistor, as long as it is over 560Ω, may also act as the load resistor, the d.c. blocking capacitor must **not** be used.



(1) (2)

MATCHING SL641 TO FILTERS
FIG. 9b

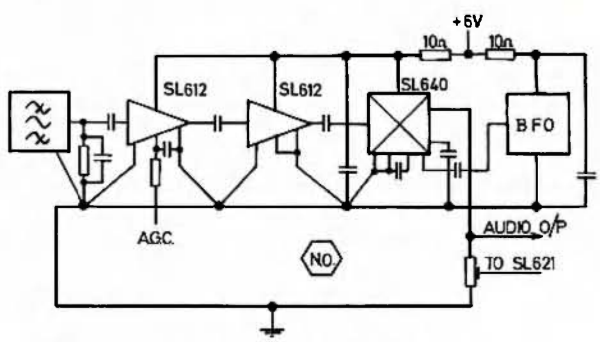
Pin 2 of SL640s or SL641s must be decoupled to earth by a low-leakage (<100 nA.) capacitor having low reactance (<10Ω) at the lowest input or carrier frequency. Carrier input from the local oscillator should be as free from modulation as possible and between 100 and 200 mV. r.m.s. in amplitude.

The broadband i.f. amplifier following the filter consists of two SL612s, a.g.c. is applied to one only. An SL610 has 50 dB. a.g.c. range and an SL612 70 dB., giving a total for two gain controlled stages of 120 dB.—if both SL612s were controlled this would be 190 dB., too much.

The positive supply to the i.f. stages and the SL640 detector is decoupled and care must be taken that earth current from the output of the strip cannot flow near its input as this leads to instability. The best earth arrangement for the i.f. strip is given in Fig. 9(c). No other connections should be made to the i.f. strip earth.

1K preset pot. The audio output to the amplifier is taken directly from pin 6, but the audio for the SL621 a.g.c. stage is taken from the potentiometer wiper. This enables the a.g.c. threshold to be adjusted so that noise in the set and aerial does not turn on the a.g.c. in the absence of signal. The coupling capacitor to the SL621 should not exceed 1 μF., otherwise l.f. instability can result.

The SL621 will usually drive a 500 μA. S meter connected (in series with 5.1K and three silicon diodes) from the a.g.c. rail to earth, but as such a load is sometimes too much for an SL621 the transistor circuit shown is preferable. The value of the emitter



IF STRIP EARTH LAYOUT-FIG. 9c

The filter must be correctly terminated at its output. The input of an SL612 is approximately 5K and 4 pF., if necessary this should be shunted (at a.c. only) by other resistors and capacitors to make the correct terminating impedance.

When a.g.c. is applied to an SL612 its d.c. output potential moves. This l.f. signal, if fed to the detector, will produce a change in output which, in turn, can produce a.g.c. from the SL621 and thus v.l.f. instability or motor-boating. To prevent this, the coupling capacitor between the last SL612 and the SL640 should be as small as possible—about 330 pF. is usual if the i.f. is over 1 MHz. Alternatively, a tuned circuit at this point prevents the trouble and also reduces noise produced in the broadband stages.

The output of the SL640 detector is decoupled to ground at frequencies above 4 kHz. by a 0.05 μF. capacitor on pin 5, and the load on pin 6 is a resistor depends on the meter used and is given by the formula:

$$R = 2.7 \div I$$

where I is the meter f.s.d. current in mA. and R is in kilohms. The S meter reads linearly in dB—from zero to full scale is about 120 dB.

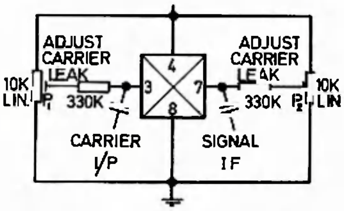
The supply to the SL621 must be well decoupled at l.f.—500 μF. is usually sufficient, but if the audio output stage shares the same power supply this should be increased. If a series/stabilised supply is used it should have a source impedance of less than 1 ohm.

The audio output stage may be an SL630, an SL402, an SL403 or any other suitable amplifier. If the SL630 is used its supply should be decoupled at r.f. and the frequency response limited as detailed in the SL630 application note.

When the SL600 circuits are used in a transmitter or transceiver they are used much as above. One or two additional points may be noted.

As transmitters often contain large r.f. fields, particular attention must be paid to screening and decoupling. It may in some cases be necessary to decouple individual stages.

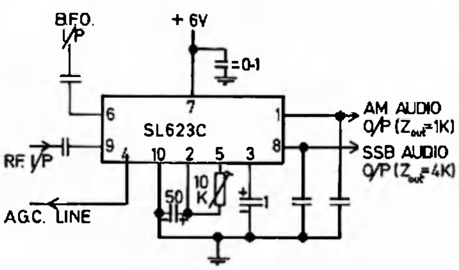
When generating s.s.b. or mixing frequencies in a transmitter the original input frequencies are not wanted in the output. The SL640 and 641 have some 30 dB. signal and carrier rejection but this may be increased with the circuit in Fig. 9(d). With signal but no carrier PI is adjusted for minimum signal leak, and with carrier but no signal P2 is adjusted for minimum carrier leak. All modulators used in transmitters may be adjusted in this way although it is less important in filter systems than in phasing systems.



SIGNAL & CARRIER LEAK ADJUSTMENT – FIG. 9d

The a.g.c. characteristics of the SL610, 611 and 612 are temperature dependent. It is unwise to use a voltage on an a.g.c. pin to set the gain of a stage (although it may be done where a.g.c. is applied to another stage in the chain to compensate for variations).

SL610s, 611s and 612s tend to oscillate if required to drive capacitive loads. Such loads should be buffered either by a resistance (SL610, 611: 47 ohms; SL612: 150 ohms) or another type of amplifier. When r.f. is taken from these SL600 amplifiers to points far removed from them care is essential to prevent instability caused by earth loop currents.



SUGGESTED CIRCUIT FOR SL623C FIG. 10

USING THE SL623

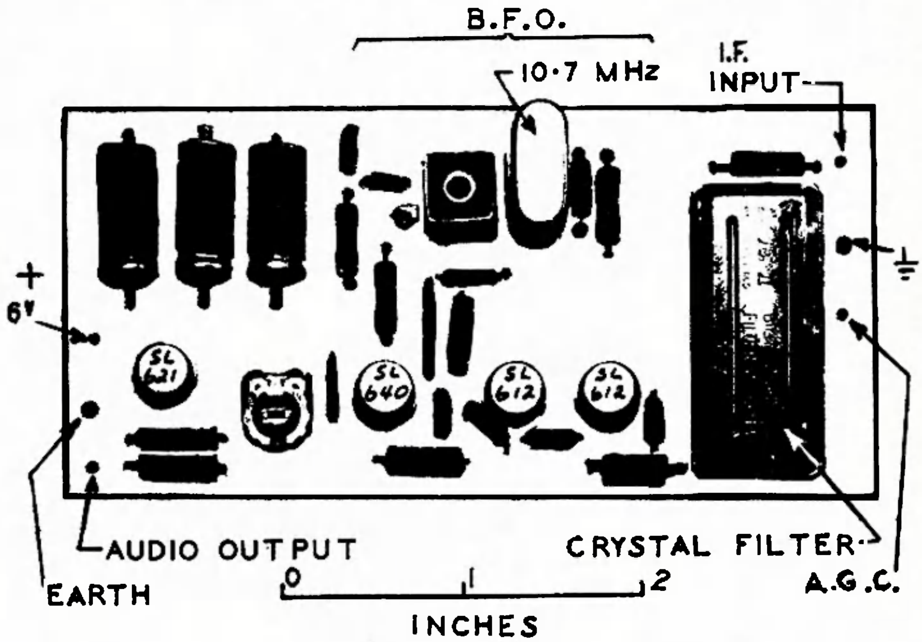
Special mention must be made of the SL623 as it is not used in s.s.b. receivers but only on a.m./s.s.b. hybrid receivers. A typical application of the SL623 is shown in Fig. 10. The a.g.c. from this circuit is c.w. derived and if audio a.g.c. is required during s.s.b. reception an SL621 should be used.

All the decoupling capacitors should go to one point and the positive supply should be decoupled. The circuit is as sensitive to s.s.b. as an SL640 but requires 125 mV. r.m.s. of a.m. to activate the a.g.c.—thus greater i.f. gain may be necessary. Despite statements to the contrary in the provisional data sheet, this circuit functions to at least 30 MHz. and, with reduced performance, to over 120 MHz.

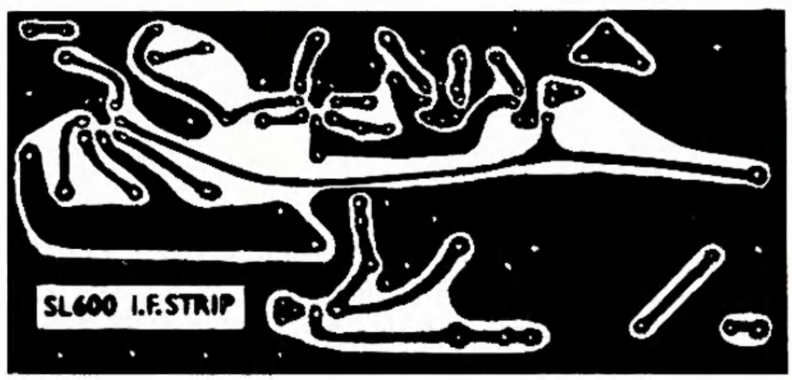
The resistor between pins 2 and 5 sets the value of carrier at which a.g.c. commences.

The b.f.o. should have a clean sine wave at about 100 mV. r.m.s.

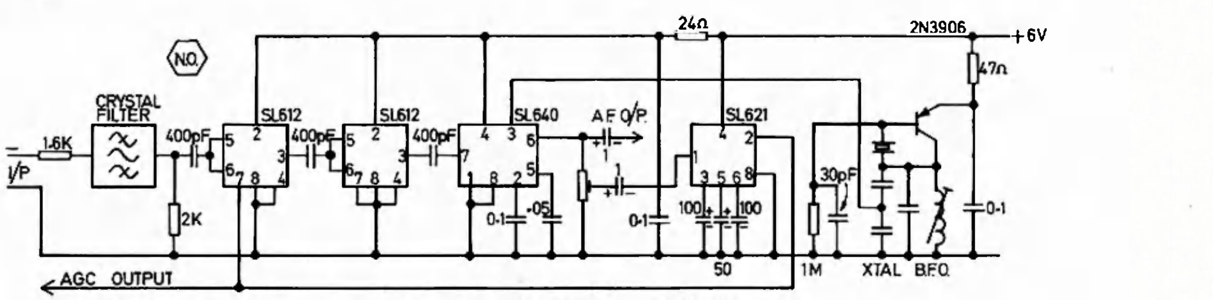
(Continued on Page 9)



Circuit Layout of Fig. 11a.



Printed Circuit Board for Fig. 11a.



CIRCUIT OF 10.7 MHz. IF STRIP SSB DETECTOR AND VOICE AGC. ILLUSTRATED IN PHOTOGRAPHS – FIG. 11a

LONG PATH GREAT CIRCLE MAP

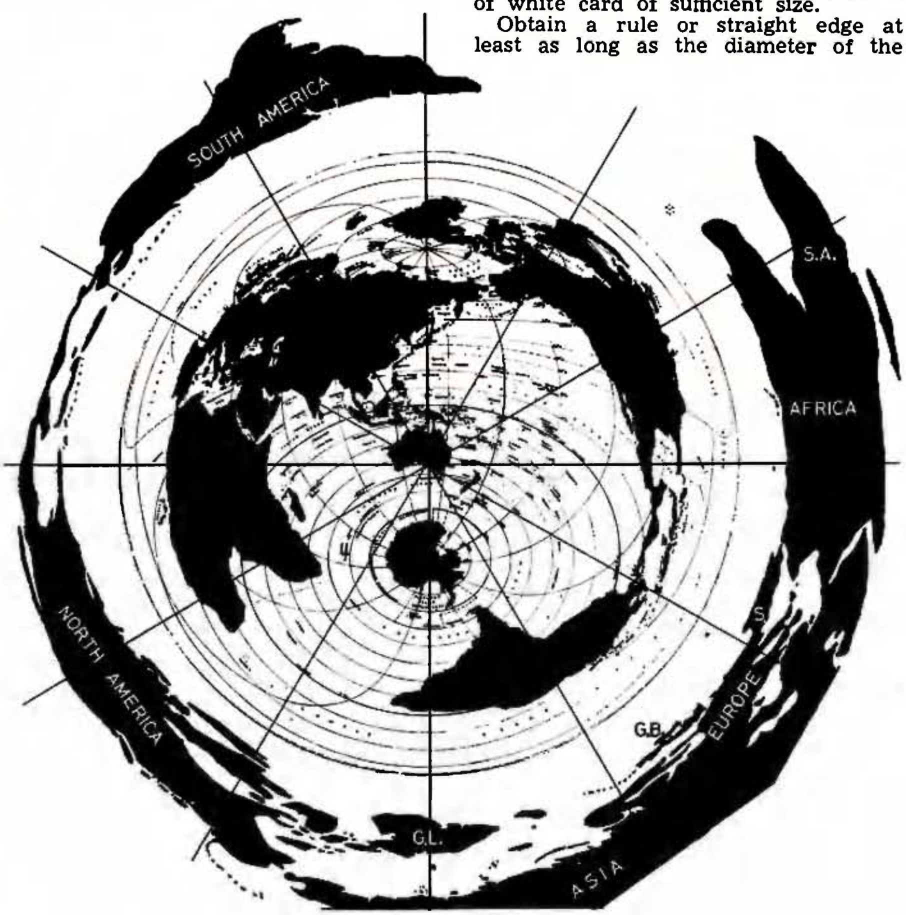
L. H. VALE, VK5NO/1*

● The primary use of Great Circle or Azimuthal Projection Maps by Amateurs is to give instant indication of bearing for beam directing, interpreting ionospheric predictions, etc. They also indicate distance from the point of origin to any chosen point on the earth's surface.

These functions are limited to the short path or most direct route, whereas, in practice, quite a high proportion of DX contacts are made over long path circuits, i.e. the signals travel more than half way around the earth to arrive at their destination.

While it is easily possible to determine the direction of a long path signal by considering it to be 180° from the short path direction to the chosen point, and to calculate the distance by subtracting the short path distance from the earth's circumference, we decided that it should be worthwhile to make a map that includes long path routes of up to about 270° of the earth's surface rather than be limited to the maximum of 180° available in a normal great circle map. In addition to making directions and distance instantly apparent at a glance, it was felt that such a map would give the user a better feel for the world as it is under long path propagation conditions.

* C/o. Box 309, Fyshwick, A.C.T., 2609.



Fortunately the construction of such a map is very easy and straight forward, if a little tedious, if it is constructed as an addition to a normal great circle map. The method described assumes that the earth is spherical and that signals travel in a straight line; these are reasonable and generally accepted assumptions.

Firstly, obtain a normal (short path) great circle map centred on your locality; the long path map given as an illustration is centred on the Adelaide area and would become rather inaccurate if used more than a few hundred miles from Adelaide. The diameter of the long path map will be about 50% greater than this short path map so it is necessary to start with a comparatively small short path map or be prepared to finish up with a monster.

Paste the map to the centre of a piece of white card of sufficient size.

Obtain a rule or straight edge at least as long as the diameter of the short path map and make two marks on it separated by this diameter.

The extensions to the 180° map are now drawn by placing one mark on a chosen point on the 180° map, running the rule through the point of origin (the centre point) and marking the point where the second rule mark comes to on the card outside the 180° map.

It will be seen that each continent, except Asia, repeats itself outside the circumference of the 180° map.

Tracing around the coastlines of the continents is tedious and you may well agree with us that the outlines of the continents are sufficient, but it would probably be of some advantage, in view of the distorted shape of the land masses, to include national boundaries and the meridan grid as an aid to finding rarer countries or places more quickly.

Asia has to be cut through the middle; actually the map as drawn includes all areas workable on the long path and the distortion increases as does the distance from the centre point.

The map illustrated was constructed by the writer as a personal exercise and is about fifteen inches in diameter. It is used in conjunction with a Mercator's projection map and a short path great circle map, all of which are pinned on the wall. These maps enable an operator, if he is so inclined, to more easily "feel himself into" this globe as it appears on high frequency radio. The exercise has been well worthwhile, but is certainly not everyone's cup of tea. ●

SL600 SERIES ICs

(Continued from Page 8)

OTHER DEVICES

The other members of the SL600 family are the SL620, 622 and 630. The SL630 is an audio amplifier with voltage controlled gain and up to 75 mW. (at 6v.) or 200 mW. (at 12v.) output. Used with the SL620, which is similar to the SL621, it forms an audio a.g.c. system. The SL622 is a self contained audio a.g.c. system with an additional side-tone output which is not a.g.c. controlled.

These circuits are intended to be compatible with the rest of the SL600 series, use the same power supplies and are, like them, in TO5 packages.

This article has described how the Plessey SL600 series circuits can be used in h.f. transmitters, receivers and transceivers. It can be seen that, with the exception of oscillators and power amplifiers, h.f. transceivers can be built using SL600 devices for all functions. V.h.f. and u.h.f. sets can be built with SL600 devices in all but the r.f. and mixer stages. These devices make the design of a.m. and s.s.b. transceivers extremely simple and their setting up trivial. ●

BUILDING MODERN FILTERS

PART ONE

By "CABBAGE-TREE NED"*

● Many of us have been aware that new methods of filter design have evolved over the last 20 or 30 years, but understanding them has appeared to require more mathematics than most of us can use. This may be true, but VK3ZRQ shows us in this whimsical series of articles that little more than simple arithmetic is necessary to apply some of the new methods to practical filter construction.

INTRODUCTION

Cabbage-tree Ned, so Dal Stivens tells us, was the crack shot of the whole North Coast of New South Wales. He shot so straight he could shoot the eye out of a snail at 100 yards; and he shot so far that he had to salt his bullets so the game would keep until he could catch up with it! But the real feature about Cabbage-Tree was the structure suspended from the brim of his hat—a series of short lengths of string with a cork at the end of each, a Comb Structure as it were. In fact, of course, it was a filter with a stop-band for flies.

Here the facetious analogy with the Comb Filter must cease, because, although the flies represent a periodic series of pulses, what the electronic comb-filter does is **pass** such discrete frequency components and **reject** noise (which usually has a continuous spectrum or band of frequencies).

Now, "modern" or "synthesised" filters need be no more troublesome to calculate and build than the macroscopic device referred to above.

Let's clear the air by collecting thoughts on filters—then you may feel prepared to try out the two audio low-pass filters whose details appear below. Their performance is quite satisfying.

FILTER TYPES

This much very briefly!

Filters can be classified in several ways:

(a) Frequency segment involved—a.f., r.f., or microwave.

(b) Circuit arrangement of elements—e.g. T, Pi, or Lattice.

(c) Character of the elements—LC (lumped element) devices; co-axial (distributed element) filters; resonator filters (such as electromechanical and piezo-electric crystal); and active filters (containing an internal energy converting device such as a transistor).

The first three types are called **passive** filters—that is they contain no transistors or valves.

* VK3ZRQ, A. G. Birch, 5 Harrison Street, Bendigo, Vic., 3550.

FILTER APPLICATIONS

It was nearly 90 years after Faraday formulated the law of electro-magnetic induction (in 1831) that Campbell and Wagner in 1915 realised the use to which frequency sensitivity of inductive reactance could be put. And so was born on absolute fundamentals the first LC filter. Nowadays, these filters have become an indispensable tool of consumer, industrial and amateur electronic systems.

Any Amateur will recognise that some of the following are applications which could force themselves upon his attention:

1. Pre-selector networks, at the input of sensitive receivers, to separate low-amplitude wanted signals from higher amplitude undesirable signals.
2. I.f. filters. Used to provide the basic receiver selectivity.
3. S.s.b. filters, which aim to suppress one sideband, and facilitate synchronism of the carrier frequency.
4. Anti-jam filters, to improve radar-target detectability.
5. Matched filters, for use in identification of radar targets, and in meteor-burst communications.
6. Other radio uses: Broadbanding filters (between transmitter and narrow-band l.f. antenna), coupling networks, harmonic suppression.

DOWN-TO-BUSINESS

To make the best choice of the available tools, we need to know two things:

(a) What we **want** to do;

(b) What each of the various methods **can** do.

Hence the following:

We must necessarily restrict exploration to the terms of item (c) of the third heading under Filter Types—namely character of elements. We choose (because of limitations on what a home-based Amateur can handle) to look at **modern** or **synthesised** LC filters, and briefly at the increasingly feasible **active** filters.

Active filters, by the way, you have played with when you built a Q-Multiplier, or an i.f. amplifier. With the aid of today's IC devices, active filters are one possible answer to the need, in a micro-miniature electronic world, for all circuit elements to be compatible in size. In the filter field, this means devising an inductorless filter and can be met by an electronic **equivalent** inductance provided the circuit used can be given satisfactory Q-factor and stability. Your reactance-modulator, for example, uses equivalent electronic inductance.

PASSIVE L-C FILTERS

These are constructed according to two different concepts:—

(a) Elementary sections of the constant-K type. These are based on image impedance notions, and are improved as to performance by cascading blocks (like stages of amplification) with the aid of an ingenious little fellow called M, to obtain a desired response.

(b) **Synthesised** or **modern** filters are not a combination of sections in the above sense. They are calculated as a whole, from mathematical equations whose graphs have been seen to have just the shape of filter response that we often need.

Both of these concepts use the traditional elements L and C, because their frequency-sensitivity will do what we need—offer a high impedance to (or **reject**) certain frequencies according to value and circuit arrangement.

Here we simply acknowledge that any filter does two jobs:—

(a) It acts as an energy-transfer device;

(b) It is selective as to frequencies passed.

CREDITS FOR L-C DEVICES

They dissipate negligible power, are stable in themselves, can be made to reasonable tolerances, generate little noise, and provide a d.c. path or total d.c. isolation as required. Finally, there is no offset voltage to worry about.

MODERN (or SYNTHESISED) FILTERS

The whole purpose of this article is to illuminate the virtues of the modern filter. Being designed as a whole, it can provide a better filter than the traditional constant-K type.

The procedure is greatly simplified by tables, step-by-step design procedures, and/or design curves. It is true that the theory behind all this is still one for the specialist, but the results of his work can well be used by the technician or by the Amateur with a taste for a challenge.

Note, by the way, that the term "section" may still appear even when a filter is of the "modern" type, as when a group of physical elements is combined in a schematically separate network, each such group being designed as a whole. Sub-division into such "sections" may be dictated by, say, excess of insertion loss and the need for an in-between amplifier, or, in the case of a crystal filter, the need to eliminate spurious responses.

Two specimen designs which immediately follow are the fruits of "modern filter" concepts as outlined above. They are respectively:

(a) **Maximally-flat**, or **Butterworth** filter. This is used for its simplicity, and its excellence around near-zero frequencies. It has tolerably good amplitude response, and no ripples, but not a very steep skirt. To a pulse type input, its response does have overshoot.

(b) **Elliptic**. This is an approximation to the ideal filter characteristic (vertical sides). It accepts that, in the interests of steeper skirts, some ripple may be tolerated **within** the pass-band. Further, it has in-built notches of added attenuation (above the wanted stop-band value) which can be useful for rejection of command signals, etc. The size of the ripple can be chosen, commonly less than 1 dB., and to some extent we can choose the notch frequencies as long as we are prepared to accept a slightly less favourable v.s.w.r. (Note: The Butterworth filter is actually a special case of a class in which there is ripple in the pass-band, but no attenuation-notches in the stop-band. This class of filter is known as **Chebyshef**. See Fig. 1.)

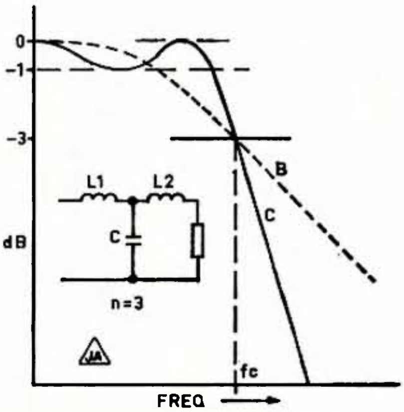


FIG 1 AMPLITUDE RESPONSES
B=BUTTERWORTH C=CHEBYSHEF

TWO SPECIMEN FILTERS

(Note: The relevant design data will be given in Part 2.)

(A) **Maximally-Flat (Butterworth) Design** (Fig. 2)

Specifications: LP filter to have 3 dB. cut-off at 3.5 kHz., attenuation about 30 dB./Octave, and work into a load of 600 ohms from a voltage-source. The coils should have a Q-factor in the region of 200. The temperature-coefficient to be satisfactory up to 50°C.

Solution:
- L1 = 42 mH. (226 turns).
- L2 = 37.7 mH. (215 turns).
- L3 = 8.42 mH. (102 turns).
- C1 = 0.128 μF.
- C2 = 0.068 μF.

Pot-Cores: 26/16 cores, of 3H1 material.

Wire: B. & S. 28 gauge Lewcomex single-strand Cu (special enamel, easily removed), chosen to give nearly-filled winding space on the 26/16 plastic bobbins.

Actual Q-factors were not less than 150, which was still acceptable.

Air-gap in the pot-core centre-post: as hand-ground = 0.008 in.

Performance: Very slight hump near roll-off point, and the expected rounding of voltage-response down near the 40 dB. attenuation level at 9.2 kHz.

Application: To be used in part of the Zone translator set-up.

(B) **Elliptic Filter** (Fig. 3)

Specifications: LP filter to cut-off at 3 kHz., work between source and load both of 600 ohms, provide minimum attenuation in the stop-band of 50 dB. for all frequencies above 4 kHz. Use the minimum number of inductors (which is two) for the obvious choice of possible circuit arrangements of T-input or Pi-input. (See Part 3 for details.)

Solution: Use parallel-resonant series arms, and simple-C shunt-arms.

We obtain:
- C1 = 0.0138 μF.—shunt C.
- C2 = 0.0015 μF.
- C3 = 0.0187 μF.—shunt C.
- C4 = 0.00425 μF.
- C5 = 0.0117 μF.—shunt C.
- L2 = 34.9 mH. paralleled with C2 —series arm.
- L4 = 27.9 mH. paralleled with C4 —series arm.

Performance: As shown in Fig. 4.

EXPLANATORY COMMENTS

(a) Inductors were made the hard way, to get the feel and prove a point.

(b) Both are made with 26/16 pot-cores (mass-produced hence cheapest; also suitable for a wide range of L-values). Being audio-filters, no attempt was made to maximise the Q-factor.

(c) The air-gap was ground by hand with a home-made tool, micrometer, and some 600-grit silicon carbide (amateur gemstone shops).

(d) Coils were hand-wound and checked for value on an H-P vector impedance meter. No trimming was needed (before cementing the core-halves) to be within 1% of designed values of L.

(e) The **easier way**, which the writer will follow in future, is to buy pre-gapped P-cores with slug-adjustor capable of ±10% variation of L, for a slightly higher cost (70c against 55c).

ACTIVE FILTERS

One way of achieving an inductorless filter is to use only RC elements, but because they have high insertion loss or pass-band attenuation, no one uses them.

Active filters, on the other hand, can have insertion-**gain**. They lend themselves to modern micro-miniature methods, and make extensive use of the very easily handled operational amplifiers, such as the 741, or 739 (a dual-in-line), the 715 (for unity gain), or the 725 (for cases where gain is positively useful).

They are most useful at low frequencies (below 1 MHz.) where simple solid state devices can have appreciable gain.

Practical active filter schemes (see Dannecker, et al) are based on applications of IC technology with specialised design techniques.

In short, active filters do overcome the limitations of passive RC filters, but are still (at present) susceptible to sensitivity problems, particularly of Q-factor with respect to gain.

The answer for the Amateur will probably be only in handling experience and much thought. Applications Notes by various manufacturers should help original effort greatly. Some considerable help will also be gained with the aid of a Table and Chart method of calculating component values published by other authors.

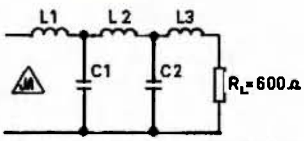


FIG 2 BUTTERWORTH-30dB/OCT, n=5

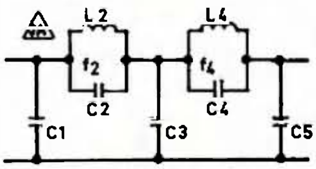


FIG 3 ELLIPTIC (RIPPLE) FILTER, as given n=5

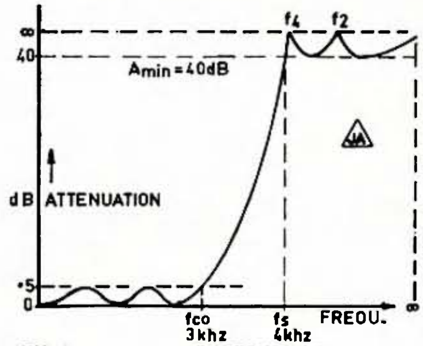


FIG 4 RESPONSE OF FIGURE 3 FILTER

BACKGROUND

The Filter Tables to follow in Parts 2 and 3 can be compiled in several ways, just to satisfy your curiosity.

(a) **The Grass-Roots Method**

Kirchhoff analysis will give us the ratio of V_{OUT}/V_{IN} in terms of the L and C elements of a given order of filter. Then we look up the corresponding Butterworth (say) Polynomial, and simply compare coefficients to evaluate the L and C.

For a 3rd order Butterworth (voltage-source), the Kirchhoff expression is

$$F(s) = \frac{1}{s^3 \dfrac{L1L2C}{R} + s^2 L1C + s\dfrac{(L1 + L2)}{R} + 1}$$

and the Butterworth expression that corresponds is

$$F(s) = \frac{1}{s^3 + 2s^2 + 2s + 1}$$

In another three lines of simple arithmetic, we find that the L1, L2 and C are respectively 0.238 H., 0.0795 H., and 0.212 F. for R = 1 ohm and f = 1 Hz. (1.5 H., 0.5 H., and 1.33 F. when frequency in radians/sec.)

The method becomes tedious (to say the least) for anything above 5th order (5-section) filters.

(Continued on Page 13)

T.V. TUNER SOLID STATE CONVERSION

BY THE TECHNICAL EDITOR

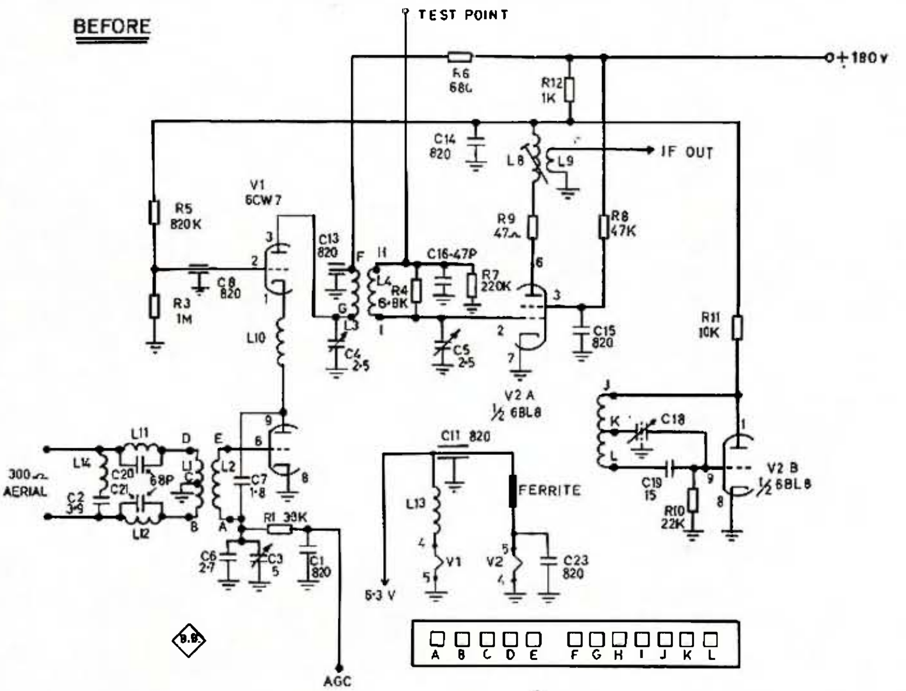
● A letter received recently from Jim Fricke, VK1JF, describes how he has converted a Philips AT7580 valve-type 10-channel t.v. tuner to use transistors instead of valves.

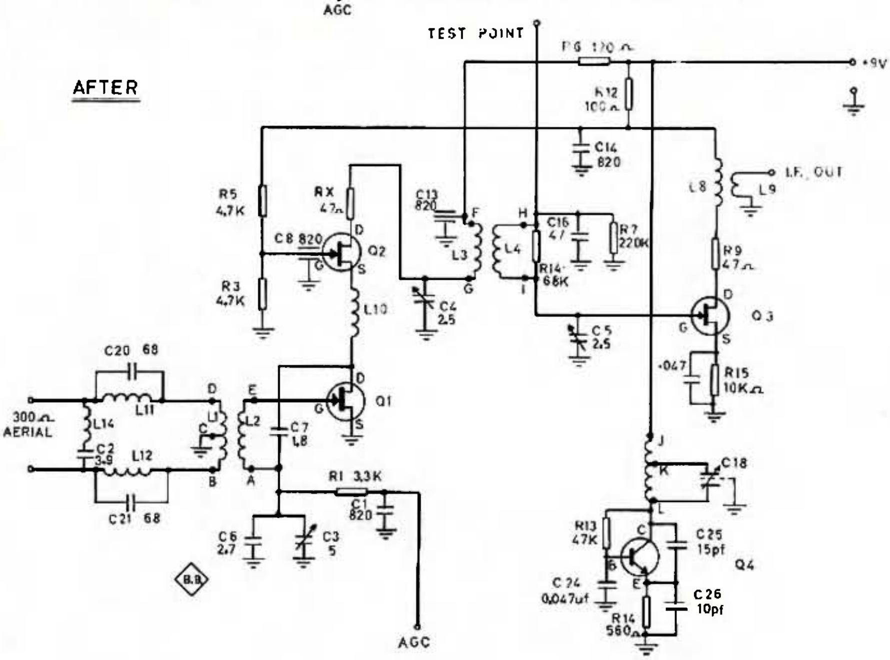
The accompanying circuit diagrams show the tuner before and after modification. The 6CW7 cascode r.f. amplifier was replaced by two 2N5485 FETs (Q1, Q2), the mixer (6BL8 pentode) by another 2N5485 (Q3), and the oscillator (6BL8 triode) by a BF115 bi-polar transistor (Q4). Initially a FET was tried as the oscillator also, but in Jim's words, "After eight hours of experimenting the results were still disappointing."

Some additional components were necessary, particularly for the oscillator, but the fact that only four of the original resistors (R3, R5, R6 and R12) needed to be changed shows rather clearly the similarity in characteristics between FETs and valves (except for their radically different power requirements!).

Although 9 volt supply is shown, Jim claims the tuner operated quite well with only 6 volts. The lower channel (1, 2 and 3) oscillator coils may need a few extra turns, and the old channel 1 coils will in any case need extra turns on all windings if required to cover channel 0. The 47 ohm resistor Rx in the r.f. drain circuit was found necessary to prevent oscillation in Q2. The transistors were all mounted above the valve sockets and soldered to the appropriate contacts. R13, R14, C24, C25 and C26 were also mounted on top of the tuner.

A possible application, not suggested in the original letter, could be to use the tuner as a multi-band v.h.f. converter with extended oscillator tuning range if necessary by fitment of an added variable capacitor to the fine tuning. Frequency stability may not be impressive, but if a suitable i.f. channel in the 31-36 MHz. range could be provided, the 6 and 2 metre bands could be covered readily on the existing channel 1 and channel 5 coils respectively. ●





☆

MODERN FILTERS

(Continued from Page 12)

(b) **The Elegant Method**

The equation quoted by R. Dannecker for the low-pass filter in his Phase-Lock Loop articles ("A.R.," Feb. 1972) is a staging-point in pole-zero methods, a particularly useful sort of compactness. For the engineer does not, on the whole, indulge in pole-zero patterns for the sake of it. He believes in the conservation of energy, and the simplest solution of a problem.

The familiar gain/frequency and phase/frequency curves of an amplifier or filter give more detail than we often need. Certain critical frequencies called break points (and a constant multiplier) are all that is necessary.

Break points are points where the skirts of a filter response change slope suddenly, and in mathematical language are related to points known as poles and zeros. They give rise to a plot called a pole-zero pattern which is the graphical heart of S-plane design, only the results of which you will be using via the Tables of Parts 2 and 3.

(Continued on Page 15)

MORE ON MORSE KEYS

ONE MORE DROP OF HOME-BREW

T. LAIDLER,* VK5TL

About 35 years ago and under slightly different circumstances, I made the key I still use.

Lacking access to the facilities available to VK3AXU, the method adopted was different, in that I made some wooden patterns, arranged for the castings to be made in the city (500 odd road miles away) and spent some time with a file on the castings made. The cost (in those days) was not considered excessive at eight shillings for two sets. A set of ignition contacts cost about 7/6 (75 cents).

A local garage was able to supply what was termed a "standard taper" pin and made the necessary tapered hole through the bar and uprights of the "U" section for a small charge. The pin is held in by a screw through the appropriate place in the key bar. (This pin tapers from 1/4" to 3/16" over a length of 2".)

The front contacts are located 1-5/8" from the front end of the key bar and the rest of the fittings are much as outlined by VK3AXU, except that screws are fitted into the right hand sides of the centre and front sections to permit wiring on the sides. This is just convenience in manufacture.

* 18 Albion Avenue, Glandore, S.A., 5037.

For anyone with a slight knowledge of woodwork, patterns can be made in a manner to those outlined below; wood being easier to work than metal. Mine were given a good coat of shellac before sending to the foundry, this was recommended by a patternmaker. (Patternmakers are highly skilled woodworkers.)

If the key bar and "U" sections are cast, the other pieces for front and back blocks can be cut from the appropriate sized metal, but I had mine cast and thus gave myself more file work.

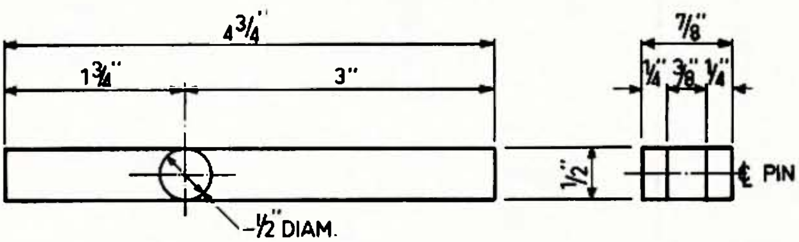
The regular Morse key was usually fitted with platinum in the contacts, but we poorer mortals, without access to platinum, seem to get by with automobile contacts which are probably tungsten. Bearing this in mind, give them occasional cleaning and, while on the job, take the pin out and put a smear of oil on the moving parts of the pin—it helps.

When setting up spring tension, do not make it any heavier than necessary to return the key bar to normal position. This eases wrist pressure to overcome the spring when pressing down.

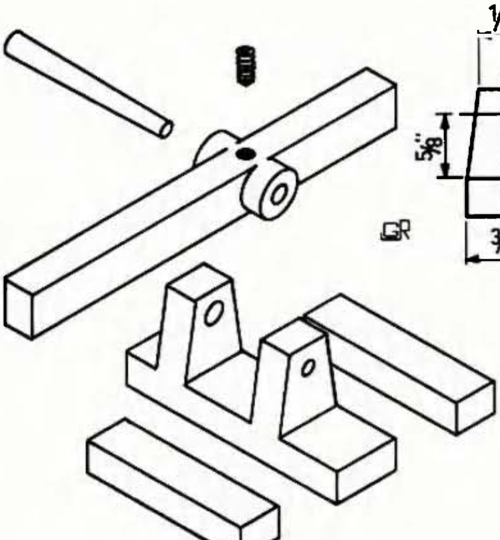
For ease of operation, I pass on what was part of my Morse instruction in days gone by—I won't say how many: "Keep the key bar, hand, wrist and fore-arm in a straight line, move from the wrist and keep as many finger ends on top of the key knob as possible." Usually two fingers will go on, but some wider knobs might take three. The thumb to the side, of course.

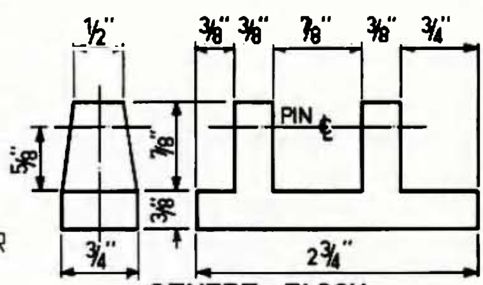
My patterns were made from several small pieces of wood nailed together. Small pieces of dowel could be used to provide the wide section of the key bar.

[Details of mounting given by VK-3AXU in the article "A Drop of Home Brew," which appeared in Feb. 1972 issue can be used with a little modification for this unit. Assume all castings are of brass.—Tech. Ed.] ●

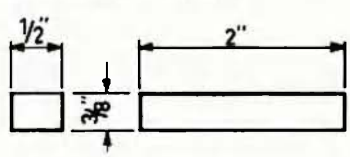


KEY BAR





CENTRE BLOCK



FRONT & REAR STOP

NEWCOMER'S NOTEBOOK

With Rodney Champness,* VK3UG

"YOUR RADIO REFERENCE LIBRARY"

"I don't need a reference library. I passed the theory exam. (just) and I intend to operate a commercially made rig and aerial system. Just quietly, I don't think I should have had to pass a theory exam. After all, I'll be operating commercial equipment and everyone knows that commercial gear is perfect, not like this shocking home-brew stuff. I'll send the gear away for service or con one of the local experimenter types to fix it for me. That reminds me, I must get Joe Blow around to solder up that wire on the rotator."

The learned thoughts of an avid appliance operator "Ham"??? Look up a dictionary to see what "Ham" means—you may get a surprise. The thoughts above seem to me to indicate the attitude of a growing number of Amateurs—a rather narrow selfish attitude, not destined to help Amateur Radio in the long term. Don't get me wrong, I have nothing against Amateurs operating commercial apparatus, only against those who know nothing about the internals of their rigs; those too frightened to open the lid of their set in case it goes "boo" at them. That type of chap won't read this article in any case.

The point I want to get across is this—that to be a competent Amateur in the true sense of the word, a working knowledge of your equipment is essential. To help you gain this knowledge a small reference library is essential.

What kind of books are necessary for this reference library? Two books which cover the wide spectrum of Amateur Radio in its many facets are "Radio Communication Handbook" by R.S.G.B., and "The Radio Amateur's Handbook" from A.R.R.L. Naturally enough you will have a leaning towards some particular aspect of Amateur Radio which will mean specialised books are desirable.

If you are just starting, "Understanding Amateur Radio" A.R.R.L. as a general text is quite good. To prepare you for examinations the N.Z.A.R.T. publication "Questions and Answers" is quite helpful—as long as it is understood that a difference exists between New Zealand Amateur examinations and ours. A small but good book on aerials is "S-9 Signals". This book has quite a few simple inexpensive aerials to suit a light weight wallet. I have been told that this book is now out of print, but I notice that most of these aerials are included in "Beam Antenna Handbook" (4th), by William Orr.

If your main interest is in v.h.f. the "V.h.f./U.H.F. Manual" by R.S.G.B., or "Radio Amateur V.H.F. Manual" (11th) by A.R.R.L. can be recommended. I do prefer the British texts as the power levels and financial levels are similar to ours. All the above books are readily available. Write away for lists and you will find several other books of interest for your particular activity.

The knowledge you gain from your reference library will help you to establish and operate your station more conveniently, effectively and efficiently, thus giving you considerable satisfaction. ●

* 24 O'Dowds Road, Warragul, Vic., 3820.

WIRELESS INSTITUTE OF AUSTRALIA YOUTH RADIO CLUBS SCHEME

A Special "A.R." Report on the Y.R.C.S. Conference

The Y.R.C.S. Conference held in Melbourne over the week-end of 2nd and 3rd September laid special stress upon the basic reasons for the existence of the Y.R.C.S.—namely, the best interests of youth. A Y.R.C.S. Constitution was negotiated for submission to the Federal Council for their acceptance.

The Conference was hosted by the W.I.A. Victorian Division and Mr. John Battrick, VK3OR, was elected by the delegates as Chairman in the unavoidable absence of the Federal President, Mr. Michael J. Owen, VK3KI. Later in the evening, Dr. David Wardlaw, VK-3ADW, was elected to the Chair when Mr. J. Battrick left with regret on another commitment.

The delegates were the Federal Y.R.C.S. Co-ordinator, Rev. R. G. (Bob) Guthberlet, of South Australia; the Federal Y.R.C.S. Secretary, Mr. J. Flynn; State Y.R.C.S. Supervisors: Mr. D. S. Jeanes, VK2BSJ, of New South Wales; Mr. R. A. Everingham, VK4EV, of Queensland; and Mr. A. M. Dunn, VK5FD, of South Australia; Mr. W. L. Tremewen, VK3ZCI, the Y.R.C.S. Correspondence Section Supervisor; Mr. K. McLachlan, VK3ZDK, State Supervisor of Y.R.S. of Victoria, with helpers Mr. Keith Nicholls, VK3ANI, and Dr. Bob Callander, VK3AQ, who demonstrated the Y.R.S. b.f.o. unit project advertised elsewhere in this issue. Comments in writing from the unavoidably absent VK6 and VK7 State Y.R.C.S. Supervisors were also taken into consideration.

This meeting of the Y.R.C.S. Council, as it is to be known under the new Constitution, clarified a number of long outstanding questions including the name of the scheme as "The Wireless Institute of Australia, Youth Radio Clubs Scheme" (abbreviated Y.R.C.S.), the supply of authorised notes to be prepared by the Y.R.S. of Victoria for distribution through the Executive office and the appointment of a committee to revise, integrate and standardise Y.R.C.S. material.

Duties of the functionaries and the necessity for constant communication and co-ordination received attention in addition to other diverse matters such as certificates, Y.R.C.S. Council meetings each three years or lesser period, copyright, "Zero Beat" and general publicity material.

☆

MODERN FILTERS

(Continued from Page 13)

The tools for calculation or design of filters and tuned amplifiers grow most easily out of these pole-zero patterns (and the mulitiplier). The Filter Tables to follow are based on extensions of these ideas.

[Editorial Note: The principles of S-plane analysis and synthesis are of necessity beyond the scope of this series. Readers who wish to study the subject are referred to the bibliography which will follow Part 3. In addition, a very readable introduction to S-plane concepts may be found in Holbrook, "Laplace Transforms for Electronic Engineers" (Pergamon, 1966), particularly chapters 1 and 8.] ●

Commercial Kinks

With Ron Fisher* VK3OM

This month, Part Three of the FT200, some modifications on the Marconi R1155 receiver, but first off, some data on carphones. Following my plea for information on these; Peter Campbell, VK2AXJ, answered my prayer and how! I can now supply circuits for the following A.W.A. units. Low band: MR10C/20A, MR15A and MRT25A; high band: MR10C/20A, MR20B, MR15A, MR6A, MRT25A, MR3A, MR10B. If you would like a copy of any of these, drop me a note with details of your requirements, plus an s.a.e.

Peter also forwarded conversion information on A.W.A. carphones and this will be published over the next two issues.

CONVERSION OF A.W.A. CARPHONES

High band MR10B to 146 MHz. Transmitter: increase IC14 to 82 pF., IC12 to 47 pF., IC21 to 15 pF. Add 4.7 pF. across the secondary of IT2 pins 2 and 3. Add 2.2 pF. across both primary and secondary of IT3. Close up IL4 and IT6A as required. Receiver: Increase C15 and C16 to 33 pF., C31 to 22 pF. Rewind both primary and secondary of T9 with 6 turns.

High band MR10C and MR20A to 146 MHz. Transmitter: T8 increase C92 to 22 pF., C89 to 33 pF. Add 2.2 pF. across L9. Close up L11, L12 and L16 as required. Receiver: Add 1.8 pF. across L1. Add 1.8 pF. across L5. Increase C54 to 15 pF. Increase C6 and C7 to 39 pF., C58 to 22 pF.

High band MR20B to 146 MHz. Transmitter: Increase C117 to 39 pF., CI18 to 22 pF. Add 2.2 pF. across L9. Close up L11. Receiver: Add 1.8 pF. across L1, L3 and L6. Increase C66 to 47 pF., add 4.7 pF. across primary of TR2 and secondary of TR1.

High band MR3A to 146 MHz. See October 1965 "Amateur Radio" or contact Commercial Kinks for a copy of the details. More carphone conversion details next month.

THE FT200, PART THREE

Here is the last part of the service data on the FT200 as supplied by Mr. Fred Bail, of Bail Electronic Services.

Symptom: No drive on "Tune". No side tone on c.w. position, but meter kicks up with speech on s.s.b. This fault is sometimes of an intermittent nature, but it is normal for the drive on "Tune" to diminish slightly if the set, and thus the audio oscillator, becomes very hot. Probable cause: Failure of the audio tune-up oscillator. Cure: Re-adjust the oscillator feedback preset pot. VR504. A slight adjustment of the output preset pot. is sometimes sufficient. Both these controls are mounted on the oscillator printed circuit board under the chassis. If the above adjustments are not effective, check other components and voltages on the board. Until the fault is rectified, the transmitter can be tuned up in the a.m. position. The carrier insertion can be adjusted with a.m. carrier level pot. at the rear of the chassis.

Symptom: Transmitter self oscillation on 21 MHz. band only. This shows up as constant high Ic meter reading at no drive condition. Probable cause: Misadjustment of L22 trap. Cure: Adjust as per the instruction book. If the transmitter self-oscillation still persists, slightly back-off the L22 adjustment until the oscillation just ceases.

Symptom: Transmitter self oscillation. High Ic meter reading at no drive condition. Ic reading varies with grid and plate tuning. Probable cause: P.a. neutralisation out of adjustment. Defective 12BY7 driver valve. Excessive voltage on 12BY7 driver valve. Cure: Connect the transmitter to a load, preferably to a 50/75 ohm dummy antenna. First tune the transmitter on 21.3 MHz. with an Ic meter reading of about 100 to 150 mA. Adjust the p.a. neutralising condenser TC-3. Adjust TC-3 so that Ic dip at p.a. resonance coincides with maximum r.f. output. Check 12BY7 driver valve. Try a replacement. Check that the 300v. line in the FP200 is not reading high. If it is, modify the 300v. filter section to a choke input type.

Although that finishes the service data on FT200s, it is by no means the end of the FT200 in Commercial Kinks. I will be back next month with plenty of ideas for you to try out on your rig. Don't forget to tell me of any problems or modifications relating to the FT200.

THE R1155 AND 160 METRES

My thanks to Mr. R. G. Edmeades for the following notes on the R1155 receiver.

"After suffering from QRM when using the broadcast band as a tunable i.f., it was decided to adjust the broadcast band of the 1155 to include the 160 metre band. Here is how it was done.

"Turn the r.f. coil slug out as far as it will go. Turn out the two No. 3 coil slugs until the tops are just below the edge of the coil box. These are the 1st, 4th in the row nearest the front. Turn out the No. 3 trimmers two turns. Set the pointer to 628 on the dial, then tune oscillator slug (1st on the left) until the set tunes to 730 kHz. Now peak the mixer coil slug (4th from the left). Turn the dial pointer to 1325 and turn the oscillator trimmer until 1600 kHz. is heard. Peak the mixer and screw out the r.f. trimmer until it has no further effect.

"This is the limit of adjustment and the set now tunes from 700 to 1900 kHz. This provides a tuning range of 1600 to 1900 kHz. for use with converters, giving very little chance of QRM from break-through. A new paper scale can be pasted over the old broadcast calibrations."

In a later thought Mr. Edmeades says that some improvement can be achieved by cutting off half of the r.f. coil slug. To do this, remove two screws and the metal cover. Mark the top of the pot, so that it can be replaced as is. Remove the long clamp screws and lift off, unscrew the slug and cut half of it off. You will now be able to peak the trimmer at 1600 kHz.

Thanks Mr. Edmeades. I am sure this will be most useful to all 1155 owners. If you want more data on 1155s, consult the September 1960 issue of "Amateur Radio," or contact Commercial Kinks for copies of this.

* 3 Fairview Avenue, Glen Waverley, Vic., 3150.

Simple Linear Traps

FOR TRIBAND BEAMS AND VERTICALS

J. HUMPHREYS, VK3ANH*

● These traps have been used in a G4ZU X-beam. They have proven to be light, easy to construct and tune, strong, and effective in operation.

The trap capacitors consist of aluminium tubing of different diameters separated by plastic tubing as a dielectric. The inductors are short, straight lengths of aluminium wire connected gamma-match fashion across the capacitors. A sliding shorting bar between the wire and the tubing tunes the traps and the antenna.

"The Antenna Book" (1970) describes a tubular capacitor formed from short pieces of tubing which are then built into the antenna. A simpler method is to make the 10 metre dipole from 1⅛" tubing. Into the ends of this go 4" lengths of 1" grey plastic conduit. Aluminium tubing, ¾" diameter, is wrapped with plastic tape to give a snug fit when inserted into the conduit. It extends the length to a half wave at 15 metres. For the next capacitor, 5" of ½" conduit are used. The length is made up to a 20 metre half wave with ½" and ⅜" aluminium. These dimensions give capacitors of about 60 pF. at the ends of the 10 and 15 metre dipoles.

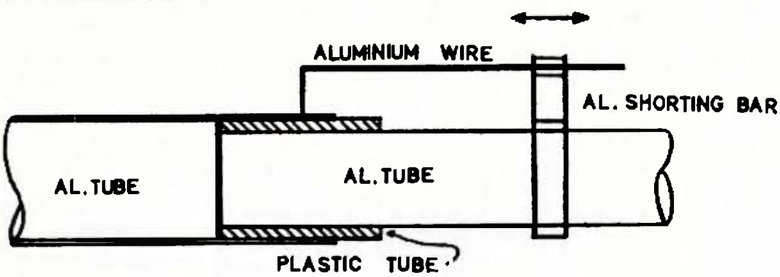
Worm screw hose clamps were used to join the various tubings and to hold the inner end of each inductance. Shorting bars were bent up from aluminium sheet and held with cadmium plated screws. Each trap then looks something like the diagram.

Tuning the antenna for s.w.r., gain or F/B ratio is a breeze. About 2" movement of the shorting bar will tune right through each band. Theory suggests that the 10 metre section be tuned first, but I found no indication that the tuning of one band affected the others. One point; believing that, like most traps, these would require the antenna to be shortened somewhat, I made the 10 metre dipole 14 feet, the 15 metre section 19 feet and the overall length for 20 metres 26 feet. When I came to tune the system on 20 by adjusting the length of the outermost section, I found it necessary to increase the length to a full 34 feet. This suggests that the 10 and 15 metre sections could have been made full size. However, their lengths are not critical because tuning the traps will compensate for any error in this regard.

[Careful checking indicates theoretical stub lengths of about 26" and 16", rather than 20" and 15". It appears that the discrepancy was compensated for by the re-adjustment of the shorter elements which were found necessary. —Tech. Ed.]

In passing, I can recommend the G4ZU X-beam for home-brew tribanding. Because of its shape, the effective spacing on all bands is the same (in wavelengths) and, using these traps, it will match nicely into a single co-ax. feed line. ●

THE LINEAR TRAP



For the inductances, referring to a table of transmission lines, aluminium wire (e.g. 14 s.w.g.) spaced 2½" from the tubing will form a line with a characteristic impedance approximately 400 ohms. The inductive reactance of a length of shorted line is given by:

$$X_L \text{ (ohms)} = Z_0 \tan \phi$$

where Z_0 is the characteristic impedance and ϕ is the length of the line in electrical degrees.

From this, it can be found that lengths of something less than two feet will give the necessary inductance to resonate with the capacitors on 10 and 15 metres. In my case, after tuning, the lengths were 15" on 10 metres and 20" on 15.

* 2 Vine Street, Ballarat East, Vic., 3350.

Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

Editor "A.R.," Dear Sir,

I refer to QSP in the June publication of "Amateur Radio".

For some months I have read and listened to various attacks on local manufacture of Ham Equipment. I have been content to sit, like a wise monkey, however, your June QSP prompted me to put pen to paper.

I am the owner of a locally produced transceiver of excellent capabilities. During my period of ownership of one of these transceivers, I have heard at least six similar units operated in N.S.W. and two in Victoria. I still operate my unit, which sold at $680.00 (your advertising records and printing blocks will verify this) as my original enquiries to the manufacturer were made after reading large prominently displayed adverts in our journal "Amateur Radio". Does history repeat itself?

The June edition of "Amateur Radio" gives prominence to QSP which is conspicuous by its inaccuracies, at the same time displaying a highly paid advert (not so prominent) from another local manufacturer.

One wonders whose face is red! And will this letter receive equal prominence.

—R. Egan, VK2ARE.
W.I.A. member.

P.S.—I have been a full member since 1946, one would like to keep the records straight.

[The locally produced transceiver referred to was advertised in 1962 at a price then of £346/10/0. No trace can be found of any recent advertising of this item, but a reference can be found to a price on page 19 of September 1971 "A.R." Readers should also refer to (a) Currently advertised prices of imported transceivers as read with the final paragraphs of Dr. Goding's QSP in June 1972 "A.R.," and (b) To a Customs Import Duties article on page 11 of September 1971 "A.R."—Ed.]

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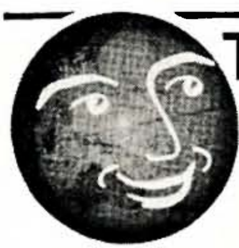

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CONTESTS

With Peter Brown,* VK4PJ

REMEMBRANCE DAY CONTEST, 1972

Well the 1972 R.D. Contest is over and a couple of days later there was a pile of logs waiting for me. A busy time ahead I guess.

A few days before the contest commenced I was asked if repeater contacts were permitted. My answer was "Yes," but I wish that I had put the ruling in the contest rules. My feelings are that where no individual gains, any of the usual means of radio communication are acceptable. In the R.D. a Division may gain. In the Ross Hull an individual will gain. There is no reason why r.t.t.y. and slow scan cannot be used also. Unless you think otherwise.

Before we get steamed up and waste efforts, let us see what the results show. Many dedicated Amateurs have spent a lot of time devising formulae and rules to make the R.D. Contest enjoyable and fair to all, but it all gets back to you.

Again read Federal Vice-President David's QSP of August "Amateur Radio". Please express yourself to your Federal Councillor, preferably, or to me and I will try and make contests to suit all. These minor changes are feelers.

Overall conditions seemed pretty good for the contest and did you note the high log numbers? Unfortunately, I was ill and could not fully participate, thus missing a few of my usuals, but I did get some comments.

"I did not think that I would see the day when congestion on the c.w. section would send me into the phone band." "Fancy a pile up on 10 metres?" (There were pile ups on 15 metres also.) "Of a 100 contests, this was the best yet."

The ZL/ZM boys seemed to be enjoying the contest.

What about a bonus to get signals on 160 and 11 metres next year?

As a final comment, I always feel sorry for the operator, especially one with a good score, whose contest logs fail to reach me, but there is nothing anybody can do about this particularly where the closing date has passed and results have been published. How can this situation be avoided? Certified mail by the sender perhaps?

ROSS HULL MEMORIAL VHF-UHF CONTEST, 1972-73

The major change in this year's contest is from E.A.S.T. to G.M.T. There is little need for me to elaborate on the advantages with "Daylight Saving" coming to some States. Quite a few wished a return to G.M.T. anyhow.

The two-hour elapsed time between contacts with the same station on the same band has been introduced to permit two contacts per calendar day. We will see if this helps.

There is no loading for c.w. as in the R.D. Contest because as a v.h.f./u.h.f. contest the Limited licensees would be at a disadvantage. The rule restricting the use of repeaters has not been altered because this is an individual effort contest. If we do not get a better return than last year from sections (a), (c) and (d) in this contest, perhaps these should be eliminated the year after.

You will note that you have five weeks to get your entry into my hands. After 23rd February I will be too busy getting results to April "Amateur Radio" to open other logs.

Don't put off writing your log—it will be later than you thought. You will note there is a variation in certificate issue. Certificates for merely entering the contest appear to be undesirable. I hope that I can put on a signal or two myself this year and will look forward to saying "good day" to you.

JOHN MOYLE MEMORIAL NATIONAL FIELD DAY CONTEST, 1973

I am sure we can make our next Field Day Contest the best yet. The ZL/ZMs have their Field Day on that week-end also and although they have a few limitations compared with our contest, about which I will make mention next month, there should be a lot of activity for both of us. I have written to Jock ZL2GX on a common Field Day and perhaps one year we can have common rules.

In our next Field Day Contest I would like to define more clearly the "Field" station for two reasons. One being to stop a drift from
(Continued on Page 22)

* Federal Contest Manager, Box 638, G.P.O., Brisbane, Qld., 4001.

Ross Hull Memorial VHF-UHF Contest, 1972-73 Rules

The Federal Contest Committee of the Wireless Institute of Australia invites all Australian and Overseas Amateurs and Short Wave Listeners to participate in this annual contest which is held to perpetuate the memory of Ross Hull whose interest in v.h.f./u.h.f. did much to advance the art.

A Perpetual Trophy is awarded annually for competition between members of the W.I.A. in Australia and its Territories, and is inscribed with the name and life work of the man whom it honours.

The name of the winning member of the W.I.A. each year is also inscribed on the Trophy. In addition, this member will receive a suitably inscribed certificate.

Objects: Australian Amateurs will endeavour to contact as many other Amateurs as possible under the following conditions.

Date of Contest: From 1401 hours G.M.T., 8th December, 1972 (0001 hours E.A.S.T., 9th Dec.) to 1400 hours G.M.T., 21st January, 1973 (2400 hours E.A.S.T., 22nd Jan.)

Duration: Any seven calendar days (local) within the dates mentioned above, not necessarily consecutive. These periods are to be at the operator's convenience. A calendar day is from 1401 hours G.M.T. to 1400 hours G.M.T. (0001 hours E.A.S.T. to 2400 hours E.A.S.T.)

RULES

1. There are two divisions, one of 48 hours duration and one for seven days. In the seven-day division there are four sections:
   (a) Transmitting, open.
   (b) Transmitting, phone.
   (c) Transmitting, c.w.
   (c) Receiving, open.

   In the 48 hours division the best score over any 48 hours period is the winner.
2. Any Australian or Overseas Amateurs operating fixed, mobile or portable may enter.
3. All Amateur v.h.f./u.h.f. bands may be used but cross-band contacts are not acceptable. Only single frequency operating at any one time is permitted. Cross mode contacts are permitted.
4. Amateurs may enter for any one of the sections. The seven-day winner is not eligible for the 48-hour award.
5. Two contacts per band per day are permitted provided that two hours elapses from the previous contact with that station on that band.
6. A multi-operator station will not count, only one may operate a station at any one time and submit a log for his own operation.
7. Entrants must operate within the terms of their licence.
8. The exchange of serial numbers consisting of RS or RST report plus three figures commencing with 001 shall be proof of contact.
9. Entries should be set out, on quarto sheets using one side of the paper only, and must be forwarded to reach the **W.I.A. Federal Contest Manager, G.P.O. Box 638, Brisbane, Qld., 4001,** in time for the last opening of logs on 23rd **February, 1973.** Envelopes should be clearly marked "Ross Hull Contest". Early logs will be appreciated.
10. Scoring will be based on the attached table and the table of distances published in November 1971 "Amateur Radio". Approximate distances are to be shown in the log. Operation via repeaters or translators is not permitted.
11. Logs should be as set out in the example and must carry a front sheet showing the following information:

Name ....Section ....
Address...Call Sign.................
....Claimed 7-day score..................
Operating dates ....
Highest 48-hour score ....
Operating period ....
I hereby certify that I have operated in accordance with the Rules and spirit of the Contest
....
Comments...

12. All times are to be logged in G.M.T.
13. Certificates may be awarded to the winners of each section of each call area.

    Certificates will be awarded subject to there being at least three other eligible entries in that call area and section. Certificates will be awarded to contestants who break any Australian v.h.f./u.h.f. distance records.

    The VK contestant who returns the highest score in the transmitting section and who is a financial member of the W.I.A. will have his name inscribed on the trophy which will be held by his Division for the prescribed period. A certificate will be awarded to the operator with the highest 48-hour score.

RECEIVING SECTION

1. Only short wave listeners may enter for this section.
2. Contest times and logging of stations shall be as for the transmitting section except that there will be no 48-hour division.
3. Logs must show the call sign of the calling station, the serial number given and only the call sign of the other station. Scoring will be as for transmitting stations.
4. Any scoring contacts may be logged. There is no limit to the number of times that a station may be logged provided that they are scoring contacts, i.e. there are serial numbers.
5. The logs for any seven calendar days may be submitted and the winner of the section will be the highest scorer.
6. Certificates will be awarded to the highest scorer in the contest provided that there are at least three other eligible entrants.
7. A certificate will be awarded to the club station with the highest seven-day score provided that there are at least three eligible club entrants.

GENERAL

It is preferable that complete logs be submitted as an aid in checking, but contestants must clearly show their best seven days or 48 hours.

SCORING TABLE

Distance		52 MHz.	144 MHz.	420 MHz.	576 MHz.	Higher
Up to 25	miles	1	1	2	5	10
26 to 50	,,	1	1	5	10	25
51 to 100	,,	5	5	15	30	50
101 to 200	,,	10	10	25	50	100
201 to 300	,,	25	15	50	150	250
301 to 500	,,	20	25	100	250	300
501 to 1000	,,	10	35	200	300	350
1001 to 1500	,,	15	100	250	350	400
1501 to 2500	,,	25	125	300	450	500
2501 to 3500	,,	35	200	400	500	600
3501 to 5000	,,	50	300	450	550	650
5001 to over		100	400	500	600	700

(When we change over to metric, these distances will be changed so you won't always be just in or just out of a range.)

EXAMPLE OF VK4 TRANSMITTING LOG

Date/ Time GMT	Band MHz.	Emission	Call Sign	RST Sent	RST Recd.	Dist. Miles	Pts.
Dec. 24							
1402	52	A3(a)	VK7ZAB	56001	57022	1234	15
1424	52	A3(a)	VK4OP	57002	54004	330	20
1534	144	A3	VK5ZDL	58003	56043	980	35
1655	144	A3	VK3ZHD	45004	57089	175	10

EXAMPLE OF VK6 S.W.L. RECEIVING LOG

Date/ Time GMT	Band MHz.	Call Heard	RST Sent	Station Called	Dist. Miles	Pts.
Jan. 2						
1207	52	VK5ZXG	56087	VK8OK	1330	15
1400	52	VK2ZDD	56244	VK6DB	2450	25
1815	432	VK6JX	57061	VK6TG	60	15
2309	144	VK5RF	47004	VK6ZDQ	1330	100

PROJECT AUSTRALIS

Unfortunately, a serious component failure in the 435.1 MHz. beacon transmitter delayed shipment to Amsat. Notwithstanding the statement on page 2 of August "A.R.," the transmitter has not yet left Australia. Long discussions on the problem have been held with Amsat, and it has been agreed to replace an offending FET with a different type. It is hoped that this will maintain the good performance figures of the transmitter, while still giving the unit the reliability needed for the AO-C Satellite. It is hoped to get the transmitter to Amsat in time to have it included on AO-C.

Amsat have advised that AO-C will begin RFI (radio frequency interference) tests with the Nimbus-E Satellite on 2nd October, and that it will then be shipped to California for a long series of pre-launch tests on 15th October. The launch date has not yet been completely finalised.

Amsat have advised that the AO-C absolute receiver sensitivity is minus 100 dbm. for maximum output of the 10 metre transmitter. This is equivalent to 2.5 microvolts. To a ground station, this is equivalent to 100w. e.r.p. The maximum output of the flight transmitter on AO-C is 1.3w. Assuming a 1w. output and 136 db. path loss, the signal at ground stations at maximum short range of 2,500 miles is 1 microvolt. As the average sensitivity of a commercial h.f. transceiver at 10 metres is 15 microvolts, a pre-amplifier WILL be needed. A suitable pre-amplifier will be published in November "A.R." as will a 10 metre to 40 metre converter. Both of these will be available in kit form.

The prototype 435 MHz. repeater has so far been to VK4 and VK5 on its tour around the country. It next goes to VK2, then VK6 and VK7.

The standard orbit tracking data will be published with October "A.R." Data will appear for each State capital. If you know of any district more than about 100 miles from a State capital which would be interested in getting a copy of the standard orbit data, please let us know, so that it can be prepared and posted out in advance of the AO-C launch.

STOP PRESS

AO-C is now due to be launched October 15 or 16 on ITOS-C or ITOS-D (REPEATER OPERATORS PLEASE NOTE).

INTRUDER WATCH

With Alf Chandler, VK3LC

I have had some complaints that run something like this:

"How about telling us when a station is removed from our bands because of Intruder Watch vigilance?" This is very difficult because the authorities do not tell us when such is the case.

Another complaint is: "We report these intruder signals but nothing seems to be done about them." Again this is very difficult because the authorities will take no action unless they get many reports of the same station being heard and at various dates. Then they will monitor the frequency in question, and if satisfied that it is a legitimate intruder causing harmful interference they will take action and send a diplomatic complaint to the Administration concerned.

Thus it is necessary for as many members to report intruders as possible. Without your reports, nothing can be done. Of the Divisions, VK4 is the most active and informed, VK2 and VK3 are only slightly interested as is VK7, VK5 and VK6 Amateurs appear to have no interest in I.W.

The I.W. Summary for the first half of 1972 lists 275 intruders, of which 106 were on 14 MHz., 30 on 7 MHz., 21 on 21 MHz. and 18 on 3.5 MHz. These were reported mainly by VK4KX and VK8HA. Contributions came also from VKs 4PB, 4BG, 4CA, 4LZ, 4NP, 4UC, 2AXK, 2ZO, 4VO, 3TX and 3ASV. On 40 mx the broadcasters are listed including an Indonesian station on 7099 and the ever-present Chinese language stations together with jammers. Most of the intruders on 14 and 21 MHz. were logged in daylight hours, whereas the opposite occurred on 40 and 80 metres, thus illustrating the mess which comes from areas somewhere to the north of us.

The list has been passed to the P.M.G. Dept., but what action is taken thereafter does not appear to achieve much result except that more and more intruders are being logged. However, we must keep up the reports to avoid a squatter's rights situation for the intruders.

An interesting item is contained in "Radio Communication," July 1972, page 446: "A radio station may operate in derogation of the Radio Regulations as long as its operation does not cause harmful interference to the radio communication services operating in accordance with the convention and regulations. This means that a commercial station may operate in an Amateur band and may continue to do so unless a report of harmful interference is made to the Administration. From this basic fact stems the need for an active and efficient intruder watch." Go to it or you'll surely perish!!!

"20 YEARS AGO"

With Ron Fisher, VK3OM

Atomic tests always seem to be making news one way or another. Back in 1952 tests were carried out at the Monte Bello Islands, and in the Editorial of October, Federal Executive urged Amateurs to make observations of any unusual propagation conditions.

Federal Executive went on to suggest that perhaps we should be helping to fill in the gaps which would enable the Ionospheric Prediction Service to provide even more accurate results than "at present" achieved. Perhaps we should.

Tucked away in the Federal Executive Proceedings column is news of the release of the 160 metre band for emergency work. The allocation was from 1840 to 1860 kHz. I do not remember anyone ever making use of the band, probably because most Amateurs were unaware of just how they could legally use it. 160 was destined to remain silent for a few years yet.

Another item of far reaching interest concerned Novice and Technician licences. Consideration was given to a letter received from the Postmaster-General's Department, Wireless Branch, in reply to the W.I.A.'s application for approval for issuance of Novice and Technician licences. The Department advised that since reference to other administrations and departments would be necessary, inquiries were likely to be protracted. As we know, the Limited licence was introduced a few years later, while the Novice licence still remains an issue.

Leading the technical articles, R. T. Busch, VK3LS, presented a run down of circuits suitable for emergency network use. Simple transmitters, modulators, receivers and mobile aerial systems were discussed.

During the 1950s the "All Models Exhibition" was a popular feature of Melbourne life. The Victorian Division of the W.I.A. was well represented and a complete description of their display appeared in the October 1952 issue of "Amateur Radio". The whole stand was organised by Len Moncur, VK3LN. Exhibits included transmitters and receivers for all bands, a complete television system and a tape recorder—all home made.

It seems rather a pity that these Exhibitions were dropped as it certainly gave the W.I.A. a wonderful opportunity to put Amateur Radio on display to the public.

In 1952, band switching an h.f. transmitter presented something of a problem. An interesting advertisement by R. H. Cunningham Pty. Ltd. showed the range of Q Max turret switched pa. coil assemblies. These units employed a separate coil for each band complete with a separate output link coupler. Rather large when compared with current methods, but no doubt efficient.

FREQUENCY ALLOCATIONS

Band Usage Questionnaire

The W.I.A. has recently established a committee to be responsible for the orderly planning of frequency usage for various Amateur purposes in the v.h.f. and u.h.f. bands, 52-54 MHz., 144-148 MHz., 420-450 MHz., and higher. Problems have arisen recently in the 144-148 MHz. band due to the conflicting channel requirements of established f.m. repeaters and the soon-to-be-launched Oscar 6 satellite, not to mention channels used for f.m. simplex communication, r.t.t.y., and other activities.

Re-organisation of the 2 metre band, because of its urgency, is to be the first task of the committee, which is known as the V.h.f. Advisory Committee, and functions as part of the Executive of the W.I.A. Obviously one of the aims must be to reconcile the needs of the various users, where conflict may exist, so as to produce the minimum of inconvenience to those already established. Planning must be carried out at least on a national basis, and particularly for satellite, moonbounce, or similar systems, there are international aspects involved.

As the first stage in the programme, data is needed regarding the present usage and future requirements of the bands. It has been decided to obtain this by the wide distribution of a questionnaire to reach all known v.h.f. and u.h.f. band users. The questionnaire is now in preparation, and will also be distributed to all v.h.f. groups, radio clubs, and similar organisations. The committee earnestly requests interested parties to study the questionnaire when received, and to supply the data called for as thoroughly as possible. One important aspect is to provide for newly-developing systems such as slow-scan t.v., facsimile, or other techniques which some users may hope to experiment with in the future. Although the 2 metre band has been emphasised, information will also be sought regarding other bands.

Only with the fullest possible knowledge of current and potential activity by Amateurs on v.h.f. and u.h.f. can the committee achieve its task of providing for all with minimum inconvenience. Success depends on co-operation. Only those who tell us of their frequency requirements can expect the final plan to have a place for them. May we, the Advisory Committee, hope to hear from you all in due course?

Magazine Index

With Syd Clark, VK3ASC

"QST"—JUNE

450 Cubic Centimetres of New Front End for Your FM Receiver (220 MHz.); The W2FMI 20 Metre Vertical Beam; More on Instant Voice Interruption; Antenna Impedance by Direct SWR Measurement; A Simple Ham Shack Wavemeter; Notes on the Amateur Station Counter; CB Whip plus Mod equals 2 Metre 5/8 Wave Vertical; An IC Audio Tune-up Device for the Blind Amateur; An Adjustable Voltage, Current Limited Power Supply (0.5-31v., 0-1.1a.); High Accuracy FET Dipper; Taking Out the 2 Metre Garbage (can coaxial on 144 MHz.); Review of "Henry" 2K Ultra Amplifier; Do You Really Dig Transistors?; Houston, This is Apollo . . . ! (how Amateurs may equip themselves to receive signals directly from space vehicles).

"HAM RADIO"—JUNE

Five-Band Solid State Communications Receiver (converter 7-30 MHz., 80 tunable i.f., Collins 2.1 kHz. filter i.f., TA300 audio); Integrated Circuit, Sequential Switching for Touch-Tone Repeater Control; RTTY Ribbon Re-inkers; Accurate Noise Figure Measurements for VHF; Sync. Generator for SSTV; Getting Started in Microwaves; Memo-Key.

VHF UHF

an expanding world

With Eric Jamieson.* VK5LP

Closing date for copy: 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

(This list will be published in full every third month.)

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK1	144.475	VK1VF, Canberra.
VK2	52.450	VK2WI, Dural.
VK3	144.700	VK3WI/R6, Vermont.†
	144.925	VK3QZ, Traralgon.†
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Albany.
	145.000	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
	145.250	ZL2VHP, Palmerston North.
	431.850	ZL2VHP, Palmerston North.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.
ZK	50.1015	ZK1AA, Cook Island.†
KH6	50.104	KH6EQI, Hawaii.†
WB6	50.013	WB6KAP, California.†
FO8	50.101	FO8DR, French Oceania.†

† Denotes addition or change of information.

Copies of a letter from Victor Frank, WB6KAP, to hand per courtesy of Federal Manager, and Ross VK5KF, Secretary, VK5 W.I.A. This letter contains interesting information on operation of beacons as follows: ZK1AA, Cook Island, 50.1015 MHz. operates continuously and to call him you should transmit on 50.104 MHz. KH6EQI, Hawaii, on 50.104 also operates continuously, to call phone 689-0111 or 432-5132!! Beams West Pacific 1230 to 1400, S.W. Pacific 1400 to 1630, South Pacific 1630 to 0400. WB6KAP in California operates for first 30 seconds; then listens second 30 secs. on 50.101. Hours 1100 to 0100 week days, longer at week-ends. Beacon permit lasts from 15th August to 15th November. FO8DR in the French Oceania group to the east of Cook Is. operates continuously on 50.101, listens infrequently on the same frequency. Beams to ZK1 (and probably in line with VK) 0300 to 0315 and 1400 to 1415.

Victor WB6KAP further reports FO8DR and ZK1AA are hearing and working each other regularly on 50 MHz. scatter. ZK1AA has been hearing the KH6EQI beacon regularly since it returned on 10th August, as early as 1600 and late as 2230. FO8DR has heard KH6EQI weakly. All four stations would appreciate reception reports. WB6KAP also has a chart recorder going on 50.101 as well as a number of t.v. video carrier frequencies continuously, plus a tape recorder on 50.101 and 50.104 between 0300 and 2000. So far no VK or ZL t.v. carriers heard this season . . . So! Looks like a good idea to run a receiver on some of the above frequencies at odd moments when poking around the shack, particularly during the equinox period.

The VK3VE beacon has been allotted a new call sign of VK3WI/R6. The VK3QZ beacon at Traralgon may not be in operation until the early part of the DX season. Other than that, it is hoped the list as presented is reasonably complete and accurate. Of interest is the news that Roger Harrison, VK2ZTB, Editor of 6 Up, will be staying on the Cocos Islands in the Indian Ocean until about the end of 1972, and hopes to be able to operate 6 and 2 metre s.s.b. from there, and with the possibility of running some sort of beacon. The distances will be about 1,800 miles to VK6 and nearly 3,000 miles to VK5. Roger would like to try t.e.p. to Japan on 144 MHz. Call sign initially will probably be VK9YR, until his own is allocated. Apart from all this Roger wants to be active when the AO-C satellite is in orbit. Whether he will be working at all has not been indicated!

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* Forreston, South Australia, 5233.

144 MHz. CONTACTS

The 27th August provided a number of Adelaide stations with good contacts during a coastal inversion on 144 MHz. Kerry VK5SU at Ceduna surprised many with his signal on 144.200, and contacts were also made with stations in widely scattered areas like Port Lincoln, Whyalla, Port Pirie, Mt. Gambier, etc. VK3s seemed elusive but the inversion may not have extended that far, although David VK5ZOO in Mt. Gambier was 9 plus for a long time.

A letter from Rod VK2ZQJ mentions successful skeds being maintained with Barry VK2ZAY in Boggabri, North-West of Tamworth, and a 250-mile path, with at least a 50 per cent. QSO rising to 99 per cent. at times. Usual QSB and occasionally fast flutter. Barry runs 100w. to a 13 el. Rod is also contacting Bill VK2ZCV at Tamworth (100w.) with excellent signals two-way s.s.b. Both these stations could represent possible contacts on 2 metres during the summer Es season, and would be advised to keep one ear on the band during December.

ON 52 MHz.

Rod VK2ZQJ goes on to mention continuing useful sessions with VK7ZGJ on meteor scatter and particularly good signals during the recent Aquarids showers, with quite a lot of residual activity after the showers finished. He heard quite a lot of Wally VK5ZWW and VK5ZDX.

For your information days of likely increased meteor shower activity are Oct. 20 and 21; Nov. 16 and 17; Dec. 4, 5, 6, 12, 13, 14. According to 6 Up, the Giacobinids showers due Oct. 9, allegedly produce a count of up to 400 per minute during peak years. According to the m.s. data in the latest A.R.R.L. V.h.f. Manual, 1972 is a peak year. Anyone for two metres?—or even 432?—m.s. on this band has been accomplished in the States!

VK3 six metre operators will be happier now that their "beloved" Channel 0 t.v. will not be commencing operation until 1130 instead of the previous 0700. If the same situation extends to the week-ends and the summer period a rise in VK3 short-skip contacts to VK5 is possible.

REMEMBRANCE DAY CONTEST

The R.D. Contest has been and gone. I considered it to have been one of the friendliest in my time of operating. Very pleasing to note the greatly increased operating on v.h.f. this year, in VK5 anyway. In this State 46 full calls and 50 limited licensees participated and there were some very good scores. With repetition contacts permitted every two hours, there is now more incentive for the v.h.f. operator to join in the contest which should be Australia's number one contest.

"S" BAND SIGNALS

Reprinted from Veron V.h.f. Bulletin, K2RIW, via "Break-In". Condensed to technical details only. In 1971 WB2MLH, WB2MUE and I, K2RIW, realised that around our laboratory was enough test equipment to receive Apollo astronaut "S" band signals if combined with a 30-35 dB. gain antenna. I had been developing a 22 pound, 12¼ ft. diam. stressed parabolic antenna with 432 and 1296 MHz. feed horns for the annual East Coast V.h.f. Society Antenna Gain Contests.

For Apollo reception we built an "S" band feed for this antenna out of an American paint can and a Scottish oatmeal can (3¾ in. cans don't exist in the U.S.) The feed is modified from W2MIU's patented design. The antenna on "S" band has a 700 ft. hear field range, so we made our solar noise measurements and found we had to improve surface accuracy. After improvements we received 6 dB. of "S" band sun noise. My company loaned me a one dB. noise figure parametric amplifier and a spectrum analyser, which we used on 2287.5 MHz. Command Service Module (c.s.m.) frequency converter. We also built a phase locked loop synchronous detector for extraction of the astronaut voice 1.25 MHz. n.b.f.m. subcarrier before we were able to receive good audio.

On Apollo 15 we received 3½ hours of astronaut voice tape recordings. The c.s.m. carrier wave was as strong as 29 dB. over the noise. For Apollo 16 I built a new feed horn which uses a set of screws as a slow wave structure to achieve circular polarisation and thus did away with the lossy hybrid. The feed is supported by fibre-glass sheets instead of wire and is much more efficient. We now see 9½ dB. of "S" band sun noise and 2½ dB. of ground noise. With the 1 dB. n.f. paramp. we can easily see the "S" band noise radiated by a man when he walks in front of the antenna.

During Apollo 16 we received 15 hours of astronaut tape recordings from the c.s.m. We listened to the 2282.5 MHz. carrier of the Lunar Module (l.m.) during its landing. It was 5 dB./noise of a 0.5 kHz. bandwidth. We didn't receive l.m. audio because of the failure of their high gain antenna.

We found the one-watt carriers of the four science packages (ALSEP packages) which were left by the astronauts on Apollos 12, 14, 15 and 16. They were all 3 dB./noise of a 0.5 kHz. bandwidth on 2278.5, 2279.5, 2278.0 and 2276.0 MHz. respectively. What makes these signals interesting is that they are powered from a nuclear power source and should be operational for about 10 years. They transmit the best "S" band weak signals that are observable on a world-wide basis wherever the moon is observable, and they transmit 24 hours a day. If you can hear the ALSEP packages, then your system has more than enough threshold for astronaut voice reception at a lunar distance of the c.s.m. and l.m. If your antenna gain minus system noise figure is plus 32 dB., you can hear the ALSEPs. We borrowed a H.P. frequency counter and measured the four ALSEPs to the nearest 100 Hz. We were not successful in picking up the Lunar Rover Car.

The Goldstone 85 ft. dish transmits 10 kW. up to the c.s.m. at 2106.4 MHz. and to the l.m. at 2101.8 MHz. We listened to these signals after moon bounce and found them to be 15 dB. average over the noise of a 3.6 kHz. bandwidth during the time either vehicle was in front of the moon, even though their frequency was considerably outside the range of our horn and paramp. My tapes of this e.m.e. signal is the wildest sounding thing I have ever heard. It has fantastic amplitude gyration but manages to remain almost pure in pitch. This encouraged us to set up the n.b.f.m. rx on the 30 kHz. audio sub-carrier of the uplink e.m.e. signal and try audio demodulation. We achieved about 50 per cent. intelligibility of the l.m. uplink during the time the l.m. was lifting off the lunar surface. I am quite sure that f.m. e.m.e. phone is far superior to a.m. or s.s.b. e.m.e. phone because of the very rapid amplitude gyrations. We will be experimenting with a new technique to increase intelligibility of this signal on Apollo 17. If anyone wants to know what 2300 e.m.e. sounds like, then he should build a rx for 2106.4 or 2101.8 MHz. by 9th December, 1972, when Apollo 17 is due to lift off.

Solar noise measurements indicate that the system presently has a gain to temperature ratio of 35.8 dB. On 23rd May, 1972, at 7 p.m., EDST, we connected a radiometer to our rx system which is capable of seeing 0.005 dB. of change in rx output. That increased the system sensitivity about 30 dB. When we aimed the antenna at the moon we measured 0.05 dB. of noise increase due to black body radiation of the moon's soil, which is at an average temperature of 220 degrees Kelvin. Besides the sun this is the first real radio astronomy measurement we have made and we are looking forward to measuring the Cygnus X and Cassiopeia A galaxies, and maybe even looking at the noise of a pulsar in the near future.

Our project is gaining momentum. My company is giving us increased backing in the form of borrowed test equipment during non-working hours and our informal "AIL Radio Astronomy Group" now consist of six members. Right now I am looking for 2300 transmitting devices. When Amateurs find out how many interesting things are possible on "S" band there will be a 2300 MHz. rush similar to the present 432 MHz. rush here in the U.S.—K2RIW.

That's all the news for this month. In closing here is the thought for the month: "A bird in the hand may be worth two in the bush, but remember also that a bird in the hand is a positive embarrassment to one not in the poultry business." Until next time, The Voice in the Hills.

OBITUARY

RAY CHAPLIN, VK2SB

Mr. Ray Chaplin, VK2SB, of Epping, passed away very suddenly on 12th August with a heart attack on Kempsey Golf Course while playing. He was aged 52 and was employed as an engineer with the Macleay River County Council at the time of his death.

He operated as an Amateur from Nambucca Heads for 13 years and then moved to Epping where he stayed for about 30 years. For many years he was a co-organiser of the Urunga Conventions.

To his wife and daughter we would like to pass on our sympathy in their sad loss.

AWARDS COLUMN

With Geoff Wilson,* VK3AMK

INCREASED CHARGES FOR W.I.A. AWARDS

At the 1972 Federal Convention it was decided to increase the cost of W.I.A. Federal Awards to non members to $1.00 per award. However, there is NO charge made to financial members of the W.I.A. for awards issued by the W.I.A.

V.H.F. AWARDS

With the approach of the summer season and increased activity on the v.h.f. bands I would like to mention some of the awards available to v.h.f. operators. Most people will be looking for a new State or Call Area on their favourite band in the coming months to gain some long sought award. In most cases the addition of one more Call Area on v.h.f. is much more difficult than another country would be to confirm on h.f.

The W.I.A. currently offers two main v.h.f. awards with others to become available in the near future. The first is the "V.H.F.C.C.," which requires one hundred confirmations. It is available for both 6 and 2 metre operation. Full rules were given in "A.R." Jan. 1972. The second is the "W.A.S.," which requires one confirmation from each VK Call Area 1 to 8. Full rules were given in "A.R." Feb. 1971. Additional credit is given for each "country" worked, countries for the purpose of this award are as for the Australian D.X.C.C. To date the "W.A.S." award has only been issued for 6 metres, but several people are known to be very close to achieving 2 metre "W.A.S."

The N.Z.A.R.T. (ZL) offer the award "W.A.D." for confirmed contact with ZL1, ZL2, ZL3 and ZL4 on any v.h.f. band or mixture of v.h.f. bands. The award is issued free of charge.

The J.A.R.L. (JA) offer three awards, which although difficult, are not impossible on v.h.f., especially for northern VK stations. The first is the "W.A.D." for confirmed contact with all JA districts 1 to 0. This has been obtained by a number of VKs. The second is the W.A.J.A." which requires confirmed contact with all 46 JA prefectures. The third, "J.C.C." requires confirmed contact with 100 JA cities. To prove that this is not an impossibility, Lyndsay VK4ZIM recently applied for "J.C.C." for 200 cities—all on 6 metres.

Applications for both ZL and JA awards may be certified by the Fed. Awards Manager W.I.A. so that cards need not be sent overseas.

In addition to the above awards, a number of VK clubs offer awards which are also available for v.h.f. operation.

Well known 6 metre DXer, Lyndsay VK4ZIM, who recently confirmed 200 different Japanese cities worked on the 6 metre band. Awards obtained by Lyndsay in recent years on v.h.f. have been the Cook Bi-Centenary Award, VHFCC and WAS. His current total of stations confirmed on 6 metres is 650.

W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign. Credits for new members and those whose totals have been amended are also shown.

PHONE—

VK5MS	319/344	VK5AB	295/314
VK6RU	317/344	VK2APK	292/300
VK4KS	312/328	VK4UC	292/300
VK3AHO	309/326	VK4FJ	285/307
VK6MK	302/324	VK4PX	284/286
VK4VX	300/301	VK4TY	283/288

New Member:

Cert. No.	Call	Total
136	VK3BBA	120/121

Amendments:

VK2AAK	275/279	VK4RF	229/230
VK2SG	263/266	VK3JF	139/140
VK2AHH	256/267	VK5WV	129/130

C.W.—

VKAHQ	309/325	VK3NC	272/297
VK2QL	304/328	VK6RU	264/289
VK3YL	291/309	VK3YD	262/281
VK2APK	288/297	VK4TY	258/272
VK4FJ	288/315	VK3TL	253/260
VK3XB	284/300	VK4VX	252/253

Amendments:

VK3RJ	250/251	VK3JF	196/204
VK4RF	203/216	VK4PX	107/112

OPEN—

VKRU	317/344	VK4TY	305/321
VK4SD	314/330	VK6MK	302/324
VK2VN	313/333	VK4UC	301/303
VK4KS	313/333	VK2EO	300/325
VK4VX	307/308	VK2SG	299/306
VK2APK	306/319	VK4FJ	296/323

New Member:

Cert. No.	Call	Total
146	VK7GC	111/112

Amendments:

VK4PX	292/298	VK3JF	213/221
VK4RF	264/277	VK2AXK	128/132

W.I.A. 52 MHz. W.A.S. AWARD

New Member:

Cert. No.	Call	Add. Count.
103	VK3ADM	3

W.I.A. V.H.F.C.C.

New Member:

Cert. No.	Call	Confirmations 52 MHz.	144 MHz.
84	VK3ZYO	—	105
Amendments:			
46	VK3ZNJ	285	—
47	VK3ZNJ	—	310
80	VK4ZIM	649	—

The Federal Contests Manager, Peter Brown, VK4PJ, in his well-equipped shack. However, he has to keep ample table top space free for checking contest logs.

Specimen copy of the Hunter Branch Award Certificate issued by the Hunter Branch (N.S.W. Division, W.I.A.). Rules for the Award will be given in November "A.R." Awards Column.

CONTESTS

(Continued from Page 19)

the original idea of a field station and the other to give v.h.f. operators another entry into the competition.

The field station takes much more organising especialy where a lot of people are involved compared with the mobile chap, h.f. or v.h.f., who gets into his car and goes for a drive. (I do both on field days.) So I propose the "Fixed" station division and the "mobile" station division. You may think that a separate contest would be better? Anyhow, let us try it out in 1973 and see how it works.

Definition of a **"Fixed Field Station"**. Transmitters and receivers are to operate from a power supply which is not used in connection with moving a vehicle (who said horsepower?) or which is not connected to any permanent installation. A car battery OUT of the car is acceptable.

"Mobile Field Station". Txs and Rxs are to be installed in a vehicle.

Rules for the "Fixed" stations will be as last year plus a c.w. bonus. "Mobile" stations will be phone only—6 and 24-hour. Both divisions may work v.h.f. with a 2-hour interval as for the R.D. Contest.

Repeaters may be used. I see no reason why any operator should not enter both divisions provided he calls VK4XX/portable or VK4XX/mobile as the case may be and puts in separate logs. Any comments?

Rules in detail should appear in December "Amateur Radio".

There should be plenty of activity for all h.f., v.h.f., portables and mobiles. If certificates are given to overseas stations for VK portable or mobile contacts we may get some interest from there.

So what about getting yourself, and your friends, well organised for February 10 and 11, the second week-end in February 1973.

Note—If you join in it will be a good contest.

* 7 Norman Avenue, Frankston, Vic., 3199.

you and DX

With Don Grantley*

Times: GMT

Although pressure here has prevented me from even switching the receiver on for many weeks, I think I can manage a few items of interest this month. It would appear that conditions are still quite good and if current reports are anything to go by, then we are in for a good summer.

Hank VK2BHL has been amongst the good stuff over the recent period and has hooked amongst others 7Z3AB, 4X4JU, CR7IZ, EL2CY, XU1AA, EP2SS, UQ2HO, OD5FB, CR7BC, 9G1BF, VP2VAR. My thanks to Hank for taking the trouble to compile a very informative list of log extracts, etc., all of which is a very real help. But, unfortunately, I have misplaced Hank's address, so I cannot thank him by letter.

Note to hand from HB8NL re the proposed jaunt to Leichtenstein. Using the calls HB0NL and HB0AIC, the two operators, HB9NL and HB9AIC, will be QRV from that locality from Oct. 9 to 21 using c.w. and s.s.b. on all bands from 160 to 10 mx daily. Skeds can be made via HB9NL, Frank Acklin, CH6233, Bueron, Switzerland, and any help or questions pertaining to the operation can be had from him or the other operator, Bruno Herger, Wesemlinterrasse 86000 Luzern, Switzerland. QSLs should go direct or via the Bureau and replies will be sent after the operation is completed.

VK2BQQ is off to Lord Howe Is. from Oct. 12 to 19 and will be using 3502, 7002, 14002, 14045, 14110 (s.s.b.), 21045 and 28045. 7045 c.w. will be used for the VK/ZL c.w. section as will 14095, which will also be used for the OK Contest. His address is Box 3209, G.P.O., Sydney, N.S.W., 2001.

Whilst on the subject of special events, please do not forget the Jamboree-on-the-Air, to be held over the week-end of Oct. 21 and 22. Starting time is 0001 local time, and the event will terminate at 2359 local time Sunday 22nd. Rules are simple, advise your branch supervisor of your intention to participate, observe your national licence regulations, use any authorised frequency or mode, and send in a report to your branch supervisor after the event. I mention it as a most worthy event for any interested persons, no amount of praise is high enough for the Scouting movement and it is only fitting that a hobby as great as Amateur Radio should be enlisted to aid and propagate such a worthy cause. I hope to be listening to much of it from a hill top at Imbil in Queensland, overlooking Gympie.

A long and interesting letter to hand from Murray VK4KX, who has taken a lot of trouble to compile a list of stations heard and worked. Amongst the latter were XV5AC, QSL to W1YRC; CM8RC, Box 5, Santiago de Cuba, Cuba; VK9JW/Mellish Reef, QSL to VK3JW; KZ5BH, 9M6AW, Box 257, Labuan; 5X5NK, via DJ3JV; PZ1AH, via Bruo; FH0DL on Comores Is., QSL to DK2SI, and VU25FBZ on Pt. Blair Andaman Is., QSL to Bureau. Murray would like to hear from anybody who has the correct QSL information on 9G1DL, his address is 6 Murray St., Red Hill, Brisbane, 4059. I cannot assist with QTHs of more than a month back as all my information sheets, etc., are packed.

At this stage I would like to pause in the notes and comment on a few remarks from VK4KX, who for the past year has been VK4 Intruder Watch Co-ordinator. The old Australian attitude of "She's right, George," may be fine at times, but when we see it applied to our bands it is high time a few more of us started yelling in the right sources. The frequencies allocated to the exclusive use of the Amateur Service are theirs by right, and theirs alone. To the listener who spends much of his spare time monitoring the bands, it is sickening to see these portions of the spectrum being taken by those interests who have absolutely no right whatsoever to them. Repeatedly I have noticed high power Amateur operators change channels or even bands in the middle of a QSO to escape the interference from these parasites who have only their own interests at heart. They can be driven from the bands, I have seen it done by some of our chaps who can be bothered to make the effort.

What has this to do with VK4KX? As one who is keenly interested in these pests, he offers the following suggestions. Take the time and trouble to log their operations and send the information on an official Report Form either to himself or Alf VK3LC for handling by the P.M.G's Department. Secondly, do not avoid the frequency, but call CQ and run QSOs on it wherever possible, in particular he suggests that local QSOs be held on top of these channels and not in the clear spots. Thirdly, more Amateur activity on the air is desperately needed, many bands are deserted for lengthy periods of time, leaving the way open for commercials and pirates to come in.

I would like to add a very timely point of my own to this one, how about those smarties who delight in interfering with other people's operation inflicting their unwanted attention on some of these operators who have no right being on the Amateur bands. This would no doubt give them the pleasure they seek in annoying others and at the same time doing all and sundry a good service—or is not this part of their make-up?

Back to more pleasant things, and I was very pleased to hear from Chas. VK4UC a few days ago and he tells me that four operators including Jerry KZ5JF will be operating from Serrana Bank under the call sign KS4SZ from Oct. 26 to 31 on all phone sections of the U.S.A. band allocations. Jerry holds a general ticket, so when he is on, he will be operating above 14270 and looking for VK/ZL contacts.

Special prefixes reported by Geoff Watts in the past few weeks include 9H4 for special stations operating from Gozo from August 1, several from JY have also cropped up. JY5HC QSL Box 2353 Amman, JY6FC and HA have their QSLs handled by DJ9ZB, JY9GR has DK4PP, JY9VO uses the services of HB9AMO, while JY9TZH goes to his home call K9TZH. Venkat appeared using the call VU25KV, a special call to celebrate India's 25 years of Independence. His manager is W6KNH. FG0GE operating recently from FS7 was Bob W1VYS who claims to be returning to that locality from January to April of 1973.

Now for a quick run around the Pacific. Firstly, KS4BH currently on from Swan Is., often using 14215 s.s.b., QSL to K3RLY. Clipperton Island is in the news with the declaration by the French Government that they will not allow any further Amateur activity from that location. VR6TC is reported in Auckland for hospital treatment and it is said that he will not return home for some time. VR4EE still active at the time of writing, QRV daily except Friday around 21210 or 21285 from 0900z, his address is Jacques Sapir, Box 400, Honiara, Guadalcanal. KS6CY QSLs for the end of July operation by Jim WB6CZB go to his manager WB5BHN. VR1 British Phoenix will issue future calls in the VP1P series from now on. KB6DA and VR1W operation by W6BHY should be on from mid September to the end of October, with a special interest in 160 metres. All QSLs and sked requests should go to W6CUF. Ken C21TL quite busy on s.s.b., has also been reported on 14040 c.w., QSL to Ken Matchett, Box 32, Nauru, Central Pacific.

Scores have just been released for the 1971 "CQ" DX Contest. Prominent amongst the top scorers were VKs 3XB, 6HD, 5NO and 2APK. The top ten were KH6RS, VR1W, 6D1AA, VP2A, KH6IJ, 3B8CR, HS5ABD, W1FBY, W1BPW and W3WJD.

In a recent poll conducted amongst the world's 200 top DX men, the following countries were named as the most wanted. In order of demand they are FO8, 3Y, VP8 Sth. Sandwich, YI Spratley Is., AC4, XV (poll taken prior to XV5AC opn.), XZ, 7O, 3X, AC3, VR3 Fanning, 7O, KP0 Palmyra Geysar Bank, A5, HK0 Malpelo, VK4 Willis, VK0 Heard Is., CE0Z Juan Fernandez, PY0 St. Peter and Paul Rocks, and HK0 Bajo Nuevo. Others in close proximity to VK which are slightly lower in the list are Manihiki, Tokelau, Kure Is., Niue, Campbell Is., Wallis Is. and Portuguese Timor.

Finally, some changes to the A.R.R.L. list. Minerva Reef to be deleted as from July 15, 1972, now counts as Tonga; Maria Theresa Reef will be deleted from October and all credits for it will be annulled.

My thanks to all who have written this month. I may be a little slow in answering due to impending move of QTH, but I will get around to it. Until notified otherwise, please send all mail to the same address.

* P.O. Box 222, Penrith, N.S.W., 2750.

REMINDER

Dates for the VK-ZL-Oceania DX Contest are: Phone. 7th and 8th October; c.w., 14th and 15th October, 1972.

Ionospheric Predictions

With Bruce Bathols,* VK3ASE **OCT. '72**

Listed below are predictions for October 1972 from Charts Series "P" supplied by courtesy of the Ionospheric Prediction Service Division.

All times stated are G.M.T.

VK0 is Macquarie Island.

VK4 is Brisbane.

ZL is Auckland.

28, 21 and 14 MHz. predictions are usable for more than 50 per cent. of the month, but not all days.

28 MHz.—

VK1/2	to	W6		minus 2 2400 plus 2
VK3	,,	JA		minus 2 0200 plus 2
VK4	,,	5Z	L.P.	minus 1 2100 plus 6
VK5	,,	KH6		minus 3 0100 plus 2
VK6	,,	SU		minus 1 0600 plus 1
ZL	,,	W1		minus 3 2200 plus 1

21 MHz.—

VK1/2	to	VE3	S.P.	1900-0100
,,	,,	VE3	L.P.	2300, 1100
,,	,,	W6		1900-0400
,,	,,	PY		minus 6 0400 plus 2 0900
,,	,,	5Z	S.P.	minus 4 0200 plus 1 0500-1100
			L.P.	1900-0300 0800 plus 6
,,	,,	G	S.P.	0600-1500
			L.P.	2000, 0900
VK3	,,	UA		0400-1200
,,	,,	JA		2100-1500
,,	,,	F	S.P.	minus 2 0700 plus 5
			L.P.	0900
VK4	,,	W1		minus 1 2200 plus 1
,,	,,	UA		minus 3 0600 plus 9
,,	,,	PY		minus 5 0100 plus 5
VK5	,,	KH6		minus 6 0100 plus 12
VK6	,,	SU		minus 3 0600 plus 9
,,	,,	W1		minus 1 1400 plus 2
,,	,,	VK9		minus 6 0500 plus 5
ZL	,,	G	S.P.	minus 2 1000 plus 4
,,	,,	ZS		minus 2 0600 plus 3

14 MHz.—

VK1/2	to	VE3	S.P.	1200-2000, 0400
			L.P.	2100-0300, 1500
,,	,,	W6		1500-2000, 0400-1100
,,	,,	PY		1900-1400
,,	,,	VK0		2000-1200
,,	,,	VK6		2200-1100
,,	,,	G	S.P.	0700-2000
			L.P.	1900-0200, 0800-1300
VK3	,,	UA		0700-1900
,,	,,	JA		0500-2400
,,	,,	F	S.P.	0800-0100
			L.P.	0800 plus 7, 2300
VK4	,,	5Z	S.P.	1400-0100
			L.P.	0400-1100, 1500-1900
,,	,,	W1		0600, 1200-2000
,,	,,	UA		0600-1800
,,	,,	PY		1800-1200
VK5	,,	KH6		0400-1500, 1700-2100
VK6	,,	SU		1100-0300
,,	,,	W1		1300-2400
,,	,,	VK9		2100-1600
ZL	,,	G	S.P.	0600-2000
			L.P.	1600-0800
,,	,,	ZS		0400-0800, 1100-1400, 1800-2000

7 MHz.—

VK1/2	to	VE3	S.P.	0700-1300
			L.P.	2100
,,	,,	W6		0700-1600
,,	,,	PY		0800
,,	,,	VK0		0800-2000
,,	,,	5Z	S.P.	1700-2100
			L.P.	0700
,,	,,	G	S.P.	1500-2100
			L.P.	0800
VK3	,,	UA		1300-2100
,,	,,	F	S.P.	1500-2100
			L.P.	0800
VK4	,,	5Z		1800-2000
,,	,,	W1		0700-1300
,,	,,	UA		1300-2000
,,	,,	PY		0900
VK5	,,	KH6		0800-1700
VK6	,,	SU		1500-2300
,,	,,	VK9		1000-2100
ZL	,,	G	S.P.	0700, 1600-1800

Smoothed Monthly Sunspot numbers predictions for September 55, October 53, November 51, December 49.

—Swiss Federal Observatory, Zurich.

* 3 Connewarra Ave., Aspendale, 3195.

NEW CALL SIGNS

JUNE 1972

VK1ZRH—R. G. Henderson, 53 Hannaford St., Page, 2614.
VK2AHC—D. Clift, 6 Gilles Cres., Dee Why, 2099.
VK2AUS—K. C. Smith, Flat 13, Telford Gardens, 29 Cottonwood Cres., Marsfield, 2122.
VK3BTG—R. C. McGregor, 44 Koola Ave., Killara, 2071.
VK2CAX—K. C. McCracken, 9 Kelburn Rd., Roseville, 2069.
VK2BCA—A. N. Cherry, 1/1 Denison St., Manly, 2095.
VK2BIF—I. Forrest, 32 Victoria St., Epping, 2121.
VK2BIM—L. A. Adams, 13 Frederick St., North Bondi, 2026.
VK2BIO—W. A. A. Brown, 3 Bedford Pl., Rockdale, 2216.
VK2BJK—K. J. Blume, 57 Wyomee Ave., West Pymble, 2073.
VK2BLI—D. R. Nagle, 5/445 Glebe Pt. Rd., Glebe, 2037.
VK2BRD—R. F. Drummond, 2 Shepherd St., Goulburn, 2580.
VK2BTC—C. T. Rylatt, Lot 1089, Kooloona Cres., Campbelltown, 2560.
VK2ZDJ—D. J. McWilliam, 22/235 Victoria Ave., Chatswood, 2067.
VK2ZOX—A. W. Sweetnam, 35 Nerim Rd., Castle Cove, 2069.
VK2ZVP—B. W. Pratt, 70 Auburn Rd., Birrong, 2143.
VK2ZXE—M. R. Seery, 135 Marsh St., Armidale, 2350.
VK2ZXF—J. H. Melvin, 7 French St., Kingswood, 2750.
VK2ZXI—A. S. Wollin, 3 Kinsey St., Moama, 2739.
VK2ZXJ—L. E. Benger, 75A Wattle Rd., Jannali, 2226.
VK2ZXK—T. R. B. Allan, 6 Phyllis St., Mt. Pritchard, 2170.
VK2ZXN—E. Klem, 46 Harriet St., Waratah, 2298.
VK2ZXO—P. Z. Hadwen, 40 Quintana Ave., Baulkham Hills, 2153.
VK2ZXQ—J. H. Tanner, 57 Rawson Rd., Woy Woy, 2256.
VK2ZXS—J. McPherson, 33 Watt St., Raymond Terrace, 2324.
VK2ZYN/T—B. W. Clark, 21 Erwin St., Tamworth, 2340.
VK2ZYO—N. C. Chivers, 51 Meeks Cres., Faulconbridge, 2776.
VK2BBV—L. R. Burston, 4 Hillside Cres., Glenbrook, 2773.
VK2ZXA—J. Mowatt, 8/31 Cornelia St., Punchbowl, 2196.
VK2ZUS—G. W. Francis, 53 Falconer St., West Ryde, 2114.
VK3CA—G. D. Whiter, 26 Simmons St., Box Hill, 3129.
VK3CH—I. R. Ampt, 4 Ranleigh Rise, Lower Templestowe, 3107.
VK3KK—R. F. Llloyd, 171 Cheddar Rd., West Keon Park, 3073.
VK3VE—M. G. White, 62 Peter St., Box Hill North, 3129.
VK3CDS—K. Sutcliffe, 66 Savige St., Morwell, 3694.
VK3YGK—P. J. Bassett, 23 Wilson St., Wodonga, 3690.
VK3ZRG—R. J. Bocke, 4 Doona Ave., Kew, 3101.
VK3BGD—J. W. Williamson, 30 Latona Ave., Knoxfield, 3180.
VK4ED—R. J. Thomson, Station: Bli Bli, via Nambour; Postal: P.S. 1505, Nambour, 4560.
VK4ZAK—F. F. Adamson, 7 Gordon Ave., Toowoomba, 4350.
VK4ZAN—A. J. MacKenzie, 4 Laird St., Mackay, 4740.
VK4ZAP/T—E. J. Smith, 3/39 Bayswater Tce., Townsville, 4810.
VK4ZIV—I. K. R. Vosper, 17 Belvedere St., Holland Park West, 4121.
VK4ZML—G. P. Lee-Manwar, 44 Webb St., Stafford, 4053.
VK5AN—J. W. Emmel, P.O. Box 262, Port Adelaide, 5015.
VK5AW—A. C. Wallace, 23 Edgeworth St., Prospect, 5082.
VK5UM—A. E. Taylor, Officers' Mess, R.A.A.F. Base, Edinburgh, 5111.
VK5ZAQ—D. B. Adlam, 32 School Dr., Banksla Park, 5191.
VK5ZBF—P. G. Becker, 51 Boandik Tce., Mt. Gambier, 5290.
VK5ZBQ—B. R. Williams, 45 Finnis Ave., Ingle Farm, 5098.
VK5ZCW—P. M. Cottell, 71 Wireless Rd., Mt. Gambier, 5290.
VK5ZMF—T. J. McCarthy, 2 Warwick St., Enfield, 5085.
VK5ZPW—P. J. Wegener, P.O. Box 125, Angaston, 5353.
VK6BZ—R. R. Braun, Station: 67 Omdurman St., Wagin; Postal: 50 Ventnor St., Wagin, 6315.
VK6OW—O. J. Willoughby, 48 View Tce., East Fremantle, 6158.
VK6RR—R. K. Green, 14 Doust St., Cannington, 6107.
VK6SD—J. R. Dupont, Flat 18, Robertson Crt., 185 Wanneroo Rd., Tuart Hill, 6060.
VK6WC—J. W. Coultham, 4 Kimbrace Way, Lynwood, 6155.
VK6ZEM—E. M. Norris, Station: 24 Ranger Rd., Mt. Yokine, 6060; Postal: C/o. O.T.C., P.O. Box 21, Balga, 6/61.
VK6ZHG—H. R. Gillis, 20 Stewart St., Albany, 6330.
VK8ZCB—T. P. Walters, Base Radio, R.A.A.F., Darwin, 5793.
VK9GO—R. S. Goldsworthy, P.O. Box 26, Panguna, Bougainville.

SILENT KEYS

It is with deep regret that we record the passing of—

VK2SB—R. W. Chaplin
VK4IM—J. D. MacLean
VK5CK—R. V. Lapidge
VK6HI—E. A. Hayward

LICENSED AMATEURS IN VK

JUNE 1972

	Full	Lim.	Total
VK0	6	1	7
VK1	91	28	119
VK2	1396	541	1937
VK3	1319	670	1989
VK4	530	209	739
VK5	514	220	734
VK6	368	136	504
VK7	153	66	219
VK8	35	12	47
VK9	90	14	104
Grand Total	4502	1897	6399

KEY SECTION

With Deane Blackman,* VK3TX

As I have been overseas this past month I have not had time to collect material for this month's column. So let me bring you up to date with new members:

14. VK4FJ	25. VK9BJ	32. VK4SS
15. VK4SO	26. VK4OD	33. VK4EZ
16. VK4KX	27. VK4RE	34. VK4VO
18. VK4CA	28. VK4RF	35. VK3RJ
22. VK3AAC	29. VK4UG	36. VK6RL
23. VK6RS	30. VK4NV	37. VK3BZ
24. VK4TH	31. VK4QS	38. VK3ABR

Applications received after August will appear in a later list.

For ease of reference, the Divisional co-ordinators of the Key Section are: VK2YB, VK3XB, VK4DP, VK5FM, VK6WT, VK7LJ. If you have any ideas for the Section they would be happy to discuss them with you.

* 44 Rathmullen Rd., Boronia, Vic., 3155.

HAMADS

- **A free service for individual members.**
- **Four lines of print free (200 characters/spaces); full charge at $6 (min.) per col. inch if exceeded or for repeats: includes name/address—use QTHR if correct in Call Book.**
- **Copy, please in typescript if possible, and signed.**
- **Excludes commercial-class advertising.**
- **Exceptions only by PRIOR arrangement.**

For full details see January 1972 "A.R.." page 23.

FOR SALE

Melbourne, Vic.: Type RC1A A.W.A. Control Unit for remote control of A.W.A. Base Unit, complete with circuit, good condition, $25. VK3ZMR, Phone 306-7536.

Caulfield, Vic.: "Radio Communication" 1967-1972, 20c; "Wireless World 1954-1965, 10c; "QST" 1929-1965, 10c; "Practical Electronics" 1964-1967, 10c; some full years. VK3WO, QTHR, Ph. 211-5189.

Footscray West, Vic.: 14AVO Antenna, 40 through 10 mx, good order, with assembly instructions, $28. VK3ZM, QTHR, Ph. (03) 689-3135 (AH).

Bendigo, Vic.: SSB 160-10 mx, 180w. PEP G2DAF Tx; VFO plus or minus 250 kHz.; Edd. 898 Dial, U/L SB, VOX, Bk-in, sep. HD PSU, xtl. mike, professionally constructed/aligned, proven DXer, $120 o.n.o., genuine sale. Birch, VK3ASO, QTHR, Ph. (054) 43-1877.

Melbourne, Vic.: 160 mx Mobile Transceiver, 20 watt output; SSB Transceiver PSU, 240 volt AC; Lafayette Grid Dip Meter; RF Ammeter, 2 amp. FSD, co-axial mounting. VK3BR, QTHR, Ph. (03) 86-5321 Ext. 2257.

Melbourne, Vic.: Yaesu FLDX400 Tx, $250. Will also sell FRDX400 Rx if transceiver required. VK3AIF, QTHR, Ph. (03) 847-5401.

Woomera, S.A.: FT200 Transceiver with FP200 P.S.U. only three months use, $380. Semi automatic Bug Key, $6. Postage extra. VK5WC, QTHR.

Melbourne, Vic.: Telescopic Tower, 4 x 25 foot sections, galvanised, built-in winch and cable, $60. VK3JT, Ph. (03) 314-6760.

WANTED

Sydney, N.S.W.: Linear Amp. FL2000B or FL2500. VK2BC, P.O. Box 111, Kingsford, N.S.W., Phone 38-2386.

Benalla, Vic.: Type 210 Valve. Required for early transmitter project. VK3PF, QTHR.

Brisbane, Qld.: Morse Keys, any type, age or condition. Price, partics. to A. Shawsmith, VK4SS, QTHR, Ph. (072) 44-6526.

Melbourne, Vic.: "Amateur Radio," complete volumes 1950 and earlier. To complete my files. Top price paid. Ron Fisher, VK3OM, QTHR. Ph. (03) 560-9215.

Ocean Grove, Vic.: A.W.A. 8C Receiver and Coil Boxes. VK3ZNZ, Box 32, Ocean Grove, Vic., 3226.

WIRELESS INSTITUTE OF AUSTRALIA

PROJECT AUSTRALIS

STANDARD ORBITS — OSCAR 6

This set of Standard Orbits and the Ascending Nodes (the longitude in degrees West and the time in hours, minutes and seconds, G.M.T., of the satellite's path over the Earth, when it crosses the Equator, travelling into the Northern Hemisphere) is the only information needed to track OSCAR 6. It also allows calculation of when the satellite will be in range of the areas around other State capitals.

The morning (Southbound, at around 0900, local time) orbits over Australia have Ascending Nodes between 80 and 290 degrees West, while the evening (Northbound, at 2100 local time) orbits have Ascending Nodes between 150 and 275 degrees West. As a guide, the morning orbits will have smaller numbers at the start of the "ASCN NODE ADD MINS" column (between 56 and 82 minutes), than the evening orbits (between 86 and 104 minutes).

Ascending Nodes will be transmitted in Morse Code by the Codestore system on OSCAR 6 (29.45 and 435.1 MHz), and will also be announced on the weekly Divisional broadcasts.

If you are in or near Sydney, and want to track a (morning) orbit which has an ascendin node of 359 degrees West at 2157 G.M.T., select the closest Standard Orbit from the Sydney set — 360 degrees West. Add 58 minutes to 2157 G.M.T., and you will hear the satellite at 2255 G.M.T. Time, azimuth and elevation points are given every two minutes on the Standard Orbits.

Because the satellite is in an almost circular (1460Km), near-polar orbit, with each orbit being completed in 115 minutes, given one Acending Node (say, 330 degrees West at 1905 G.M.T.), later Ascending Nodes can be determined by simply adding the distance in degrees which separates the orbits at the Equator (the Nodal Increment, 28.8 degrees), to 330, and adding 115 minutes to 1095 G.M.T. The result is, in round figures, 359 degrees West at 2157 G.M.T., for the next orbit.

To see whether the orbit which you are tracking in Sydney will be in range of Perth, look at the Perth Standard Orbit which corresponds with the orbit that you are following. If you are tracking an orbit with an Ascending Node of 359 degrees West and are using the 360 degrees West Standard Orbit for Sydney, OSCAR 6 will be in range of Sydney from 58 to 78 minutes after the Ascending Node (2255 to 2315 G.M.T., on the example above), a total of 20 minutes. The same orbit will be in range of Perth from 68 to 78 minutes after the Ascending Node (2305 to 2315 G.M.T.). Therefore, that orbit will be in range of both Sydney and Perth from 2305 to 2315 G.M.T., so that 10 minutes of contact through the satellite will be possible. By slecting an orbit that passes midway between Sydney and Perth (e.g., an Ascending Node of 25 degrees West), contacts of up to 18 minutes are possible. For contact with New Zealand, orbits to the East of Australia should be used, while for contacts into Asia, orbits in the North and West should be used.

Users of Standard Orbits should note that the sets of Southbound Orbits start towards the end of the set (315 degrees West for Sydney) and resume at the beginning of each set (0 degrees West for Sydney), ending near the middle of the set (45 degrees West for Sydney). They are then immediately followed by the first of the Northbound orbits (150 degrees West for Sydney). It was not possible in the short time available after the OSCAR 6 launch rocket was changed to put the Southbound orbits in continuous order).

Assuming a launch at 1715 G.M.T., on 9th, October, the first Ascending Nodes bringing orbits in range of Australia will be: —

Orbit 1 324 W at 1842 GMT 9/10/72 Southbound
Orbit 2 353 W at 2037 GMT 9/10/72 Southbound
Orbit 3 22 W at 2232 GMT 9/10/72 Southbound
Orbit 4 50 W at 0028 GMT 10/10/72 Southbound
Orbit 8 166 W at 0809 GMT 10/10/72 Northbound
Orbit 9 194 W at 1004 GMT 1/10/72 Northbound
Orbit 223 W at 1159 GMT 10/10/72 Northbound
Orbit 252 W at 1354 GMT 10/10/72 Northbound

Any change in the OSCAR 6 launch date will alter the times, but not the longitudes of the Ascending Nodes. Any alterations will be notified on Divisional broadcasts.

PERTH

ASCN NODE 0. W.

ADD MINS	AZ	EL
68.0	102	2
70.0	113	4
72.0	125	6
74.0	138	6
76.0	150	5
78.0	161	2

ASCN NODE 5. W.

ADD MINS	AZ	EL
66.0	90	3
68.0	101	6
70.0	113	9
72.0	127	10
74.0	141	10
76.0	154	7
78.0	165	4

ASCN NODE 10. W.

ADD MINS	AZ	EL
64.0	78	3
66.0	87	8
68.0	100	12
70.0	114	15
72.0	130	15
74.0	146	13
76.0	159	9
78.0	169	5
80.0	177	0

ASCN NODE 15. W.

ADD MINS	AZ	EL
62.0	66	2
64.0	73	8
66.0	84	13
68.0	99	18
70.0	116	21
72.0	135	20
74.0	152	16
76.0	164	11
78.0	174	5
80.0	181	0

ASCN NODE 20. W.

ADD MINS	AZ	EL
60.0	54	0
62.0	60	6
64.0	68	13
66.0	80	20
68.0	98	26
70.0	120	28
72.0	142	26
74.0	159	19
76.0	170	12
78.0	178	6
80.0	184	0

ASCN NODE 25. W.

ADD MINS	AZ	EL
60.0	47	4
62.0	53	11
64.0	61	19
66.0	75	28
68.0	97	36
70.0	127	37
72.0	152	31
74.0	167	21
76.0	177	13
78.0	183	6

ASCN NODE 30. W.

ADD MINS	AZ	EL
58.0	36	0
60.0	39	7
62.0	44	15
64.0	52	26
66.0	66	38
68.0	97	50
70.0	139	47
72.0	165	35
74.0	177	23
76.0	184	13
78.0	188	5

ASCN NODE 35. W.

ADD MINS	AZ	EL
58.0	28	3
60.0	30	10
62.0	33	20
64.0	38	32
66.0	52	50
68.0	100	68
70.0	163	55
72.0	181	36
74.0	187	22
76.0	190	12
78.0	192	4

ASCN NODE 40. W.

ADD MINS	AZ	EL
58.0	19	5
60.0	19	13
62.0	19	23
64.0	20	38
66.0	21	61
68.0	175	86
70.0	196	56
72.0	196	35
74.0	196	21
76.0	196	11
78.0	196	3

ASCN NODE 45. W.

ADD MINS	AZ	EL
58.0	10	6
60.0	8	14
62.0	4	25
64.0	357	40
66.0	336	60
68.0	259	60
70.0	220	48
72.0	209	30
74.0	204	18
76.0	202	9
78.0	199	2

ASCN NODE 50. W.

ADD MINS	AZ	EL
56.0	3	0
58.0	360	6
60.0	355	14
62.0	348	24
64.0	335	37
66.0	307	49
68.0	263	50
70.0	233	38
72.0	219	25
74.0	211	15
76.0	206	7
78.0	203	0

ASCN NODE 55. W.

ADD MINS	AZ	EL
58.0	350	6
60.0	343	13
62.0	334	21
64.0	310	31
66.0	293	37
68.0	263	36
70.0	240	29
72.0	225	20
74.0	216	12
76.0	210	5

ASCN NODE 60. W.

ADD MINS	AZ	EL
58.0	340	4
60.0	332	11
62.0	321	17
64.0	306	24
66.0	285	27
68.0	262	26
70.0	244	21
72.0	230	15
74.0	220	8
76.0	213	2

ASCN NODE 65. W.

ADD MINS	AZ	EL
58.0	332	3
60.0	323	8
62.0	311	13
64.0	297	17
66.0	279	19
68.0	262	18
70.0	246	15
72.0	233	10
74.0	223	5
76.0	216	0

ASCN NODE 70. W.

ADD MINS	AZ	EL
58.0	324	0
60.0	315	5
62.0	304	8
64.0	290	11
66.0	276	13
68.0	260	12
70.0	247	9
72.0	235	6
74.0	225	2

ASCN NODE 75. W.

ADD MINS	AZ	EL
60.0	308	1
62.0	297	4
64.0	285	6
66.0	272	7
68.0	259	7
70.0	247	5
72.0	236	2

ASCN NODE 80. W.

ADD MINS	AZ	EL
62.0	292	0
64.0	281	2
66.0	270	2
68.0	258	2
70.0	247	0

ASCN NODE 185. W.

ADD MINS	AZ	EL
104.0	104	1
106.0	93	1
108.0	82	1

ASCN NODE 190. W.

ADD MINS	AZ	EL
100.0	125	0
102.0	115	3
104.0	103	5
106.0	91	6
108.0	78	5
110.0	66	3
112.0	56	1

ASCN NODE 195. W.

ADD MINS	AZ	EL
98.0	136	0
100.0	126	4
102.0	115	7
104.0	102	10
106.0	88	11
108.0	74	10
110.0	60	8
112.0	49	4
114.0	40	0

ASCN NODE 200. W.

ADD MINS	AZ	EL
98.0	138	3
100.0	128	8
102.0	116	12
104.0	102	16
106.0	85	17
108.0	68	16
110.0	53	12
112.0	41	8
114.0	32	3

ASCN NODE 205. W.

ADD MINS	AZ	EL
96.0	147	0
98.0	140	6
100.0	131	12
102.0	118	18
104.0	101	23
106.0	81	25
108.0	60	23
110.0	44	17
112.0	32	11
114.0	24	5

ASCN NODE 210. W.

ADD MINS	AZ	EL
96.0	150	3
98.0	144	9
100.0	135	17
102.0	122	25
104.0	102	32
106.0	75	35
108.0	50	30
110.0	33	22
112.0	21	14
114.0	14	7
116.0	9	0

ASCN NODE 215. W.

ADD MINS	AZ	EL
96.0	153	5
98.0	148	13
100.0	141	22
102.0	128	33
104.0	103	44
106.0	65	47
108.0	34	37
110.0	18	25
112.0	9	15
114.0	4	7
116.0	0	1

ASCN NODE 220. W.

ADD MINS	AZ	EL
94.0	160	0
96.0	158	7
98.0	154	16
100.0	149	27
102.0	138	42
104.0	109	60
106.0	43	61
108.0	12	42
110.0	2	27
112.0	357	16
114.0	353	7
116.0	351	0

ASCN NODE 225. W.

ADD MINS	AZ	EL
94.0	163	2
96.0	162	9
98.0	161	18
100.0	160	31
102.0	157	50
104.0	140	78
106.0	354	68
108.0	347	42
110.0	345	26
112.0	344	15
114.0	343	6

ASCN NODE 230. W.

ADD MINS	AZ	EL
94.0	167	3
96.0	168	10
98.0	170	20
100.0	174	33
102.0	184	53
104.0	236	73
106.0	311	58
108.0	325	37
110.0	330	23
112.0	333	12
114.0	334	4

ASCN NODE 235. W.

ADD MINS	AZ	EL
94.0	171	4
96.0	174	11
98.0	179	21
100.0	188	33
102.0	209	48
104.0	254	55
106.0	293	44
108.0	310	30
110.0	318	18
112.0	323	9
114.0	326	2

ASCN NODE 240. W.

ADD MINS	AZ	EL
94.0	175	4
96.0	180	12
98.0	188	20
100.0	202	30
102.0	225	39
104.0	258	41
106.0	284	33
108.0	299	22
110.0	308	13
112.0	314	6

ASCN NODE 245. W.

ADD MINS	AZ	EL
94.0	179	5
96.0	186	11
98.0	197	19
100.0	212	26
102.0	234	31
104.0	259	29
106.0	278	23
108.0	292	16
110.0	301	9
112.0	307	2

ASCN NODE 250. W.

ADD MINS	AZ	EL
94.0	184	4
96.0	192	10
98.0	204	16
100.0	220	21
102.0	239	23
104.0	259	21
106.0	275	16
108.0	286	10
110.0	295	4

ASCN NODE 255. W.

ADD MINS	AZ	EL
94.0	188	4
96.0	198	9
98.0	210	13
100.0	226	16
102.0	242	17
104.0	258	14
106.0	271	10
108.0	282	5
110.0	290	0

ASCN NODE 260. W.

ADD MINS	AZ	EL
94.0	192	3
96.0	202	7
98.0	215	10
100.0	229	12
102.0	244	11
104.0	257	8
106.0	269	5
108.0	278	1

ASCN NODE 265. W.

ADD MINS	AZ	EL
94.0	196	2
96.0	207	5
98.0	219	7
100.0	232	7
102.0	245	6
104.0	256	4
106.0	266	0

ASCN NODE 270. W.

ADD MINS	AZ	EL
94.0	199	1
96.0	210	3
98.0	222	4
100.0	234	3
102.0	245	2

ASCN NODE 275. W.

ADD MINS	AZ	EL
96.0	213	0
98.0	224	1
100.0	235	0

ASCN NODE 350. W.

ADD MINS	AZ	EL
74.0	134	0
76.0	145	0

ASCN NODE 355. W.

ADD MINS	AZ	EL
70.0	113	0
72.0	124	2
74.0	136	3
76.0	147	2
78.0	158	1

ASCN NODE 360. W.

ADD MINS	AZ	EL
68.0	102	2
70.0	113	4
72.0	125	6
74.0	138	6
76.0	150	5
78.0	161	2

ASCN NODE 0. W.

ADD MINS	AZ	EL

ASCN NODE 0. W.

ADD MINS	AZ	EL

ASCN NODE 0. W.

ADD MINS	AZ	EL

BRISBANE

ASCN NODE 0. W.

ADD MINS	AZ	EL
56.0	25	1
58.0	26	8
60.0	28	17
62.0	32	29
64.0	41	47
66.0	75	69
68.0	160	63
70.0	181	41
72.0	187	26
74.0	190	15
76.0	192	6

ASCN NODE 5. W.

ADD MINS	AZ	EL
56.0	16	3
58.0	16	10
60.0	15	20
62.0	14	34
64.0	11	54
66.0	334	83
68.0	205	62
70.0	200	39
72.0	199	24
74.0	198	13
76.0	197	5

ASCN NODE 10. W.

ADD MINS	AZ	EL
56.0	7	4
58.0	5	12
60.0	1	21
62.0	353	35
64.0	335	52
66.0	281	64
68.0	232	50
70.0	215	33
72.0	208	20
74.0	204	11
76.0	[illegible]	3

ASCN NODE 15. W.

ADD MINS	AZ	EL
56.0	358	4
58.0	353	11
60.0	346	20
62.0	334	31
64.0	311	43
66.0	274	46
68.0	243	38
70.0	225	26
72.0	216	16
74.0	210	8
76.0	[illegible]	1

ASCN NODE 20. W.

ADD MINS	AZ	EL
56.0	348	3
58.0	342	10
60.0	333	18
62.0	319	26
64.0	297	32
66.0	271	33
68.0	248	28
70.0	232	20
72.0	221	12
74.0	214	5

ASCN NODE 25. W.

ADD MINS	AZ	EL
56.0	340	2
58.0	332	8
60.0	322	14
62.0	307	20
64.0	289	23
66.0	269	23
68.0	250	20
70.0	236	14
72.0	225	8
74.0	218	2

ASCN NODE 30. W.

ADD MINS	AZ	EL
56.0	331	0
58.0	323	5
60.0	312	10
62.0	299	14
64.0	283	16
66.0	267	16
68.0	252	13
70.0	239	9
72.0	228	4
74.0	220	0

ASCN NODE 35. W.

ADD MINS	AZ	EL
58.0	315	2
60.0	305	5
62.0	293	8
64.0	279	10
66.0	265	9
68.0	252	7
70.0	240	4
72.0	231	1

ASCN NODE 40. W.

ADD MINS	AZ	EL
60.0	299	1
62.0	288	3
64.0	276	4
66.0	264	4
68.0	252	3
70.0	241	0

ASCN NODE 45. W.

ADD MINS	AZ	EL
64.0	273	0

ASCN NODE 150. W.

ADD MINS	AZ	EL
104.0	110	2
106.0	99	3
108.0	87	4
110.0	75	3
112.0	64	1

ASCN NODE 155. W.

ADD MINS	AZ	EL
100.0	131	0
102.0	121	3
104.0	110	6
106.0	97	8
108.0	84	9
110.0	70	8
112.0	58	5
114.0	47	2

ASCN NODE 160. W.

ADD MINS	AZ	EL
100.0	133	3
102.0	123	8
104.0	111	12
106.0	96	14
108.0	80	15
110.0	64	13
112.0	51	10
114.0	40	5
116.0	31	1

ASCN NODE 155. W.

ADD MINS	AZ	EL
98.0	143	1
100.0	136	7
102.0	126	12
104.0	112	18
106.0	95	22
108.0	75	22
110.0	57	19
112.0	42	14
114.0	31	9
116.0	23	3

ASCN NODE 170. W.

ADD MINS	AZ	EL
98.0	147	4
100.0	140	10
102.0	130	18
104.0	115	25
106.0	94	31
108.0	68	31
110.0	46	26
112.0	31	19
114.0	21	11
116.0	14	4

ASCN NODE 175. W.

ADD MINS	AZ	EL
96.0	155	0
98.0	151	7
100.0	145	14
102.0	136	24
104.0	120	34
106.0	92	43
108.0	57	42
110.0	32	33
112.0	18	22
114.0	9	13
116.0	4	5

ASCN NODE 180. W.

ADD MINS	AZ	EL
96.0	158	2
98.0	156	9
100.0	152	18
102.0	145	30
104.0	130	45
106.0	91	60
108.0	35	54
110.0	12	37
112.0	2	23
114.0	357	13
116.0	354	5

ASCN NODE 185. W.

ADD MINS	AZ	EL
96.0	163	3
98.0	162	11
100.0	160	21
102.0	158	35
104.0	152	56
106.0	89	82
108.0	356	59
110.0	349	37
112.0	347	22
114.0	346	12
116.0	345	4

ASCN NODE 190. W.

ADD MINS	AZ	EL
96.0	167	5
98.0	168	13
100.0	170	23
102.0	175	38
104.0	189	59
106.0	270	74
108.0	320	52
110.0	329	33
112.0	333	20
114.0	335	10
116.0	336	3

ASCN NODE 195. W.

ADD MINS	AZ	EL
96.0	172	6
98.0	176	14
100.0	182	24
102.0	193	37
104.0	220	52
106.0	268	54
108.0	301	40
110.0	314	26
112.0	321	16
114.0	325	7
116.0	328	0

ASCN NODE 200. W.

ADD MINS	AZ	EL
94.0	174	0
96.0	178	6
98.0	183	14
100.0	193	23
102.0	208	33
104.0	235	40
106.0	267	39
108.0	290	30
110.0	304	20
112.0	312	11
114.0	317	4

ASCN NODE 205. W.

ADD MINS	AZ	EL
94.0	178	0
96.0	183	6
98.0	191	13
100.0	202	20
102.0	220	27
104.0	243	30
106.0	266	28
108.0	284	21
110.0	296	14
112.0	304	7
114.0	310	1

ASCN NODE 210. W.

ADD MINS	AZ	EL
94.0	182	0
96.0	188	6
98.0	198	11
100.0	210	17
102.0	227	21
104.0	246	22
106.0	265	19
108.0	279	14
110.0	290	8
112.0	298	3

ASCN NODE 215. W.

ADD MINS	AZ	EL
94.0	186	0
96.0	193	5
98.0	204	9
100.0	217	13
102.0	232	15
104.0	249	15
106.0	263	12
108.0	276	8
110.0	286	3

ASCN NODE 220. W.

ADD MINS	AZ	EL
96.0	198	3
98.0	209	7
100.0	222	9
102.0	236	10
104.0	250	9
106.0	262	7
108.0	273	3

ASCN NODE 225. W.

ADD MINS	AZ	EL
96.0	202	2
98.0	213	4
100.0	225	6
102.0	238	6
104.0	250	4
106.0	261	2

ASCN NODE 230. W.

ADD MINS	AZ	EL
96.0	206	0
98.0	216	1
100.0	228	2
102.0	239	1
104.0	250	0

ASCN NODE 320. W.

ADD MINS	AZ	EL
70.0	119	1
72.0	130	2
74.0	141	1
76.0	152	0

ASCN NODE 325. W.

ADD MINS	AZ	EL
66.0	97	1
68.0	108	3
70.0	120	5
72.0	132	5
74.0	144	4
76.0	156	2

ASCN NODE 330. W.

ADD MINS	AZ	EL
64.0	86	2
66.0	96	5
68.0	108	8
70.0	122	9
72.0	135	9
74.0	148	7
76.0	160	4
78.0	169	0

ASCN NODE 335. W.

ADD MINS	AZ	EL
62.0	74	2
64.0	83	6
66.0	94	11
68.0	109	14
70.0	124	15
72.0	140	13
74.0	153	10
76.0	164	5
78.0	173	0

ASCN NODE 340. W.

ADD MINS	AZ	EL
60.0	61	1
62.0	69	6
64.0	79	12
66.0	93	17
68.0	110	21
70.0	129	21
72.0	146	17
74.0	159	12
76.0	169	6
78.0	177	1

ASCN NODE 345. W.

ADD MINS	AZ	EL
60.0	56	5
62.0	63	12
64.0	74	19
66.0	91	25
68.0	113	29
70.0	136	27
72.0	154	21
74.0	166	14
76.0	175	7
78.0	181	1

ASCN NODE 350. W.

ADD MINS	AZ	EL
58.0	43	2
60.0	48	9
62.0	56	17
64.0	68	27
66.0	88	36
68.0	118	39
70.0	146	34
72.0	164	24
74.0	174	15
76.0	181	7
78.0	185	1

ASCN NODE 355. W.

ADD MINS	AZ	EL
58.0	35	6
60.0	39	14
62.0	46	24
64.0	58	36
66.0	85	50
68.0	130	52
70.0	161	39
72.0	175	26
74.0	182	15
76.0	186	7
78.0	189	0

ASCN NODE 360. W.

ADD MINS	AZ	EL
56.0	25	1
58.0	26	8
60.0	28	17
62.0	32	29
64.0	41	47
66.0	75	69
68.0	160	63
70.0	181	41
72.0	187	26
74.0	190	15
76.0	192	6

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ASCN NODE 0. W.

ADD MINS	AZ	EL
60.0	46	0
62.0	51	7
64.0	58	14
66.0	68	23
68.0	85	32
70.0	112	38
72.0	141	35
74.0	162	26
76.0	174	17
78.0	181	9
80.0	186	2

ASCN NODE 5. W.

ADD MINS	AZ	EL
60.0	37	3
62.0	43	11
64.0	49	20
66.0	59	31
68.0	80	44
70.0	119	50
72.0	154	41
74.0	172	28
76.0	181	19
78.0	18[illegible]	9
80.0	190	2

ASCN NODE 10. W.

ADD MINS	AZ	EL
60.0	31	6
62.0	33	14
64.0	27	25
66.0	46	40
68.0	78	55
70.0	130	64
72.0	173	45
74.0	184	29
76.0	189	17
78.0	191	8
80.0	198	1

ASCN NODE 15. W.

ADD MINS	AZ	EL
58.0	21	1
60.0	21	8
62.0	21	17
64.0	22	29
66.0	24	48
68.0	35	75
70.0	187	70
72.0	194	44
74.0	195	27
76.0	196	16
78.0	196	7
80.0	196	0

ASCN NODE 20. W.

ADD MINS	AZ	EL
58.0	12	2
60.0	11	10
62.0	8	19
64.0	4	32
66.0	355	50
68.0	311	72
70.0	220	61
72.0	211	39
74.0	205	24
76.0	202	14
78.0	200	5

ASCN NODE 25. W.

ADD MINS	AZ	EL
58.0	3	3
60.0	358	10
62.0	355	19
64.0	346	31
66.0	327	45
68.0	287	55
70.0	243	47
72.0	223	33
74.0	213	20
76.0	207	11
78.0	203	4

ASCN NODE 30. W.

ADD MINS	AZ	EL
58.0	354	3
60.0	349	10
62.0	341	18
64.0	329	27
66.0	309	37
68.0	278	41
70.0	249	35
72.0	230	26
74.0	219	16
76.0	211	9
78.0	206	2

ASCN NODE 35. W.

ADD MINS	AZ	EL
58.0	345	2
60.0	339	8
62.0	330	15
64.0	316	22
66.0	297	28
68.0	274	30
70.0	251	26
72.0	234	20
74.0	223	12
76.0	215	6
78.0	209	0

ASCN NODE 40. W.

ADD MINS	AZ	EL
58.0	337	0
60.0	329	6
62.0	319	11
64.0	306	17
66.0	289	21
68.0	270	21
70.0	252	19
72.0	237	14
74.0	226	9
76.0	217	3

ASCN NODE 45. W.

ADD MINS	AZ	EL
60.0	321	3
62.0	311	8
64.0	298	12
66.0	284	14
68.0	268	15
70.0	252	13
72.0	239	9
74.0	228	5
76.0	219	0

ASCN NODE 50. W.

ADD MINS	AZ	EL
60.0	315	0
62.0	304	4
64.0	292	7
66.0	279	9
68.0	265	9
70.0	252	8
72.0	240	5
74.0	23[illegible]	2

ASCN NODE 55. W.

ADD MINS	AZ	EL
62.0	298	0
64.0	287	2
66.0	275	4
68.0	263	4
70.0	251	3
72.0	240	1

ASCN NODE 60. W.

ADD MINS	AZ	EL
60.0	272	0
62.0	261	0

ASCN NODE 150. W.

ADD MINS	AZ	EL
104.0	101	0
106.0	90	0

ASCN NODE 165. W.

ADD MINS	AZ	EL
100.0	122	1
102.0	111	3
104.0	99	4
106.0	87	4
108.0	75	3
110.0	64	1

ASCN NODE 170. W.

ADD MINS	AZ	EL
98.0	132	1
100.0	122	4
102.0	110	7
104.0	97	9
106.0	83	9
108.0	70	7
110.0	58	4
112.0	46	1

ASCN NODE 175. W.

ADD MINS	AZ	EL
96.0	142	0
98.0	134	4
100.0	123	8
102.0	110	12
104.0	95	14
106.0	79	14
108.0	64	12
110.0	51	8
112.0	41	4

ASCN NODE 180. W.

ADD MINS	AZ	EL
96.0	144	2
98.0	136	8
100.0	125	13
102.0	111	18
104.0	93	21
106.0	74	21
108.0	57	17
110.0	43	12
112.0	33	7
114.0	25	1

ASCN NODE 185. W.

ADD MINS	AZ	EL
96.0	146	5
98.0	139	11
100.0	128	18
102.0	112	25
104.0	91	29
106.0	67	29
108.0	47	23
110.0	33	16
112.0	23	9
114.0	16	3

ASCN NODE 190. W.

ADD MINS	AZ	EL
94.0	154	1
96.0	150	7
98.0	143	15
100.0	132	24
102.0	115	34
104.0	88	40
106.0	56	39
108.0	34	29
110.0	20	19
112.0	12	11
114.0	7	4

ASCN NODE 195. W.

ADD MINS	AZ	EL
94.0	157	3
96.0	154	10
98.0	148	19
100.0	140	30
102.0	122	44
104.0	82	55
106.0	30	48
108.0	17	33
110.0	7	21
112.0	1	11
114.0	357	4

ASCN NODE 200. W.

ADD MINS	AZ	EL
94.0	160	4
96.0	158	12
98.0	156	22
100.0	150	36
102.0	136	56
104.0	68	73
106.0	9	54
108.0	357	34
110.0	352	21
112.0	350	11
114.0	348	3

ASCN NODE 205. W.

ADD MINS	AZ	EL
94.0	164	6
96.0	164	14
98.0	164	25
100.0	165	41
102.0	171	65
104.0	31[illegible]	81
106.0	336	52
108.0	331	32
110.0	331	19
112.0	333	10
114.0	339	2

ASCN NODE 210. W.

ADD MINS	AZ	EL
92.0	167	0
94.0	168	7
96.0	171	15
98.0	175	26
100.0	184	42
102.0	212	61
104.0	281	62
106.0	312	43
108.0	322	27
110.0	327	16
112.0	329	7
114.0	331	0

ASCN NODE 215. W.

ADD MINS	AZ	EL
92.0	170	1
94.0	173	8
96.0	177	16
98.0	185	26
100.0	201	39
102.0	233	50
104.0	274	46
106.0	298	33
108.0	310	22
110.0	317	12
112.0	321	5

ASCN NODE 220. W.

ADD MINS	AZ	EL
92.0	173	1
94.0	178	8
96.0	18[illegible]	16
98.0	19[illegible]	25
100.0	21[illegible]	34
102.0	24[illegible]	38
104.0	271	34
106.0	29[illegible]	25
108.0	30[illegible]	16
110.0	30[illegible]	8
112.0	31[illegible]	1

ASCN NODE 225. W.

ADD MINS	AZ	EL
92.0	176	2
94.0	182	8
96.0	191	15
98.0	205	22
100.0	224	28
102.0	247	29
104.0	268	24
106.0	283	18
108.0	294	11
110.0	301	4

ASCN NODE 230. W.

ADD MINS	AZ	EL
92.0	179	2
94.0	187	6
96.0	19[illegible]	13
98.0	21[illegible]	19
100.0	230	22
102.0	249	21
104.0	266	17
106.0	27[illegible]	12
108.0	28[illegible]	6
110.0	29[illegible]	0

ASCN NODE 235. W.

ADD MINS	AZ	EL
92.0	183	2
94.0	192	7
96.0	20[illegible]	11
98.0	21[illegible]	15
100.0	23[illegible]	16
102.0	250	15
104.0	264	11
106.0	275	6
108.0	284	2

ASCN NODE 240. W.

ADD MINS	AZ	EL
92.0	186	1
94.0	196	6
96.0	208	9
98.0	221	11
100.0	236	11
102.0	250	9
104.0	262	6
106.0	272	2

ASCN NODE 245. W.

ADD MINS	AZ	EL
92.0	189	1
94.0	199	4
96.0	211	7
98.0	224	8
100.0	237	7
102.0	250	5
104.0	260	1

ASCN NODE 250. W.

ADD MINS	AZ	EL
92.0	19[illegible]	0
94.0	20[illegible]	3
96.0	21[illegible]	4
98.0	226	4
100.0	238	3
102.0	24[illegible]	1

ASCN NODE 255. W.

ADD MINS	AZ	EL
94.0	205	1
96.0	217	1
98.0	228	1

ASCN NODE 325. W.

ADD MINS	AZ	EL
74.0	130	1
76.0	141	1
78.0	153	1
80.0	168	0

ASCN NODE 330. W.

ADD MINS	AZ	EL
70.0	109	0
72.0	120	2
74.0	131	4
76.0	144	4
78.0	15[illegible]	3
80.0	[illegible]	1

ASCN NODE 335. W.

ADD MINS	AZ	EL
68.0	96	1
70.0	108	4
72.0	120	6
74.0	133	7
76.0	146	7
78.0	159	5
80.0	169	2

ASCN NODE 340. W.

ADD MINS	AZ	EL
66.0	87	1
68.0	96	5
70.0	108	9
72.0	121	11
74.0	136	11
76.0	150	10
78.0	162	6
80.0	172	2

ASCN NODE 345. W.

ADD MINS	AZ	EL
64.0	75	1
66.0	83	5
68.0	94	9
70.0	108	14
72.0	124	16
74.0	140	15
76.0	155	12
78.0	167	8
80.0	176	3

ASCN NODE 350. W.

ADD MINS	AZ	EL
64.0	70	5
66.0	79	11
68.0	92	16
70.0	108	20
72.0	127	22
74.0	145	19
76.0	160	14
78.0	171	9
80.0	179	3

ASCN NODE 355. W.

ADD MINS	AZ	EL
62.0	58	3
64.0	65	9
66.0	75	16
68.0	89	23
70.0	109	28
72.0	132	28
74.0	152	23
76.0	167	16
78.0	176	9
80.0	183	3

ASCN NODE 360. W.

ADD MINS	AZ	EL
60.0	46	0
62.0	51	7
64.0	58	14
66.0	68	23
68.0	85	32
70.0	112	38
72.0	141	35
74.0	162	26
76.0	174	17
78.0	181	9
80.0	186	2

ASCN NODE 0. W.

ADD MINS	AZ	EL

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ASCN NODE 0. W.

ADD MINS	AZ	EL
62.0	28	5
64.0	29	13
66.0	31	23
68.0	35	38
70.0	47	60
72.0	132	76
74.0	182	53
76.0	191	33
78.0	194	20
80.0	195	10
82.0	196	3

ASCN NODE 5. W.

ADD MINS	AZ	EL
60.0	19	0
62.0	18	6
64.0	18	15
66.0	17	26
68.0	14	43
70.0	7	68
72.0	221	77
74.0	204	49
76.0	201	31
78.0	200	18
80.0	199	9
82.0	198	2

ASCN NODE 10. W.

ADD MINS	AZ	EL
60.0	11	0
62.0	9	7
64.0	6	16
66.0	1	27
68.0	351	43
70.0	320	63
72.0	249	62
74.0	219	43
76.0	210	27
78.0	205	16
80.0	202	7
82.0	200	0

ASCN NODE 15. W.

ADD MINS	AZ	EL
60.0	2	1
62.0	358	8
64.0	35[illegible]	16
66.0	34[illegible]	26
68.0	33[illegible]	39
70.0	298	51
72.0	25[illegible]	60
74.0	229	35
76.0	21[illegible]	23
78.0	209	10
80.0	204	4

ASCN NODE 20. W.

ADD MINS	AZ	EL
60.0	353	1
62.0	349	7
64.0	342	15
66.0	331	24
68.0	314	33
70.0	286	39
72.0	256	37
74.0	234	28
76.0	221	19
78.0	212	11
80.0	206	4

ASCN NODE 25. W.

ADD MINS	AZ	EL
60.0	34[illegible]	0
62.0	33[illegible]	6
64.0	331	13
66.0	31[illegible]	20
68.0	30[illegible]	26
70.0	28[illegible]	30
72.0	25[illegible]	28
74.0	23[illegible]	22
76.0	224	15
78.0	215	8
80.0	208	2

ASCN NODE 30. W.

ADD MINS	AZ	EL
62.0	330	4
64.0	321	10
66.0	309	15
68.0	294	20
70.0	275	22
72.0	255	21
74.0	239	17
76.0	226	11
78.0	217	5
80.0	209	0

ASCN NODE 35. W.

ADD MINS	AZ	EL
62.0	322	2
64.0	313	7
66.0	301	11
68.0	287	14
70.0	271	16
72.0	255	15
74.0	240	12
76.0	228	8
78.0	218	3

ASCN NODE 40. W.

ADD MINS	AZ	EL
64.0	305	3
66.0	294	7
68.0	282	10
70.0	268	11
72.0	253	10
74.0	240	8
76.0	229	4
78.0	219	1

ASCN NODE 45. W.

ADD MINS	AZ	EL
64.0	299	0
66.0	289	3
68.0	277	5
70.0	265	6
72.0	252	6
74.0	240	4
76.0	229	1

ASCN NODE 50. W.

ADD MINS	AZ	EL
68.0	273	1
70.0	262	2
72.0	251	2
74.0	239	1

ASCN NODE 150. W.

ADD MINS	AZ	EL
100.0	112	0
102.0	101	0

ASCN NODE 155. W.

ADD MINS	AZ	EL
96.0	133	0
98.0	122	2
100.0	111	3
102.0	99	4
104.0	87	3
106.0	76	2

ASCN NODE 160. W.

ADD MINS	AZ	EL
96.0	133	2
98.0	122	5
100.0	110	7
102.0	96	8
104.0	83	8
106.0	70	5
108.0	60	2

ASCN NODE 165. W.

ADD MINS	AZ	EL
94.0	143	1
96.0	134	5
98.0	122	9
100.0	109	12
102.0	94	13
104.0	78	12
106.0	65	10
108.0	53	6
110.0	43	1

ASCN NODE 170. W.

ADD MINS	AZ	EL
94.0	144	3
96.0	135	8
98.0	123	13
100.0	108	17
102.0	90	19
104.0	73	18
106.0	57	14
108.0	45	9
110.0	36	4

ASCN NODE 175. W.

ADD MINS	AZ	EL
92.0	152	0
94.0	145	6
96.0	137	12
98.0	124	18
100.0	108	23
102.0	87	26
104.0	66	24
106.0	49	19
108.0	36	12
110.0	27	6
112.0	20	0

ASCN NODE 180. W.

ADD MINS	AZ	EL
92.0	154	2
94.0	141	8
96.0	139	15
98.0	127	23
100.0	108	31
102.0	82	34
104.0	56	31
106.0	38	23
108.0	26	15
110.0	18	8
112.0	12	1

ASCN NODE 185. W.

ADD MINS	AZ	EL
92.0	155	3
94.0	150	11
96.0	143	19
98.0	131	30
100.0	110	40
102.0	75	45
104.0	43	38
106.0	24	27
108.0	14	17
110.0	7	9
112.0	3	2

ASCN NODE 190. W.

ADD MINS	AZ	EL
92.0	157	5
94.0	154	13
96.0	149	23
98.0	138	36
100.0	115	52
102.0	63	58
104.0	24	45
106.0	9	29
108.0	1	18
110.0	35[illegible]	9
112.0	354	2

ASCN NODE 195. W.

ADD MINS	AZ	EL
90.0	161	0
92.0	160	7
94.0	158	15
96.0	155	26
98.0	149	43
100.0	129	66
102.0	38	71
104.0	359	47
106.0	352	30
108.0	349	17
110.0	347	8
112.0	345	1

ASCN NODE 200. W.

ADD MINS	AZ	EL
90.0	165	1
92.0	163	8
94.0	163	17
96.0	164	29
98.0	165	48
100.0	177	75
102.0	327	70
104.0	334	44
106.0	336	27
108.0	337	15
110.0	337	7
112.0	[illegible]37	1

ASCN NODE 205. W.

ADD MINS	AZ	EL
90.0	165	2
92.0	166	9
94.0	169	19
96.0	174	31
98.0	185	49
100.0	229	67
102.0	296	57
104.0	316	38
106.0	323	23
108.0	326	13
110.0	328	5

ASCN NODE 210. W.

ADD MINS	AZ	EL
90.0	167	3
92.0	170	10
94.0	175	19
96.0	18[illegible]	31
98.0	20[illegible]	45
100.0	24[illegible]	53
102.0	28[illegible]	44
104.0	30[illegible]	30
106.0	31[illegible]	19
108.0	31[illegible]	10
110.0	32[illegible]	3

ASCN NODE 215. W.

ADD MINS	AZ	EL
90.0	169	4
92.0	174	11
94.0	182	20
96.0	194	30
98.0	217	39
100.0	250	41
102.0	277	34
104.0	294	23
106.0	303	14
108.0	309	6
110.0	312	0

ASCN NODE 220. W.

ADD MINS	AZ	EL
90.0	172	4
92.0	176	11
94.0	188	19
96.0	20[illegible]	27
98.0	226	33
100.0	252	32
102.0	273	25
104.0	28[illegible]	17
106.0	296	10
108.0	302	3

ASCN NODE 225. W.

ADD MINS	AZ	EL
90.0	175	5
92.0	183	[illegible]
94.0	196	[illegible]
96.0	216	[illegible]
98.0	231	[illegible]
100.0	252	[illegible]
102.0	269	[illegible]
104.0	291	[illegible]
106.0	296	6
108.0	[illegible]96	0

ASCN NODE 230. W.

ADD MINS	AZ	EL
88.0	170	[illegible]
90.0	177	[illegible]
92.0	187	[illegible]
94.0	199	[illegible]
96.0	216	[illegible]
98.0	235	[illegible]
100.0	252	[illegible]
102.0	266	[illegible]
104.0	277	[illegible]
106.0	[illegible]	[illegible]

ASCN NODE 235. W.

ADD MINS	AZ	EL
88.0	172	0
90.0	180	5
92.0	191	10
94.0	204	14
96.0	220	16
98.0	237	15
100.0	251	12
102.0	264	8
104.0	273	3

ASCN NODE 240. W.

ADD MINS	AZ	EL
88.0	174	1
90.0	183	5
92.0	19[illegible]	9
94.0	20[illegible]	12
96.0	22[illegible]	13
98.0	238	11
100.0	250	8
102.0	[illegible]	4

ASCN NODE 245. W.

ADD MINS	AZ	EL
88.0	176	1
90.0	186	5
92.0	198	8
94.0	211	9
96.0	225	9
98.0	236	7
100.0	249	4
102.0	259	0

ASCN NODE 250. W.

ADD MINS	AZ	EL
88.0	178	1
90.0	188	4
92.0	201	6
94.0	213	7
96.0	226	6
98.0	238	3
100.0	248	0

ASCN NODE 255. W.

ADD MINS	AZ	EL
88.0	180	1
90.0	191	4
92.0	203	5
94.0	215	5
96.0	227	3
98.0	237	0

ASCN NODE 260. W.

ADD MINS	AZ	EL
88.0	182	[illegible]
90.0	193	[illegible]
92.0	205	[illegible]
94.0	217	[illegible]
96.0	227	[illegible]

ASCN NODE 265. W.

ADD MINS	AZ	EL
88.0	184	1
90.0	195	2
92.0	207	1
94.0	218	0

ASCN NODE 270. W.

ADD MINS	AZ	EL
86.0	175	0
88.0	186	1
90.0	197	1
92.0	208	0

ASCN NODE 275. W.

ADD MINS	AZ	EL
86.0	177	0
88.0	188	0
90.0	199	0

ASCN NODE 280. W.

ADD MINS	AZ	EL
86.0	179	0
88.0	190	0

ASCN NODE 285. W.

ADD MINS	AZ	EL
84.0	169	0
86.0	180	0

ASCN NODE 290. W.

ADD MINS	AZ	EL
82.0	160	[illegible]
84.0	171	[illegible]
86.0	182	[illegible]

ASCN NODE 295. W.

ADD MINS	AZ	EL
80.0	151	0
82.0	162	1
84.0	173	1
86.0	184	0

ASCN NODE 300. W.

ADD MINS	AZ	EL
78.0	141	1
80.0	152	2
82.0	164	2
84.0	175	2
86.0	186	0

ASCN NODE 305. W.

ADD MINS	AZ	EL
76.0	131	1
78.0	142	3
80.0	154	4
82.0	166	4
84.0	177	2

ASCN NODE 310. W.

ADD MINS	AZ	EL
74.0	121	1
76.0	131	4
78.0	143	6
80.0	156	6
82.0	168	4
84.0	179	2

ASCN NODE 315. W.

ADD MINS	AZ	EL
72.0	110	1
74.0	120	5
76.0	132	7
78.0	145	8
80.0	159	7
82.0	171	5
84.0	181	2

ASCN NODE 320. W.

ADD MINS	AZ	EL
70.0	99	[illegible]
72.0	108	[illegible]
74.0	120	9
76.0	133	11
78.0	148	11
80.0	162	9
82.0	174	6
84.0	184	2

ASCN NODE 325. W.

ADD MINS	AZ	EL
68.0	88	0
70.0	96	5
72.0	107	9
74.0	120	13
76.0	136	14
78.0	151	13
80.0	165	10
82.0	177	6
84.0	186	1

ASCN NODE 330. W.

ADD MINS	AZ	EL
68.0	84	4
70.0	93	9
72.0	106	14
74.0	121	18
76.0	139	18
78.0	155	16
80.0	169	11
82.0	180	6
84.0	188	1

ASCN NODE 335. W.

ADD MINS	AZ	EL
66.0	72	3
68.0	79	8
70.0	88	14
72.0	105	20
74.0	123	23
76.0	143	22
78.0	161	18
80.0	174	12
82.0	183	6
84.0	189	0

ASCN NODE 340. W.

ADD MINS	AZ	EL
64.0	61	0
66.0	68	6
68.0	74	13
70.0	86	20
72.0	104	27
74.0	127	29
76.0	149	26
78.0	167	20
80.0	178	13
82.0	186	6
84.0	191	0

ASCN NODE 345. W.

ADD MINS	AZ	EL
64.0	54	4
66.0	61	11
68.0	68	19
70.0	82	28
72.0	104	35
74.0	138	37
76.0	154	30
78.0	172	21
80.0	181	13
82.0	189	9

ASCN NODE 350. W.

ADD MINS	AZ	EL
62.0	44	0
64.0	47	7
66.0	52	15
68.0	60	25
70.0	76	37
72.0	109	46
74.0	148	44
76.0	168	33
78.0	180	21
80.0	187	12
82.0	191	5

ASCN NODE 355. W.

ADD MINS	AZ	EL
62.0	36	3
64.0	38	10
66.0	42	19
68.0	50	31
70.0	66	48
72.0	118	60
74.0	160	51
76.0	179	34
78.0	187	21
80.0	191	11
82.0	194	4

ASCN NODE 360. W.

ADD MINS	AZ	EL
62.0	28	5
64.0	29	13
66.0	31	23
68.0	35	38
70.0	47	60
72.0	132	76
74.0	182	53
76.0	191	33
78.0	194	20
80.0	195	10
82.0	196	3

SYDNEY

ASCN NODE 0. W.

ADD MINS	AZ	EL
58.0	25	1
60.0	26	8
62.0	28	17
64.0	31	30
66.0	38	47
68.0	71	71
70.0	165	65
72.0	184	42
74.0	190	26
76.0	192	15
78.0	193	6

ASCN NODE 5. W.

ADD MINS	AZ	EL
58.0	17	3
60.0	16	10
62.0	15	20
64.0	13	33
66.0	9	54
68.0	330	82
70.0	209	62
72.0	202	39
74.0	200	24
76.0	198	13
78.0	198	5

ASCN NODE 10. W.

ADD MINS	AZ	EL
58.0	7	4
60.0	5	11
62.0	1	21
64.0	353	34
66.0	336	52
68.0	303	64
70.0	232	51
72.0	215	33
74.0	208	21
76.0	204	11
78.0	201	3

ASCN NODE 15. W.

ADD MINS	AZ	EL
58.0	358	4
60.0	354	11
62.0	347	20
64.0	335	31
66.0	312	43
68.0	275	47
70.0	242	39
72.0	224	27
74.0	215	17
76.0	209	9
78.0	204	2

ASCN NODE 20. W.

ADD MINS	AZ	EL
58.0	349	3
60.0	342	10
62.0	333	18
64.0	320	26
66.0	298	33
68.0	271	35
70.0	247	29
72.0	230	21
74.0	220	13
76.0	212	6
78.0	207	0

ASCN NODE 25. W.

ADD MINS	AZ	EL
58.0	340	2
60.0	332	8
62.0	322	14
64.0	308	20
66.0	290	25
68.0	268	25
70.0	249	21
72.0	234	15
74.0	223	9
76.0	215	3

ASCN NODE 30. W.

ADD MINS	AZ	EL
58.0	331	0
60.0	323	5
62.0	313	10
64.0	300	15
66.0	283	17
68.0	266	17
70.0	250	15
72.0	237	11
74.0	226	6
76.0	218	1

ASCN NODE 35. W.

ADD MINS	AZ	EL
60.0	315	2
62.0	305	6
64.0	293	9
66.0	279	11
68.0	264	11
70.0	250	9
72.0	238	6
74.0	228	2

ASCN NODE 40. W.

ADD MINS	AZ	EL
62.0	299	2
64.0	288	5
66.0	279	6
68.0	262	6
70.0	250	5
72.0	239	2

ASCN NODE 45. W.

ADD MINS	AZ	EL
64.0	283	0
66.0	272	1
68.0	261	1
70.0	249	0

ASCN NODE 150. W.

ADD MINS	AZ	EL
102.0	112	1
104.0	101	2
106.0	90	2
108.0	78	1

ASCN NODE 155. W.

ADD MINS	AZ	EL
100.0	123	2
102.0	112	5
104.0	100	6
106.0	87	7
108.0	74	5
110.0	63	3
112.0	52	0

ASCN NODE 160. W.

ADD MINS	AZ	EL
98.0	134	2
100.0	124	6
102.0	112	9
104.0	98	12
106.0	83	12
108.0	69	10
110.0	56	7
112.0	46	3

ASCN NODE 165. W.

ADD MINS	AZ	EL
96.0	144	0
98.0	136	5
100.0	126	10
102.0	113	15
104.0	97	18
106.0	79	18
108.0	62	16
110.0	48	12
112.0	38	7
114.0	29	1

ASCN NODE 170. W.

ADD MINS	AZ	EL
96.0	146	3
98.0	139	9
100.0	128	15
102.0	114	21
104.0	95	25
106.0	73	26
108.0	54	22
110.0	39	16
112.0	28	9
114.0	21	3

ASCN NODE 175. W.

ADD MINS	AZ	EL
96.0	149	5
98.0	142	12
100.0	132	20
102.0	117	29
104.0	93	35
106.0	65	35
108.0	42	28
110.0	27	20
112.0	18	12
114.0	11	5

ASCN NODE 180. W.

ADD MINS	AZ	EL
94.0	157	1
96.0	153	8
98.0	147	16
100.0	138	26
102.0	122	38
104.0	92	48
106.0	52	46
108.0	27	34
110.0	14	22
112.0	6	13
114.0	2	5

ASCN NODE 185. W.

ADD MINS	AZ	EL
94.0	160	2
96.0	157	10
98.0	153	19
100.0	147	31
102.0	133	49
104.0	89	65
106.0	27	56
108.0	7	37
110.0	359	23
112.0	355	13
114.0	352	5

ASCN NODE 190. W.

ADD MINS	AZ	EL
94.0	163	4
96.0	162	12
98.0	161	22
100.0	160	36
102.0	156	58
104.0	73	86
106.0	349	58
108.0	345	36
110.0	344	22
112.0	343	12
114.0	343	4

ASCN NODE 195. W.

ADD MINS	AZ	EL
94.0	167	5
96.0	168	13
98.0	171	24
100.0	176	39
102.0	192	60
104.0	272	72
106.0	317	58
108.0	327	32
110.0	330	19
112.0	332	10
114.0	334	2

ASCN NODE 200. W.

ADD MINS	AZ	EL
94.0	171	6
96.0	175	14
98.0	181	24
100.0	193	38
102.0	221	52
104.0	269	53
106.0	300	39
108.0	313	26
110.0	319	15
112.0	323	7
114.0	326	0

ASCN NODE 205. W.

ADD MINS	AZ	EL
92.0	172	0
94.0	176	7
96.0	181	14
98.0	191	24
100.0	207	34
102.0	235	41
104.0	267	39
106.0	290	29
108.0	302	19
110.0	310	11
112.0	315	4

ASCN NODE 210. W.

ADD MINS	AZ	EL
92.0	175	1
94.0	180	7
96.0	188	14
98.0	204	22
100.0	218	29
102.0	242	32
104.0	265	28
106.0	283	21
108.0	295	14
110.0	303	7
112.0	308	0

ASCN NODE 215. W.

ADD MINS	AZ	EL
92.0	178	1
94.0	185	7
96.0	194	13
98.0	207	19
100.0	225	23
102.0	245	23
104.0	264	20
106.0	278	14
108.0	289	8
110.0	297	3

ASCN NODE 220. W.

ADD MINS	AZ	EL
92.0	181	1
94.0	189	6
96.0	200	11
98.0	214	15
100.0	230	17
102.0	247	17
104.0	262	13
106.0	275	9
108.0	284	4

ASCN NODE 225. W.

ADD MINS	AZ	EL
92.0	184	1
94.0	193	5
96.0	205	9
98.0	218	12
100.0	233	12
102.0	248	11
104.0	261	8
106.0	271	4

ASCN NODE 230. W.

ADD MINS	AZ	EL
92.0	188	0
94.0	197	4
96.0	209	7
98.0	222	8
100.0	235	8
102.0	240	6
104.0	259	3
106.0	269	0

ASCN NODE 235. W.

ADD MINS	AZ	EL
92.0	191	0
94.0	201	2
96.0	212	4
98.0	224	5
100.0	237	4
102.0	248	2

ASCN NODE 240. W.

ADD MINS	AZ	EL
94.0	204	1
96.0	215	2
98.0	226	2
100.0	237	0

ASCN NODE 315. W.

ADD MINS	AZ	EL
72.0	121	0
74.0	132	2
76.0	143	2
78.0	155	1

ASCN NODE 320. W.

ADD MINS	AZ	EL
70.0	110	2
72.0	121	4
74.0	134	5
76.0	146	5
78.0	158	3
80.0	168	0

ASCN NODE 325. W.

ADD MINS	AZ	EL
68.0	99	3
70.0	110	6
72.0	123	8
74.0	136	9
76.0	149	7
78.0	161	4
80.0	171	1

ASCN NODE 330. W.

ADD MINS	AZ	EL
66.0	87	4
68.0	97	8
70.0	110	11
72.0	124	13
74.0	140	12
76.0	153	10
78.0	165	6
80.0	174	1

ASCN NODE 335. W.

ADD MINS	AZ	EL
64.0	74	3
66.0	83	8
68.0	95	13
70.0	110	17
72.0	127	18
74.0	144	16
76.0	158	12
78.0	170	7
80.0	178	2

ASCN NODE 340. W.

ADD MINS	AZ	EL
62.0	62	2
64.0	69	8
66.0	79	14
68.0	93	20
70.0	111	24
72.0	132	24
74.0	150	20
76.0	164	14
78.0	174	8
80.0	181	2

ASCN NODE 345. W.

ADD MINS	AZ	EL
60.0	50	0
62.0	56	6
64.0	63	13
66.0	74	21
68.0	91	28
70.0	114	32
72.0	139	30
74.0	158	23
76.0	171	15
78.0	179	8
80.0	185	2

ASCN NODE 350. W.

ADD MINS	AZ	EL
60.0	44	3
62.0	48	10
64.0	55	18
66.0	67	28
68.0	88	39
70.0	120	43
72.0	150	36
74.0	168	26
76.0	178	16
78.0	184	8
80.0	188	1

ASCN NODE 355. W.

ADD MINS	AZ	EL
60.0	36	6
62.0	39	14
64.0	45	24
66.0	56	38
68.0	83	53
70.0	133	55
72.0	166	41
74.0	179	27
76.0	185	16
78.0	189	7
80.0	191	0

ASCN NODE 360. W.

ADD MINS	AZ	EL
58.0	25	1
60.0	26	8
62.0	28	17
64.0	31	30
66.0	38	47
68.0	71	71
70.0	165	65
72.0	184	42
74.0	190	26
76.0	192	15
78.0	193	6

ASCN NODE 0. W.

ADD MINS	AZ	EL

ASCN NODE 0. W.

ADD MINS	AZ	EL

ASCN NODE 0. W.

ADD MINS	AZ	EL

MELBOURNE

ASCN NODE 0. W.

ADD MINS	AZ	EL
60.0	35	1
62.0	37	8
64.0	41	17
66.0	48	28
68.0	62	43
70.0	97	57
72.0	148	53
74.0	173	37
76.0	183	23
78.0	186	13
80.0	191	5

ASCN NODE 5. W.

ADD MINS	AZ	EL
60.0	27	3
62.0	28	11
64.0	30	20
66.0	33	34
68.0	43	54
70.0	101	75
72.0	175	58
74.0	188	37
76.0	192	22
78.0	194	12
80.0	194	4

ASCN NODE 10. W.

ADD MINS	AZ	EL
60.0	18	5
62.0	17	13
64.0	16	23
66.0	14	38
68.0	9	62
70.0	247	83
72.0	205	55
74.0	201	34
76.0	199	20
78.0	198	11
80.0	197	3

ASCN NODE 15. W.

ADD MINS	AZ	EL
60.0	8	6
62.0	5	14
64.0	1	24
66.0	352	39
68.0	329	58
70.0	263	64
72.0	224	46
74.0	212	30
76.0	206	18
78.0	203	9
80.0	200	2

ASCN NODE 20. W.

ADD MINS	AZ	EL
60.0	358	6
62.0	353	14
64.0	346	24
66.0	332	36
68.0	305	47
70.0	263	48
72.0	234	37
74.0	220	25
76.0	211	15
78.0	206	7
80.0	202	0

ASCN NODE 25. W.

ADD MINS	AZ	EL
60.0	348	5
62.0	342	13
64.0	332	21
66.0	316	30
68.0	292	36
70.0	263	36
72.0	240	29
74.0	225	20
76.0	216	12
78.0	209	5

ASCN NODE 30. W.

ADD MINS	AZ	EL
60.0	339	4
62.0	331	10
64.0	320	17
66.0	305	23
68.0	284	27
70.0	262	26
72.0	243	22
74.0	229	15
76.0	219	9
78.0	211	3

ASCN NODE 35. W.

ADD MINS	AZ	EL
60.0	330	2
62.0	322	8
64.0	311	13
66.0	296	17
68.0	279	20
70.0	260	19
72.0	244	16
74.0	231	11
76.0	221	5
78.0	213	0

ASCN NODE 40. W.

ADD MINS	AZ	EL
60.0	322	0
62.0	314	5
64.0	303	9
66.0	290	12
68.0	275	13
70.0	259	13
72.0	245	10
74.0	233	7
76.0	223	3

ASCN NODE 45. W.

ADD MINS	AZ	EL
62.0	307	1
64.0	296	5
66.0	284	7
68.0	271	8
70.0	258	8
72.0	245	6
74.0	234	3
76.0	224	0

ASCN NODE 50. W.

ADD MINS	AZ	EL
64.0	291	1
66.0	280	3
68.0	268	4
70.0	256	3
72.0	245	2
74.0	234	0

ASCN NODE 155. W.

ADD MINS	AZ	EL
102.0	107	1
104.0	96	1
106.0	85	0

ASCN NODE 160. W.

ADD MINS	AZ	EL
98.0	128	0
100.0	117	3
102.0	106	5
104.0	93	5
106.0	81	4
108.0	69	2
110.0	59	0

ASCN NODE 165. W.

ADD MINS	AZ	EL
96.0	138	0
98.0	128	4
100.0	117	7
102.0	104	9
104.0	90	10
106.0	76	9
108.0	64	6
110.0	53	3

ASCN NODE 170. W.

ADD MINS	AZ	EL
96.0	139	3
98.0	130	7
100.0	118	11
102.0	103	14
104.0	87	15
106.0	71	14
108.0	57	11
110.0	46	6
112.0	36	2

ASCN NODE 175. W.

ADD MINS	AZ	EL
94.0	148	0
96.0	141	5
98.0	132	11
100.0	119	17
102.0	102	21
104.0	83	22
106.0	64	20
108.0	49	15
110.0	37	10
112.0	28	4

ASCN NODE 180. W.

ADD MINS	AZ	EL
94.0	150	2
96.0	144	8
98.0	134	15
100.0	121	22
102.0	102	29
104.0	78	30
106.0	55	27
108.0	39	20
110.0	27	12
112.0	19	6
114.0	13	0

ASCN NODE 185. W.

ADD MINS	AZ	EL
94.0	153	4
96.0	147	11
98.0	139	20
100.0	125	29
102.0	102	38
104.0	70	41
106.0	43	34
108.0	26	24
110.0	16	15
112.0	9	7
114.0	5	0

ASCN NODE 190. W.

ADD MINS	AZ	EL
92.0	159	0
94.0	156	6
96.0	151	14
98.0	144	24
100.0	132	37
102.0	104	51
104.0	57	53
106.0	25	40
108.0	11	26
110.0	4	16
112.0	359	7
114.0	356	0

ASCN NODE 195. W.

ADD MINS	AZ	EL
92.0	161	1
94.0	159	8
96.0	157	17
98.0	152	29
100.0	144	46
102.0	112	67
104.0	27	64
106.0	2	43
108.0	355	27
110.0	351	15
112.0	349	7
114.0	348	0

ASCN NODE 200. W.

ADD MINS	AZ	EL
92.0	164	2
94.0	163	10
96.0	163	19
98.0	163	32
100.0	164	52
102.0	173	82
104.0	337	65
106.0	339	41
108.0	339	25
110.0	339	14
112.0	339	6

ASCN NODE 205. W.

ADD MINS	AZ	EL
92.0	166	3
94.0	158	11
96.0	170	21
98.0	176	34
100.0	190	53
102.0	246	69
104.0	305	54
106.0	320	35
108.0	326	21
110.0	329	11
112.0	330	4

ASCN NODE 210. W.

ADD MINS	AZ	EL
92.0	169	4
94.0	173	12
96.0	178	21
98.0	189	34
100.0	212	48
102.0	256	53
104.0	291	42
106.0	307	28
108.0	315	17
110.0	319	8
112.0	322	1

ASCN NODE 215. W.

ADD MINS	AZ	EL
92.0	175	5
94.0	178	12
96.0	187	21
98.0	201	31
100.0	226	40
102.0	258	40
104.0	283	31
106.0	297	21
108.0	306	12
110.0	311	5

ASCN NODE 220. W.

ADD MINS	AZ	EL
92.0	176	5
94.0	184	12
96.0	194	20
98.0	211	27
100.0	234	31
102.0	258	29
104.0	277	23
106.0	290	15
108.0	299	8
110.0	304	2

ASCN NODE 225. W.

ADD MINS	AZ	EL
90.0	174	0
92.0	180	6
94.0	189	12
96.0	201	18
98.0	218	23
100.0	238	24
102.0	258	21
104.0	273	16
106.0	284	10
108.0	293	4

ASCN NODE 230. W.

ADD MINS	AZ	EL
90.0	176	0
92.0	184	5
94.0	194	11
96.0	207	15
98.0	223	18
100.0	241	18
102.0	257	15
104.0	270	10
106.0	280	5
108.0	287	0

ASCN NODE 235. W.

ADD MINS	AZ	EL
90.0	179	0
92.0	187	5
94.0	198	9
96.0	212	12
98.0	227	14
100.0	242	13
102.0	256	10
104.0	267	6
106.0	276	1

ASCN NODE 240. W.

ADD MINS	AZ	EL
90.0	181	0
92.0	191	4
94.0	202	8
96.0	215	9
98.0	229	10
100.0	243	8
102.0	255	5
104.0	264	1

ASCN NODE 245. W.

ADD MINS	AZ	EL
90.0	184	0
92.0	194	3
94.0	205	6
96.0	218	7
98.0	231	6
100.0	243	4
102.0	253	1

ASCN NODE 250. W.

ADD MINS	AZ	EL
90.0	186	0
92.0	197	2
94.0	208	4
96.0	220	4
98.0	232	3
100.0	242	0

ASCN NODE 255. W.

ADD MINS	AZ	EL
92.0	199	1
94.0	210	2
96.0	222	1

ASCN NODE 260. W.

ADD MINS	AZ	EL
92.0	201	0

ASCN NODE 310. W.

ADD MINS	AZ	EL
78.0	147	0
80.0	158	0

ASCN NODE 315. W.

ADD MINS	AZ	EL
74.0	126	0
76.0	137	2
78.0	148	2
80.0	160	2
82.0	171	0

ASCN NODE 320. W.

ADD MINS	AZ	EL
72.0	116	1
74.0	126	3
76.0	138	5
78.0	151	4
80.0	162	3
82.0	173	0

ASCN NODE 325. W.

ADD MINS	AZ	EL
70.0	105	2
72.0	115	5
74.0	127	7
76.0	141	8
78.0	154	7
80.0	165	4
82.0	176	1

ASCN NODE 330. W.

ADD MINS	AZ	EL
68.0	93	2
70.0	103	6
72.0	115	9
74.0	129	11
76.0	143	11
78.0	157	9
80.0	169	5
82.0	178	1

ASCN NODE 335. W.

ADD MINS	AZ	EL
66.0	81	1
68.0	90	6
70.0	102	11
72.0	116	14
74.0	131	15
76.0	147	14
78.0	161	10
80.0	172	6
82.0	181	1

ASCN NODE 340. W.

ADD MINS	AZ	EL
64.0	70	0
66.0	77	6
68.0	87	11
70.0	100	16
72.0	117	20
74.0	135	20
76.0	152	17
78.0	166	12
80.0	176	6
82.0	184	1

ASCN NODE 345. W.

ADD MINS	AZ	EL
64.0	64	4
66.0	72	10
68.0	83	17
70.0	99	23
72.0	119	26
74.0	141	25
76.0	158	20
78.0	171	13
80.0	180	7
82.0	186	1

ASCN NODE 350. W.

ADD MINS	AZ	EL
62.0	53	2
64.0	58	8
66.0	68	16
68.0	78	24
70.0	98	31
72.0	184	34
74.0	149	30
76.0	166	22
78.0	177	14
80.0	184	6
82.0	189	0

ASCN NODE 355. W.

ADD MINS	AZ	EL
62.0	45	5
64.0	50	12
66.0	58	22
68.0	72	32
70.0	97	42
72.0	132	43
74.0	159	34
76.0	174	23
78.0	183	14
80.0	188	6

ASCN NODE 360. W.

ADD MINS	AZ	EL
60.0	35	1
62.0	37	8
64.0	41	17
66.0	48	28
68.0	62	43
70.0	97	57
72.0	148	53
74.0	173	37
76.0	183	23
78.0	188	13
80.0	191	5

ASCN NODE 0. W.

ADD MINS	AZ	EL

ASCN NODE 0. W.

ADD MINS	AZ	EL

ASCN NODE 0. W.

ADD MINS	AZ	EL

ASCN NODE 0. W.

ADD MINS	AZ	EL

amateur radio

NOVEMBER, 1972

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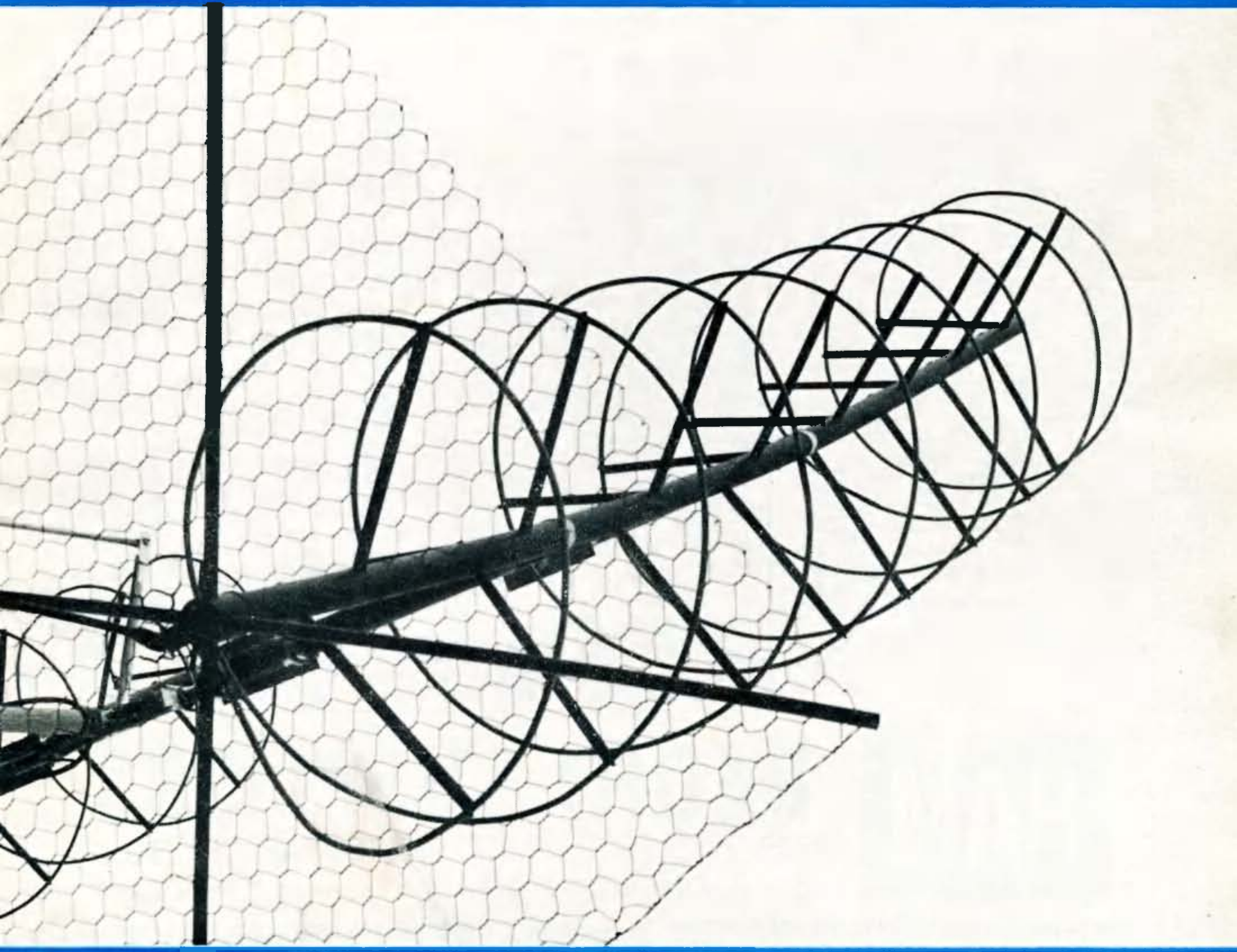

SATELLITE ISSUE

AMATEUR CRYSTALS

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Channel A	Transmit	4,051.55 kHz.
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	Receive	10,285.71 kHz.
Channel C	Transmit	4,059.61 kHz.
	Receive	10,296.14 kHz.
Channel Z	Transmit	4,048.88 kHz.
	Receive	10,411.55 kHz.
Channel 4	Transmit	4,066.66 kHz.
	Receive	10,278.57 kHz.
Channel 1	Transmit	4,058.33 kHz.
	Receive	10,257.14 kHz.

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1,000 kHz. Marker	$12.00
3,500 kHz. Marker	$5.50
5,500 kHz. Marker	$5.50

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Sloping front panel. Plastic case, metal front panel. 7¼ x 4¼ x 5 inches. Suitable for radio, test equipment, projects, etc.

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ADCOLA M70 1/8 inch tip, 240 volt	$8.00
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SCOPE 4 volts AC/DC, 100 watts	$6.40
MINISCOPE	$6.00
SCOPE De Luxe	$7.00

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Five-Core, 60/40	$2.50
Five-Core, 40/60	$2.20
Solder Pack, 42 inches	18c

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6 Volt. Suit Burglar Alarms, Boats, Fire Brigades, etc. Complete with mounting bracket. Available in 12 volt.

Price $10.50 each

No. 62 TRANSCEIVERS

Wireless Set No. 62 Mk. II. (Pye). Frequency range 1.6 to 10 MHz. in two bands. In-built generator power supply for 12 volt operation. Clean condition. $39.50 including circuit diagram. Packing 75c F.O.R.

MICROPHONE CABLE

Type 15P1/24, E3748, 1/16 inch diameter.

Price 15c yard, or 100 yds. $14.00

1 WATT TRANSCEIVER

13 transistors, 3-channel, and call system. Specifications: 13 transistors, 1 diode, 1 thermistor. Range up to 10 miles (depending on terrain, etc.). Frequency 27.240 MHz. (P.M.G. approved with licence). Freq. stability: plus or minus 0.005%. Transmitter: Crystal controlled, 1 watt. Receiver: Superheterodyne, crystal controlled. Antenna: 13 section telescopic. Power source: eight UM3 1.5 volt pen batteries. Size: 8¼ x 3¼ x 1¾ inches. Weight: 25 ozs. Other features: Leather carrying case, battery level meter, squelch control, earphone jack, AC adaptor jack, etc.

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Single units available, $40 each. Be early.

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Receivers, transceivers, ex-Army, and citizens band transmitters, test equipment, oscilloscopes, signal generators, multimeters, chassis racks, panels, computer parts and boards, power transformers up to 6.6 kv., valves, transistors, potentiometers, etc., speakers, amplifiers, cables—hook-up and co-axial 50 and 70 ohms, multicore up to 50 core—panel meters, AVO meters, valve testers and all types or electronic components.

7,000 sq. ft. of electronic gear, plenty of parking—come and inspect. Open 10-5 p.m. week days, 9.30-12 Saturday morning.

Wanted to buy: Receivers, transceivers, electronic equipment and components. Top prices paid.

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No. 62 Transceivers, Army type, 1.6 to 10 MHz., 12v. operation. **Price $39.50** incl. circuit diagram.

50 ohm Co-axial Cable, ½ inch diam., new, **Price 45c yard.**

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MULTIMETERS

MODEL 200-H **Price $12.50**

20,000 ohms per volt d.c., 10,000 ohms per volt a.c.

Specifications:
D.C. volts: 0-5, 25, 50, 250, 500, 2500.
A.C. volts: 0-10, 50, 100, 500, 1000.
D.C. current: 0-50 uA.; 25, 250 mA.
Resistance: 0-60,000 ohms; 0-6 meg.
Capacity: 0.01 - 0.3 uF. (at A.C. 5v.); 0.0001-0.01 uF. (at A.C. 250v.).
Decibel: Minus 20 db., plus 22 db.
Output range: 0-10, 50, 100, 500, 1000.
Battery used: UM3 1.5v., 1-piece.
Dimensions: 3¼ x 4½ x 1⅛ inch.
With internal battery, leads, prods.

MODEL AS-100D/P **Price $34.50**

High 100,000 ohm/volt sensitivity on DC. Mirror scale, protected movement.
AC volts: 6, 30, 120, 300, 600, 1200 (10K o.p.v.). DC volts: 3, 12, 60, 120, 300, 600, 1200 (100,000 o.p.v.). DC current: 12 uA., 6 mA., 60 mA., 300 mA., 12 amps. Resistance (ohms): 2K, 200K, 20M, 200M. dB. scale: minus 20 to plus 63 dB. Audio output (volts AC): 6, 30, 120, 300, 500 1200. Battery: Internal. Approx. size: 7½ x 5½ x 2¾ inches.

MODEL OL-64D **Price $19.75**

20,000 ohms per volt. DC volts: 0.025, 1, 10, 50, 250, 500, 1000 (at 20K o.p.v.), 5000 (at 10K o.p.v.). AC volts: 10, 50, 250, 1000 (at 8K o.p.v.). DC current: 50 uA., 1 mA., 50 mA., 500 mA., 10 amps. Resistance (ohms): 4K, 400K, 4M, 40 megohms. dB scale: minus 20 to plus 36 dB. Capacitance: 250 pF. to 0.02 uF. Inductance: 0-5000 Henries. Size: 5¾ x 4¼ x 1¾ inches.

MODEL C1000 **Price $6.95**

This is the ideal low-cost pocket meter. AC volts: 10, 50, 250, 1000 (1000 o.p.v.). DC volts: 10, 50, 250, 1000 (1000 o.p.v.). DC current: 1 mA., 100 mA. Resistance (ohms): 150K. dB. scale: minus 10 to plus 22 dB. Dimensions: 4¾ x 3¼ x 1¼ inches.

MODEL CT-500/P **Price $16.75**

Popular, medium-size, mirror scale, over-loaded protected. AC volts: 10, 50, 250, 500, 1000 (10K o.p.v.). DC volts: 2.5, 10, 50, 250, 500, 5000. DC current: 50 uA., 5 mA., 50 mA., 500 mA. Resistance (ohms): 12K, 120K, 1.2M, 12M. dB. scale: minus 20 to plus 62 dB. Approx. size: 5½ x 3½ x 1¾ inches.

MODEL A-10/P **Price $55.00**

Giant 6½ inch meter. In-built signal injector, overload protected.
AC volts: 2.5, 10, 50, 250, 500, 1000 (10K o.p.v.). DC volts: 0.5, 2.5, 10, 50, 250, 500, 1000 (30K o.p.v.), 5000 (10K o.p.v.). DC current: 50 uA., 1 mA., 50 mA., 250 mA., 1 amp., 10 amps. AC current: 1 amp., 10 amps. Resistance (ohms): 10K, 100K, 1M, 100M. dB. scale: minus 20 to plus 62 dB. Signal injector: Blocking oscillator circuit with a 2SA102 transistor. Approx. size: 6½ x 7¼ x 3¾ inches.

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Phones: 67-7329, 67-4286 All Mail to be addressed to above address

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We sell and recommend Leader Test Equipment, Pioneer Stereo Equipment and Speakers, Hitachi Radio Valves and Transistor Radios, Kew Brand Meters, A. & R. Transformers and Transistor Power Supplies, Ducon Condensers, Welwyn Resistors, etc

amateur radio

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CONTENTS

COVER

Portion of the twin helix 2 metre satellite tracking array used by VK3ABP. The helixes are 12 ft. long of eight turns of 3/8 in. aluminium tubing, and the array is remotely controllable in elevation and azimuth.
Photo: VK3YAZ and VK3ZU.

QSP

At page 15 of the August issue of "A.R." we reported on the results of the special Conference held at Albury on 8th and 9th July, 1972, to consider the possible alteration of existing repeater and simplex channels in the 2 metre band.

The Conference arose from proposals put forward by the Victorian Division with a view to leaving the allocation 144 to 146 MHz. clear for Satellite operation, that being the segment allocated for that purpose as a result of the 1971 W.R.A.C. on Space Communications.

The recommendations of the Conference were circulated as a postal vote for Federal Council. The Executive delayed the circulation of this postal vote for some time to enable full discussion of the proposals to take place at Divisional and other meetings. In fact the proposals have generated some intense debate and many Amateurs interested in this area of operation have formed extremely strong views either for or against the proposals to alter the existing channels.

It is interesting to record that in a matter of days before the circulation of the postal vote the Federal Communications Commission released a report and order prohibiting terrestrial repeaters in the U.S.A. between 144 and 146 MHz. to preserve for satellite communications the world-wide band from 144 to 146 MHz. (the band 144-148 MHz. is allocated to the Amateur Service **only** in Regions 2 and 3).

It is also interesting to note that the v.h.f. repeater group in the Southern California area, at a meeting held on 9th September, adopted a frequency allocation plan in that area which will require the voluntary shifting of frequencies by more than 50 repeaters. I do not offer this information in support of the proposals circulated, but draw your attention to them as evidence of a global concern for the problem placed before the Federal Council by the postal vote for their consideration.

The Federal Councillor of the New South Wales Division, Mr. Don Miller, VK2GN, has given notice in accordance with Article 44 of the Institute's Articles of Association that he requires the matters the subject of this postal poll to be held over for determination at the next Federal Convention. The right to take this step in relation to a postal poll of the Federal Council is given to each Federal Councillor. The object of this Article is to provide a means of protection against hasty decisions on important matters without the opportunity for adequate discussion.

Accordingly, the Federal Council is unable to determine the matter by a postal poll and the Institute will not adopt at this time, nor can it adopt prior to the Federal Convention any policy seeking the change of the existing repeater allocations. Whether the Council will decide to preserve the status quo or adopt a new policy will be decided by the Federal Council at the next Federal Convention.

MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

1973 CALL BOOK

All members of the Publications Committee have been working very hard during the past few months to improve "A.R.," and with the able help of the Contributing Editors, Drafting Assistants, and Publishing Associates, we feel that, within the stringent economic limitations imposed upon us, we are gradually improving the presentation and content of the magazine. And, most important, the financial situation is looking better all the time.

One of the duties of the Publications Committee is the production of the Call Book. The preliminary planning and costing of the 1973 Call Book has been completed, and I am sure that all Amateurs will be pleased with the improved format, the additional information, and the cost of the finished article.

However, the most important part of the Call Book, the station listings, is causing considerable concern.

At the closing date for this Call Book, 31st December, 1972, the P.M.G. Dept. will provide us with the official lists of all Amateur Stations under the control of the Australian administration. We will then check this against our own index systems, which are continually updated from their monthly lists, as well as from written forms of advice we receive from Amateurs themselves.

So, you say, what is the problem?

Simply this. A rough check of our index system against the mailing list for "A.R." shows that a large number of Amateurs are receiving the magazine at an address different from their station address.

Does this mean that they now have a separate postal address from their station address, or does it mean that the station address has also changed? We don't know!

Unless the change-of-address advice received by us **specifically states that the new address is also the new station address, and is not just a new address for "A.R.,"** we are unable either to alter the Call Book index or to advise the P.M.G.

If your mailing address, as shown on your "A.R." wrapper, is NOT also your station address, please let us know as soon as possible and give us your full station address. This is needed only if your 1971 Call Book details have changed or are incorrect.

Are you blameless of this type of change-of-address advice?

If your address was incorrect in the last Call Book, or has changed since that time, and you are not absolutely sure that you advised both the W.I.A. and the P.M.G. in the correct manner, please do something about it NOW.

If you want to be correctly listed in the 1973 Call Book, you MUST advise us at once of any amendments, and your advice MUST reach us before 31st December, 1972. We will then advise the P.M.G. Dept. of the alteration, and the official lists as printed in the 1973 Call Book should be as accurate as you can make them.

—Call Book Sub-Committee.

OTHER SERVICES

The charges for obtaining television programmes via satellite (Intelsat) remain at $850 for the first ten minutes and $40 for each additional minute. (Aust. Br. Control Board, 24th Annual Report.)

CALL SIGN BLOCKS

The I.T.U. has allocated to Oman (Sultanate) the call sign block A4A to A4Z, and to Bangladesh the block S2A to S3Z. (Reg. 1 News.)

ITALIAN LICENSING

In Italy it appears there are four classes of licence available, but mobile operations are not permitted. The class 1 licence allows up to 75w. input, class 2 up to 150w., class 3 up to 350w. and a new technician's licence (theory exam. only) for 10w. input on vh.f. and u.h.f. bands only. (I.A.R.U. Reg. 1 News.)

TRANSISTORS AND VALVES

The percentage of total usage of transistors and valves in 1967 was shown as 94% valves, 5% transistors and 1% ICs. For 1972 these were quoted as 30%, 49% and 21% respectively. By 1974 the percentages are expected to be 5%, 35% and 60% respectively. (W6LS Bulletin.)

SWITZERLAND

Licensing authorities are now prepared to allow repeaters having input and output frequencies in the 2 metre band. It is not expected that many 2 metre repeaters will be installed, since five repeaters are now operating in the 70 cm. band, giving excellent results. The latter band proves to be superior for mobile work in cities and mountainous areas. (I.A.R.U. Reg. 1 News, Aug. '72.)

MARCO

Marco means "Medical Amateur Radio Council". In a recent letter, JA0BXP/1, C/o. Nomura, 2-21-9 Ogikubo, Suginami-ku, Tokyo 167, writes that he is Marco correspondent in Japan but is hampered by the absence of an Asia-Oceania net to prepare for any medical emergencies. If you are a Radio Amateur Medical Practitioner you might care to write to him direct to set up skeds.

PORTABLE AND MOBILE OPERATIONS

A recent letter from the Director-General P.M.G's Department Radio Branch (RB1/17/46) clarifies the meaning of paragraphs 90 and 91 in the Handbook. The letter states, inter alia, "Portable or mobile operation referred to in these paragraphs, including the 'five consecutive days' when no approval is required, means absences of a licensed Amateur from his fixed station address during which he is in possession of portable or mobile equipment capable of being used in the Amateur Service".

In further elucidation, it has been ascertained that the key to the situation is "absence from the fixed station address".

If you do NOT go away from your fixed station address for more than five days at any one time you can, of course, work portable or mobile without special approval. However, if you are away from your fixed station address for more than five days at any one time and you take with you, or use, portable or mobile equipment in that period you must obtain special approval to operate portable or mobile even if only for a few minutes.

BARS

If your signal puts some across your neighbour's t.v. you could go out into too many, come out singing a few, and end up behind some—even if you are a sheep farmer.

SATELLITE TRACK CALCULATOR

P. D. FRITH, VK7PF*

● In this article VK7PF describes what is possibly one of the simplest ways yet devised of making orbital predictions for a satellite such as Amsat Oscar-C. He also gives some sound practical advice on antenna pointing while attempting communication through the satellite translator.

This visual method plots the path across the earth of a satellite and from this determines:

(1) In what direction will it first be heard and at what time (acquisition of signal, or a.o.s.).

(2) The bearing, time and elevation at closest approach (t.c.a.).

(3) The loss of signal (l.o.s.), direction and time.

For communication purposes it is required to know areas of possible contacts. These can be found by using overlays for the particular areas and establishing whether there is a common overlap period when the satellite is within range of both stations.

SOME TERMS

Before going into details, some terms used in tracking satellites will be given and explained. When the first Oscars were tracked I had difficulty in finding a suitable text to explain in just the right amount of detail the mechanism of how and why a satellite orbits where it does and Ref. 1 is to be recommended as that text.

Orbit.—A satellite is in orbit when it revolves around the earth in a plane which passes through the earth's centre. This means that it has to spend time in both the north and south hemispheres. It is not possible to orbit around say 40°S latitude only.

Orbit Number.—The start of an orbit is said to be when a satellite passes over the equator on a north bound track (ascending node) and the number of the orbit changes at that time. It will be seen from the calculator that it also passes over the equator southbound (descending node) approximately 180° further west.

Inclination.—This is the angle the plane of revolution makes with the equator at the start of an orbit with east as reference. For AO-C this will be 102°, which is the angle required for the chosen height to cancel the influences that would move the daily viewing time away from the chosen 9 o'clock local sun time.

Progression of Tracks.—The plane of the orbit in which the satellite revolves can be regarded as fixed with the earth rotating beneath. This means that successive equator crossings in the same direction will be further to the west and because of this the longitude scale on the equator is marked in degrees west only.

Period.—The time of one revolution. For earlier Oscars this varied but the changes will be of no consequence for AO-C.

Predictions.—These are usually given as orbit numbers, the time of the start of this orbit (as it crosses the equator northbound) and the west longitude of this crossing.

THE CALCULATOR

This takes the form of a polar map, that is, a great circle map with the south pole as centre. Two sample tracks are shown on Fig. 1, one south-bound east of Australia and the other north-bound in the same area. The first would be around 8 a.m. and the other around 9 p.m. The tracks are actually great circle paths corrected for the earth's rotation as the satellite moves along them. The north-bound track crosses the equator south-bound at 006.5°W, passes to the east of the pole and north-wards to cross the equator at 200.9°W (006.5 + 180 + 14.4) and into the next orbit.

The south-bound track crosses the equator seven orbits later at 207.5°W, passes to the west of the pole and then north-wards to cross the equator at 41.9°W (207.5 + 180 + 14.4 — 360). The earth rotates 14.4° during half an orbit or 28.8° for a full orbit of AO-C (115 min. period).

The next N-S crossing will be at 236.3°W.

Shown in Fig. 2 are two sample range diagrams which have to be used for the particular latitude of interest. The ones supplied with the tracking kit, being made available, will be for most latitudes and be on transparent paper.

USING THE CALCULATOR

Select the range ring for your latitude and fix it over the map with the centre at your location, or better still, copy it onto the map to leave the transparency free for use at other locations. Fix the map onto a baseboard of heavy cardboard or other suitable material and the AO-C track onto a piece of perspex. Pivot by some means the perspex with the indicated south pole at the south pole of the map. Now you can do a trial run of a typical day's

(continued on page 12)

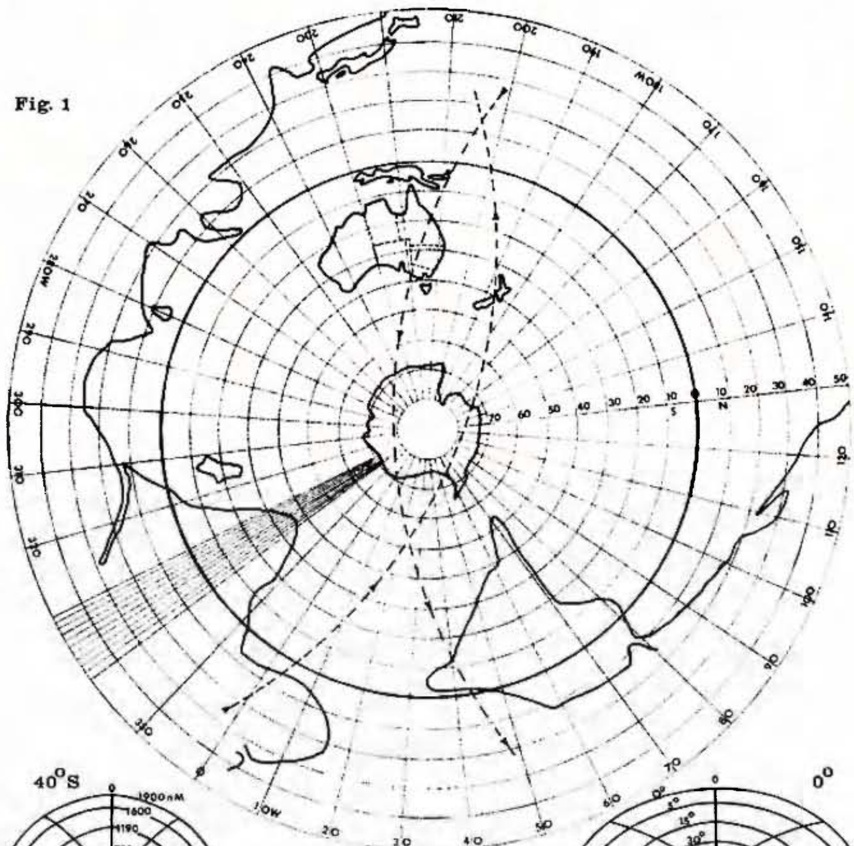

Fig. 1

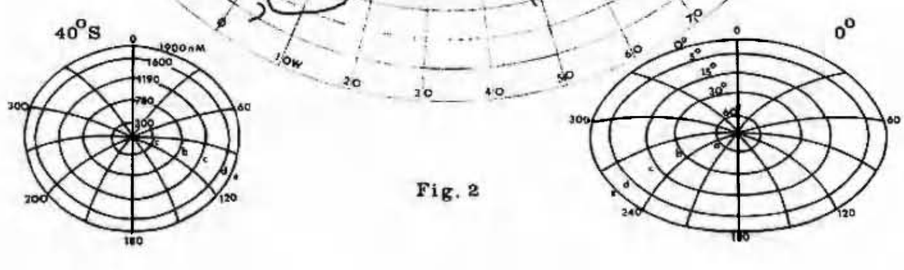

Fig. 2

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AO-C 2 METRE TO 10 METRE REPEATER

G. N. LONG, VK3YDB*
Chairman, Project Australis Group

INTRODUCTION

This article is intended to deal with the operation and design of the Amsat 2 metre to 10 metre linear repeater (translator or transponder).

As an insight into its development here is a short history of the device:

(a) Designed by Carl Meinzer, DJ-4ZC, in late 1970. The first prototype was built in the autumn of 1971. (This is the one now here in Australia.)
(b) A second prototype was built in the Spring of 1971 by Mr. P. Klein, K3JTE.
(c) The flight model for AO-C was built in 1972 by Jan King, Perry Klein and other members of the Amsat organisation.

The launch of the AO-C will bring to the Amateurs of the world a means to find some answers to complex questions about propagation, orbital geometry, and electronic reliability. This is the first satellite in the history of Amateur Radio which contains its own primary power generating source, and it will therefore be a long life system.

It is felt that if the system is "go" ten minutes after launch, then it will work for a year, thus giving us Amateurs an invaluable tool with which to demonstrate to various Administrations around the world that Amateur operators are a valuable asset, not a liability as presently thought by some Administrations.

This satellite has the following uses:

(a) Education—by Y.R.C.S., school clubs and universities.
(b) To be available for scientific research by people such as moonbounce groups, C.S.I.R.O., P.M.G. if they so desire—and by medical groups, interested in remote medical sensing.
(c) For outback communication, in Central Australia, as an example.
(d) Further development of small low-cost ground terminals.

These are all great hopes to be fulfilled. The Australian Amateur has done much to help this and, we hope, also the future satellites. To this end we feel that all Amateurs should make maximum use of the **bird.**

Now for a technical description as taken from the latest Amsat Newsletter (September 1972).

THE REPEATER DESIGN

The repeater uses a 2N3478 r.f. transistor as a two metre pre-amplifier and another 2N3478 as the first mixer to mix the two metre received signal down to 39.1 MHz. A 35.61625 MHz. crystal oscillator output is multiplied by three to 106.84875 MHz. and is mixed with the amplified two metre signal to provide this 39.1 MHz. first i.f. frequency. The signal is then fed to a 2N918 second mixer, which uses the 35.61625 MHz. crystal oscillator a second time to mix down to a second i.f. frequency of 3.485 MHz., providing a gain of approximately 20 dB. in the process.

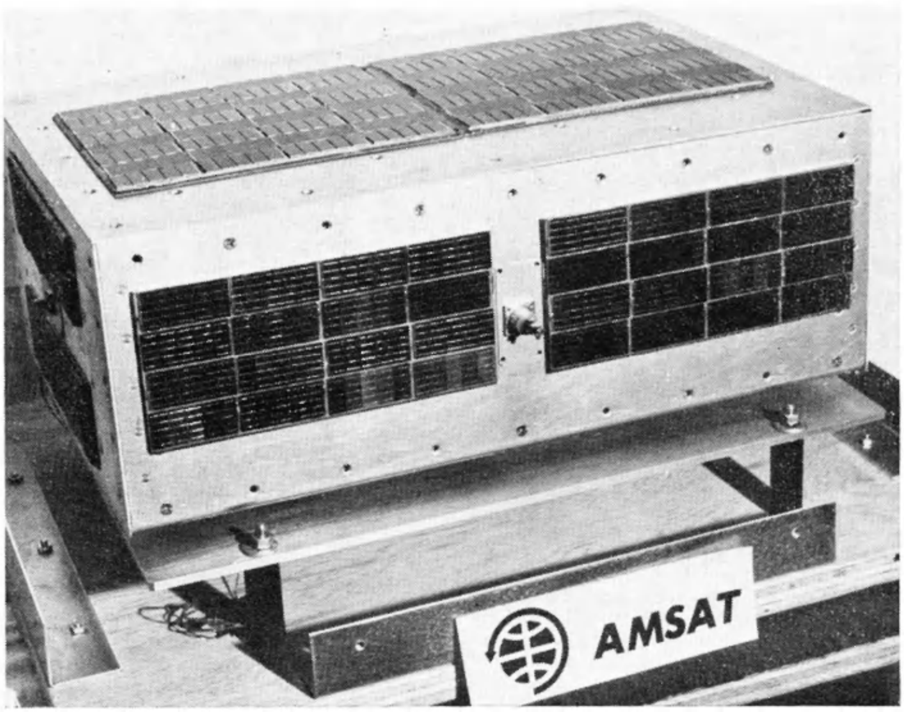
The 3.485 MHz. i.f. signal is then amplified approximately 35 dB. in a single BF167 i.f. amplifier stage, after which it is up-converted to a frequency of 29.5 MHz. in a 2N918 balanced mixer, using a 2N918 crystal local oscillator operating at 26.015 MHz. The balanced mixer achieves a gain of nearly 25 dB., and the signal level at this point is of the order of one milliwatt at 29.5 MHz. The signal is then amplified to a maximum of about 1 to 1.3 watts output using a 2N3866 driver and 2N3375 final amplifier. A.g.c. voltage is developed in a three-transistor a.g.c. amplifier, which senses the emitter current of the final amplifier and controls the gain of the BF167 i.f. amplifier.

The repeater also contains a beacon oscillator which operates at 29.45 MHz., the same frequency used by the last satellite, Australis-Oscar 5. The beacon signal is injected at the input to the driver stage, and the beacon is keyed by the Morse code telemetry encoder or the code-store message storage unit, which are selected alternately at approximately 14 to 15-minute intervals by a clock timer device in the satellite.

USING THE REPEATER

The repeater is designed for linear operation and is capable of handling most forms of narrowband modulation, s.s.b., c.w., a.m., f.m., r.t.t.y. and s.s.t.v. S.s.b. and c.w. are recommended primary modes of operation and make most efficient use of the repeater because a number of users can operate simultaneously, each taking different proportions of the repeater's power capability at a particular instant of time. Therefore, a higher average power level is available to each user since not all c.w. users are key-down at any given instant, nor are all sideband stations talking up to full power at any one moment. A.m., f.m. and r.t.t.y. do not have this characteristic. Thus, stations employing these modes will each expend the available repeater power at all times, even when no intelligence is being transmitted.

To facilitate the most efficient operation of the repeater, all users are strongly urged to continuously monitor their own downlink signals. This is an operating technique previously rarely available to Amateurs, but which enables each user to hear his own signal from the satellite as others hear it. It requires simply that a separate receiver and antenna be available for receiving one's own downlink signal on ten meters, while transmitting simultaneously on the two metre uplink band.



Photograph of the Amsat Oscar-C (Oscar 6) satellite package, courtesy of Dr. Perry Klein, K3JTE.

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Such operation makes possible perfect break-in QSOs and roundtables, particularly on s.s.b., permitting full duplex operation.

Unlike other forms of Amateur communications, satellite communications with downlink self-monitoring permits each user to observe how the DX hears his signal, and he can then adjust his power and frequency to compensate for the satellite's distance and Doppler frequency shift. This is most readily done by observing the satellite's beacon signal level on 29.45 MHz. and adjusting the power of the ground transmitter so that the repeated signal from the satellite appears to be the same level, either as read on an S meter or as determined aurally. If the transmitter is v.f.o. controlled, its frequency should be constantly adjusted by the operator while transmitting to keep the apparent downlink frequency constant in the presence of changing Doppler shift, which can be as much as ±4.5 kHz. for an overhead pass.

Spotting one's own downlink carrier is not always easy through the satellite repeater, and it is quite difficult to zero beat another station without careful dial calibration. One excellent method of getting a "frequency spotter" is to obtain a two metre converter having either a 10 or 20 metre output and use it as a satellite repeater simulator in the shack. If the converter uses a 38.666 or 43.333 MHz. crystal, replacing it with a 38.817 MHz. crystal will convert locally generated two metre signals in the 145.9 to 146.0 MHz. uplink band to the correct frequency in the 29.45 to 29.55 MHz. downlink band, so that spotting and zero beating can be accomplished without the signals leaving the shack.

Because of Doppler shifts up to ±4.5 kHz. which will occur when using the actual satellite repeater, the spotter's frequency will be off by the amount of the Doppler shift. This can easily be corrected for by setting the transmitter frequency several kHz. **higher** than the spotted frequency near the beginning of a pass, or several kHz. **lower** than the spotted frequency near the end of a pass.

OPERATING PROCEDURE

The procedure recommended for operating with the Oscar two-to-ten metre repeater is as follows:

(1) When the satellite comes within range, begin listening for the Morse code beacon signal on 29.45 MHz. Be sure to note the signal strength of the beacon signal. Since the beacon is A1 emission, use your b.f.o. to receive it.

(2) Once you have located the beacon on 29.45 MHz., tune up the band and begin looking for signals from the repeater in the 29.45 to 29.55 MHz. range.

(3) When you are ready to transmit, choose a frequency within the 145.90 to 146.00 MHz. uplink band and send a test signal, preferably a string of dots, on this frequency (f_2). Listen for your own signal re-transmitted from the satellite on the corresponding ten metre frequency (f_{10}), found from the formula:

$$f_{10} = f_2 - 116.45 \text{ MHz.} \pm f_{DOPPLER}$$

where $f_{DOPPLER}$ = +4.5 kHz. near the beginning of an overhead pass.
= 0 kHz. at the middle of the pass.
= —4.5 kHz. near the end of an overhead pass.

For example, a signal transmitted on 145.92 MHz. will be re-transmitted on 29.47 MHz. ±Doppler. This is where you should listen for your signal. If you can hear your own signal, you can be sure that others can hear your signal as well.

(4) Adjust your transmitter power so that on s.s.b. voice peaks or with a slow string of dots the repeated signal is approximately equal to the beacon signal level. This will assure that you take the correct share of the repeater power without overloading the repeater and running down the satellite's battery unnecessarily. Keep in mind that the power will be divided among all stations in the passband. An overly strong station will prevent other Amateurs from simultaneously using the repeater if he does not reduce his power. He will also reduce the overall repeater gain, through a.g.c. action, so that he will not be able to hear weaker stations who may be trying to call him. If you do not have a convenient method for directly controlling your power output, an alternative technique is to aim your antenna away from the satellite.

If you intend to operate with high power or use a large antenna array such that the transmitter output multiplied by the antenna gain is above 80 to 100 watts effective radiated power, then it is suggested that you operate slightly off from the regular passband of 145.90 to 146.00 MHz. The repeater has an "extended passband" feature in its design, that is the —10 dB. response is ±120 kHz. from the centre frequency (the passband is 240 kHz. wide at the 10 dB. down points). Therefore, if higher power stations will transmit between 145.83 and 145.89 MHz. or from 146.01 to 146.07 MHz., their signals will be compensated for by the roll-off of the repeater response, and they will not take more than the correct portion of the repeater power.

One benefit for doing this is simply a reduction in QRM, since only high power stations can operate through the repeater on these extended frequency segments. Low power stations cannot easily overcome the additional attenuation of the passband roll-off and should operate in the normal repeater passband of 145.90 to 146.00 MHz.

SUMMARY

In summary, listed below are the basic operating characteristics of the AO-C two-to-ten metre linear repeater:

Input frequency range: 145.90 to 146.00 MHz. for normal operation. 145.83 to 146.07 MHz. for extended passband operation.

Output frequency range: 29.45 to 29.55 MHz. for normal operation. 29.38 to 29.62 MHz. for extended passband operation. Passband is **non-inverting** (i.e. upper sideband remains upper sideband and vice versa).

Beacon frequency: 29.45 MHz. (same as Australis-Oscar 5).

Beacon modulation: Morse code (A1 emission).

Repeater bandwidth: 100 kHz. flat; 120 kHz. at 3 dB. down points; 150 kHz at 6 dB. down points; 240 kHz. at 10 dB. down points.

Operating modes: S.s.b. and c.w. are recommended; a.m., r.t.t.y. and s.s.t.v. can also be used but with less efficiency. F.m. is **not** recommended.

Repeater power output: 1 to 1.3 watts c.w. into a half-wave dipole.

Input sensitivity: Approximately —100 dBm. (2 microvolts/m) for full output.

Ground power required: 80 to 100 watts of effective radiated power produces full output from the repeater at a maximum range of 2,000 miles. (An 8 to 10 watt transmitter and 10 dB. of antenna gain, or 80 watt transmitter and omnidirectional antenna should be adequate.)

Intermodulation: 20 dB. down.

A.g.c.: Up to 26 dB. gain reduction; 0.1 second attack time; 2.2 second release time. Designed for highest efficiency with s.s.b.

Ground receiver required: Better than ½ microvolt/m sensitivity for 10 dB. (S+N)/N on 10 metres should be adequate. Dipole antenna can be used, but beam is preferable. ●

THE AMSAT OSCAR-C COMMAND SYSTEM

PETER R. HAMMER, VK3ZPI*

● The author has been involved, as a member of the Australis satellite design group, in the development of command systems for the Amsat Oscar B and C satellites. He discusses here the requirements to be met by a command system and some of the techniques employed in these satellites.

There are several requirements which a command system for a satellite should meet. Firstly, it is necessary to have a sufficiently large number of commands so that the various sub-systems on the spacecraft can be adequately controlled. Secondly, the command system must be secure. This means that the presence of noise and interference at the input of the command decoder must not be decoded as a command. Thirdly, the power consumption of the command decoder must be as low as possible, consistent with the previous requirements. Fourthly, the weight of the command decoder must be as small as possible.

The reason for the last two requirements is that, as the spacecraft weight and power budget are limited, it is desirable that the support systems such as command and telemetry involve as little power and weight as possible so as to leave the maximum amount of power and weight for the main experiments (in this case the 2-10 metre translator and 435 MHz. beacon).

Finally, the command decoder must perform reliably for one year in the harsh environment of space as well as surviving the acceleration and vibration caused by the launch vehicle.

We shall now consider two possible command systems.

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(a) THE FULLY PARALLEL COMMAND SYSTEM

This decoder system is illustrated in Fig. 1. Here we assign each command channel a unique audio tone. When this tone is detected by the decoder, at the decoder input, the appropriate switch at the decoder output is operated. The presence of noise at the decoder input could be interpreted as an erroneous command. To decrease the likelihood of this occurring, we use a separate, unique audio tone, transmitted at the same time as the command tone, to operate an enable gate. Unless this enable tone is present the enable gate is not activated and the decoded command will not be passed through to the output switches.

The decoder scheme described above is very simple and reasonably secure against noise and interference. (Further improvements in this regard can be made by adding additional enable tone systems in parallel with the single one mentioned above.)

The main disadvantage of the fully parallel decoder scheme is that each command needs its own unique tone filter; thus if many command channels are desired the resulting number of filters becomes excessive. The main advantage of the decoder is its inherent redundancy. Provided that the enable channel does not fail, then the failure of one component will only result in the loss of one command. (The enable channel can easily be made redundant, without greatly increasing the weight or the power drain, by duplication of components which are likely to fail.)

(b) THE SERIAL COMMAND SYSTEM

This decoder system is illustrated in Fig. 2. Here we have represented each command by a unique binary word. We transmit the resulting command word in a serial fashion, one bit at a time, and re-assemble the word in the decoder. A decoding matrix in the decoder then decides which command was sent. The decoder for this com-

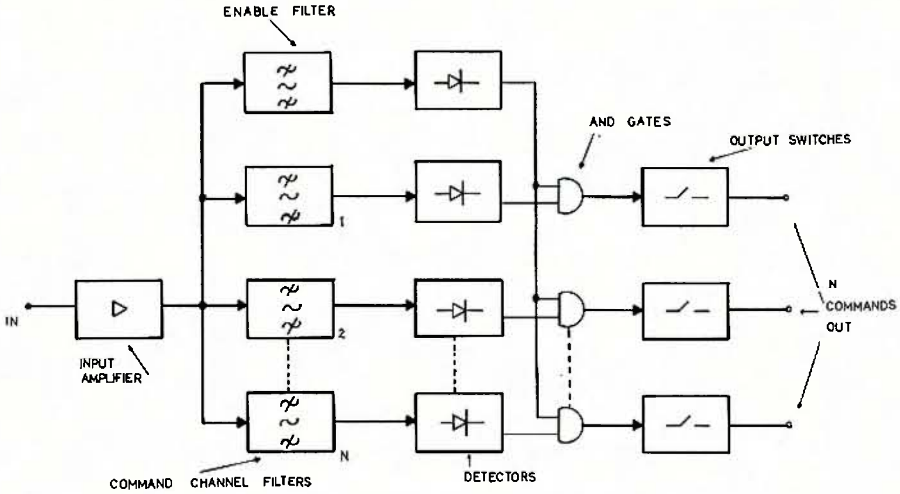

FIG. 1 A BLOCK DIAGRAM OF A FULLY PARALLEL COMMAND SYSTEM

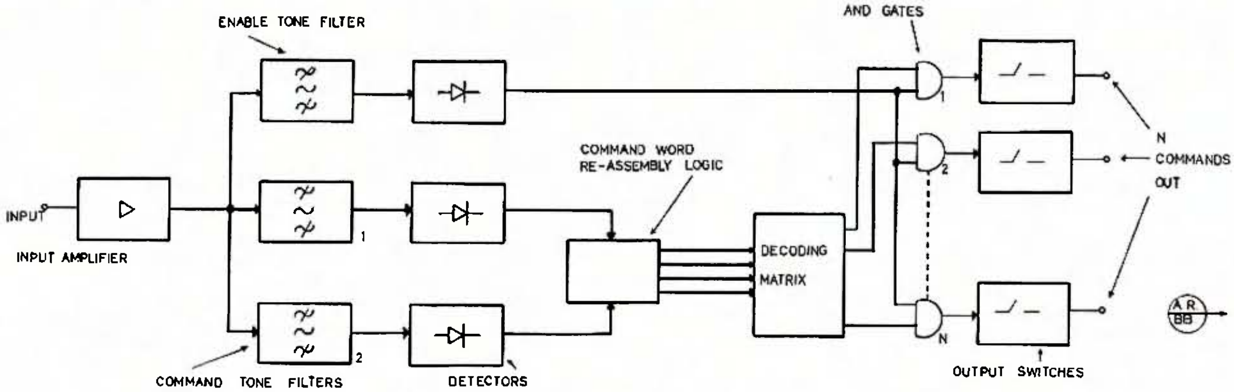

FIG. 2 — A BLOCK DIAGRAM OF A SERIAL COMMAND SYSTEM

mand scheme is thus very similar to a 2-channel parallel decoder; we have replaced the parallel transmission of a large set of possible tones by the serial transmission of a string of two possible tones. (An enable tone can still be used to prevent spurious signals from triggering the decoder.)

In order to correctly re-assemble the bits of the command word it is necessary to have additional information relating to the length of time each bit is sent. This can either be predetermined by the design of the decoder or can be transmitted together with the command word, using a separate timing channel.

The main disadvantage of this decoding scheme is that it is more susceptible to component failure, unless redundancy is designed into each section of the decoder.

It is this latter scheme which has been used for the AO-C spacecraft.

Having decided on the form of the command scheme, we now have to consider how to implement it. Here we are guided by the requirements listed earlier.

The heaviest parts of the decoder are the tone decoding filters. It is possible to use active filters rather than passive filters, but there are two major reasons for not doing this. Firstly, active filters require many more components than passive filters to achieve the same performance and, secondly, the cost and power requirements of the large number of operational amplifiers required is excessive compared to the cost of high quality inductors.

The supply current needed for the analogue portions of the decoder can be minimised by using lower power operational amplifiers and by operating all transistors at very low collector currents. The digital integrated circuits used in the decoder are the only other source of power drain. To minimise this power drain complementary metal-oxide-silicon (COS/MOS) integrated circuits are used. The COS/MOS logic family is based on the use of two series FETs, one P-channel and one N-channel, as shown by the inverter of Fig. 3. As the gates of the two FETs are tied together, only one FET is on at any one time and thus the quiescent d.c. power drain is due to leakage current through the two series channels. In addition, the output state of the gate is a low impedance at all times and thus the noise immunity of the logic family is very high.

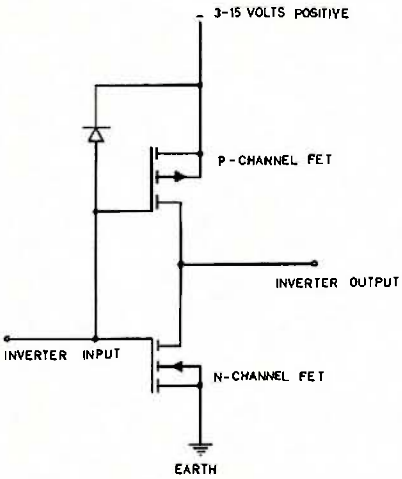

FIG. 3- A COS/MOS INVERTER SCHEMATIC

Fig. 4 shows the two circuit boards which comprise the complete 21-channel command decoder for AO-C. (The blank spaces in one board are for additional integrated circuits which can be inserted to give the 35-channel command system intended for AO-B.)

The reliability of the command decoder is greatly determined by the components used and by the construction method. The decoder is built on fibre-glass printed circuit boards which have been solder-coated. Solder coating is preferable to gold plating as the lead in solder forms a brittle amalgam with gold and this can result in a dry joint developing after a period of time. Dry joints can best be eliminated by using the correct solder (a 63% tin 37% lead composition solder with a non corrosive resin core) and a constant temperature soldering iron. To prevent damage of the decoder during the high vibration and acceleration experienced during launch most components are mounted hard down on the circuit boards. As this is not always possible, the decoder will need to be potted in polyurethane foam.

As can be seen in Fig. 4, all the digital integrated circuits carry a unique serial number. This is because **they have all been tested by the manufacturer to full military specifications.** The rest of the components used in the decoder are all manufactured to military specifications and have been qualified by N.A.S.A. for use in space.

Having designed the command system, we are now in a position to allocate command channel assignments. To protect the system against component failure it is desirable that any redundant commands have as few circuit components common to the primary command electronics as possible. The final command channel assignments for AO-C are listed below.

LIST OF COMMAND FUNCTIONS FOR AO-C

1. 2 mx/10 mx translator on.
2. 2 mx/10 mx translator off.
3. 435 MHz. beacon transmitter on.
4. 435 MHz. beacon transmitter off.
5. Code store—run mode.
6. Code store—load mode.
7. Morse code telemetry encoder—high bite rate (20 w.p.m.).
8. Morse code telemetry encoder—low bit rate (10 w.p.m.).
9. Translator a.g.c. loop enabled.
10. Translator a.g.c. loop disabled.
11. Command code store to modulate 435 MHz. beacon.
12. Command morse code telemetry encoder to modulate 435 MHz. beacon.
13. Command code store to modulate translator beacon.
14. Command morse code telemetry to modulate translator beacon.
15. Disable commands 13 and 14/enable clock sequence (switches between code store and telemetry once every 15 minutes).
16. Enable command 13 or 14 (whichever was last commanded)/disable clock sequence.
17. Reset clock.
18. 2 mx/10 mx translator on (redundant).
19. 2 mx/10 mx translator off (redundant).
20. 435 MHz. beacon transmitter on (redundant).
21. 435 MHz. beacon transmitter off (redundant).

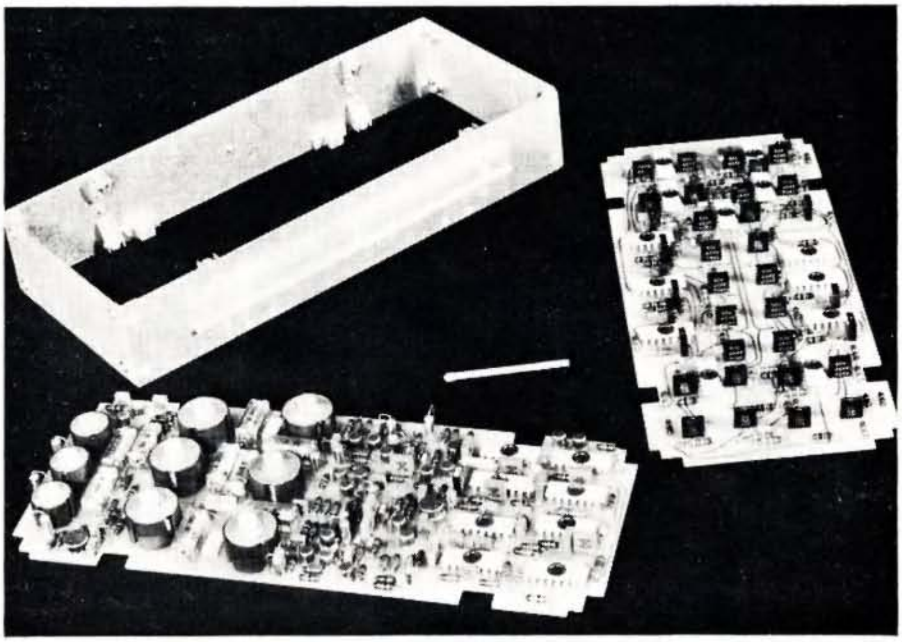

Fig. 4 —A photograph of the AO-C Command Decoder. The photograph was taken before all the interboard wiring was installed. The module housing is shown at the back of the photograph.

THE AMSAT OSCAR-C TELEMETRY SYSTEM

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Chairman, Project Australis Group

● The purpose of this article is to explain some of the characteristics of the American 24-channel c.w. telemetry system.

The satellite AO-C will carry the following radio and pulse equipment:

(a) Two metre to ten metre translator.
(b) Australis 21-channel command system.
(c) The American c.w. 24-channel telemetry system.
(d) The American code-store system.

This is the first time that this system is being flown on any satellite and its results will be closely examined to see how it compares with the Australis r.t.t.y. telemetry system which is due to fly in the AO-B satellite.

At this stage it should be made clear that the telemetry is purely for housekeeping. It is not intended that the Amateur population should decode the information and send it in. For this satellite this is unnecessary and will cause confusion; i.e. my postman will get very upset!

The telemetry from the satellite will be transmitted in a three-figure code, in which the first number relates to the channel number and is therefore disregarded as far as actual information is concerned.

For example, I will now quote from the Amsat Newsletters for March and June 1972:

SAMPLE TELEMETRY FRAME
(Simulating AO-C Flight Data)

HI	153	132	102	141	
	202	235	200	263	
	352	380	368	355	
	457	452	453	458	
	558	524	530	500	
	633	600	687	650	HI

Using the above data one can answer the following questions (remember to drop the most significant digit which is used for data line identification and is not part of the telemetered value):

1. What is the approximate spacecraft attitude relative to the sun line? Which faces are being illuminated?
2. What is the total power being generated by the solar arrays at the instant the measurement was made?
3. Is the spacecraft running on a positive power budget at the time the measurement was made? (i.e. is the battery being charged or discharged?)
4. What is the state of charge of the battery? This is a function of the battery voltage (unregulated bus voltage).
5. What is the change of temperature (thermal gradient) across the spacecraft?
6. Is the temperature of the power amplifier transistor running at a temperature very close to that of the spacecraft baseplate? (This will influence the p.a. efficiency.)
7. What is the translator usage at the time of the measurement? Is the activity high or low?
8. At what efficiency is the translator power amplifier running? (The p.a. runs from the 24v. unregulated bus.)
9. What is the status of the 435 MHz. beacon?
10. Does the telemetry encoder appear to be in calibration?

If you have bothered to work out the telemetry values of the sample telemetry frame, using the calibration data, you should have reached the following conclusions:

Channel	Telemetered Value (Counts)	Parameter	Value
1*	53	I_T	265 mA.
2	32	I_{+X}	32 mA.
3	02	I_{+Y}	4 mA.
4	41	I_{+Z}	164 mA.
5	02	I_{-X}	2 mA.
6	35	I_{-Y}	70 mA.
7	00	I_{-Z}	0 mA.
8	63	I_{BAT}	+130 mA.
9	52	V_{BUS}	24.2 V.
10	80	$V_{\frac{1}{2}BAT}$	12.0 V.
11	68	V_{SR}	10.2 V.
12	55	T_{BAT}	15.0°C.
13	57	T_{BP}	12.0°C.
14	52	T_{PA}	19.6°C.
15	53	T_{+X}	17.8°C.
16	58	T_{+Y}	10.5°C.
17	58	T_{+Z}	10.5°C.
18	24	I_{PA}	120 mA.
19	30	V_{TXR}	9.0 V.
20	00	Spare	——
21	33	P_{OUT}	1.09 W.
22	00	P_{OUT}	0.00 W.
23	87	V_{AGC}	2.62 V.
24	50	Cal.	50 counts

* Corrected.

Telemetry values associated with the solar arrays and the spacecraft battery should be checked first since they are the most critical values for maintaining the spacecraft. Problems in the power system obviously affect all of the operating systems. The current available from the solar arrays is used either to charge the battery or is delivered to the loads within the spacecraft. Of these loads the translator and the 435 MHz. beacon draw most of the current. We can thus write:

$$I_T = I_{BAT} + \underset{\text{(PA Emitter)}}{I_{TRANS}} + I_{BEACON} + I_{MISC}$$

Using the sample data (current in mA.):

$$265 = 130 + 120 + 0 + I_{MISC}$$

$$\therefore I_{MISC} = 15 \text{ mA.}$$

This miscellaneous current is used to power the instrumentation switching regulator which provides regulated voltages to all of the sub-systems. The terms of this equation change continually throughout the orbit. As an example, when Oscar 6 is in eclipse the solar array current will be zero and all of the current must be supplied by the NiCd battery. Since the battery will be discharging during this period the I_{BAT} channel will be negative. The battery voltage from the sample data is 24.2 volts. Since there are 18 separate cells the voltage per cell is 1.32 volts. When fully charged the voltage of a NiCd cell is about 1.38 volts, giving a total battery voltage of about 25 volts. So for this example the battery is in a fully charged condition.

The battery voltage should not be allowed to go below 20.0 volts or about 1.1 volts per cell. The battery may also be checked by observing $V_{\frac{1}{2}BAT}$ or one-half of the battery voltage. From this measurement we can tell if each half of the battery is approximately at the same potential. In our example, it appears that two halves of the battery are balanced within 0.2v., which is about the resolution of the telemetry encoder. (Keep in mind that the encoder is digital in nature and the accuracy is ±1 count.)

Now that we are sure that the total array current is normal, each array should be checked separately for its output. It is noted that the +X, +Z and —Y faces all are reading a substantial current, indicating they are the panels being illuminated by the sun. The —X, +Y and —Z faces in our simulation are reading slight currents which would be due to the earth's albedo or reflected solar energy.

If we sum the current from each array we obtain: 32 mA. + 4 mA. + 164 mA. + 2 mA. + 70 mA. + 0 mA. = 272 mA., which is slightly higher than the measured value for I_T (Channel 1). Recall that the measurements for each panel were not made simultaneously but were sampled over a period of several seconds. The spacecraft has rotated during this time (a considerable amount just after launch) so that perhaps the current from the —Y panel has increased since the +X and +Z measurements were made. Only after several months in orbit when the spin rate is near zero should these two data compare closely.

This suggests, then, that the orientation of the spacecraft can be determined by knowing the current from the array. Actually this is quite easy to do because we are assisted by a simplifying characteristic of solar cells. The current available from a given panel is proportional to the cosine of the angle between the sun and the normal to the panel. This relationship holds for angles between 0 and 90°. Each panel has a maximum current which occurs at normal incident illumination (0° sun angle) at a given temperature. The

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angle of each panel relative to the sun line is then simply:

$$\cos \theta_{X\ Y\ OR\ Z} = \frac{I\ \text{measured}}{I\ \text{max}_{X\ Y\ OR\ Z}}$$

To check the results of these calculations, we may use a characteristic identity of direction cosines:

$$\cos^2\theta_X + \cos^2\theta_Y + \cos^2\theta_Z = 1$$

This identity, of course, will not hold exactly until the satellite spin rate is very low for the reasons given above. Inaccuracies in these spacecraft attitude estimates will result from changes in the values of I max. The maximum array current changes as a function of temperature and time in space. It should be possible, however, to determine the spacecraft's exact orientation to ±5° during the first few months of the AO-C lifetime.

Observing the temperature within the spacecraft will give important information. As with Australis-Oscar 5, the +X, +Y and +Z face temperature will be several degrees warmer in the sun than when the panel is looking into space. A periodic temperature function will be noticed by plotting the +Y and +Z temperature data; since this is the spacecraft spin axis. In our simulation the +X face was warmer since it does not experience rotation in and out of the sun on a short term basis. The temperature difference from inside the satellite to its outer surface (the thermal gradient of the structure) is of importance to us. Using the baseplate temperature we can calculate the gradient along each axis.

$$\Delta T_X = T_{+X} - T_{BP} = +5.8°C$$
$$\Delta T_Y = T_{+Y} - T_{BP} = -1.5°C$$
$$\Delta T_Z = T_{+Z} - T_{BP} = -1.5°C$$

The temperature of the final transistor in the 2 metre/10 metre translator is of considerable importance. For good efficiency this temperature should be nearly equal to the base-plate temperature (about 1 or 2 degrees higher); in our example a difference of 7.6°C is indicated. If this were an actual measurement a problem would be suspected and the translator would probably be turned off by command.

In order of priorities the translator operation is second only to the power system performance parameters. If we check its performance in the simulation we note that the r.f. power output is 1.09 watts. The d.c. input to the final amplifier is calculated by multiplying the unregulated bus voltage (battery voltage) by the emitter current of the power amplifier transistor (Channel 18).

In the example given:

$$I_{PA} \times V_{BUS} = 2.90 \text{ Watts}$$

The translator's p.a. efficiency is then:

$$\text{Eff}_{PA} = \frac{P_{RF}\ (\text{out})}{P_{DC}\ (\text{in})}$$

$$= \frac{1.09}{2.90}$$

$$= 37.6\%$$

which is slightly higher than we are presently expecting and disagrees somewhat with what we would expect given the thermal problem mentioned earlier.

The a.g.c. loop voltage is quite high (2.62 volts out of a possible 3.00 volts) indicating the translator is heavily loaded. This can also be near the maximum value. From the beacon power output and the current balance equation it can be seen that the 435 MHz. beacon transmitter is off.

Channel 24 of the telemetry encoder is a calibration channel for the encoder itself. A voltage reference of 0.5 volt is measured on this channel and the encoder should respond with an output of 50 counts (±1 error count). This 0.5 volt reference is used for all of the thermistors as well and has been very carefully regulated. This channel will allow us to recalibrate the encoder in flight should this become necessary.

Chan. No.	Parameter	Unit	Parameter Range	Final Calibration Data/Comments*
1A	Total Array	I (mA.)	0 to 500 mA.	$I_T = 5.00$ N (mA.)
1B	+X Solar Panel	I (mA.)	0 to 100 mA.	$I_{+X} = 1.00$ N (mA.)
1C	—X Solar Panel	I (mA.)	0 to 100 mA.	$I_{-X} = 1.00$ N (mA.)
1D	+Y Solar Panel	I (mA.)	0 to 200 mA.	$I_{+Y} = 2.00$ N (mA.)
2A	—Y Solar Panel	I (mA.)	0 to 194 mA.	$I_{-X} = 1.94$ N (mA.)
2B	+Z Solar Panel	I (mA.)	0 to 370 mA.	$I_{+Z} = 3.72$ N (mA.)
2C	—Z Solar Panel	I (mA.)	0 to 370 mA.	$I_{-Z} = 3.68$ N (mA.)
2D	Bat. Charge or Discharge	I (mA.)	—500 to +500 mA.	$I_{BAT} = 10.00$ N —500 (mA.)
3A	Unregulat. Bus	V	12.4 to 30 V.	$V_{BUS} = 0.174$ N 12.4 (Volts)
3B	Half Battery	V	0 to 15 V.	$V_{\frac{1}{2}BAT} = 0.161$ N (Volts)
3C	Switching Reg.	V	0 to 15 V.	$V_{SR} = 0.147$ N (Volts)
3D	Battery Temp.	°C	—30 to +50°C	$T_{BAT} = -1.471$ N + 95.79 (°C)
4A	Base-plate Temp.	°C	—30 to +50°C	$T_{BP} = -1.471$ N + 95.79 (°C)
4B	Translator P.A. Temp.	°C	—30 to +50°C	$T_{PA} = -1.471$ N + 95.79 (°C)
4C	+X Panel Temp.	°C	—30 to +50°C	$T_{+X} = -1.471$ N + 95.79 (°C)
4D	+Y Panel Temp.	°C	—30 to +50°C	$T_{+Y} = -1.471$ N + 95.79 (°C)
5A	+Z Panel Temp.	°C	—30 to +50°C	$T_{+Z} = -1.471$ N + 95.79 (°C)
5B	Translator P.A. Emitter	I (mA.)	0 to 500 mA.	$I_{PA} = 5.00$ N (mA.)
5C	Transla. Sw. Reg.	V	0 to 30 V.	$V_{TSR} = 0.30$ N (Volts)
5D	Instr. Sw. Reg.	I (mA.)	3.8 to 63.8 mA.	$I_{ISR} = 0.601$ N + 3.80 (mA.)
6A	Translator R.F. Power	W	0 to 10 W.	$P_{OUT} = 0.001\ (N)^2$ (W.)
6B	435 MHz. Beacon R.F. Power	mW.	0 to 1 W.	$P_{OUT} = 0.10\ (N)^2$ (mW.)
6C	Translator A.G.C.	V	0 to 3 V.	$V_{AGC} = 0.03$ N (Volts)
6D	Mid-range Cal.	V	0 to 1 V.	N = 50 counts ±1

AO-C Data to be Telemetered by the Morse Code Telemetry System.

* N = Value Telemetered (omit first digit, which identifies the data line number)

PRE-LAUNCH ORBITAL DATA

ITOS-D orbital elements for middle of window (1731z), October 11, 1972, launch:

Epoch 18h36.92 m.
Semimajor axis 7839.845 km.
Eccentricity 0.000257.
Inclination 101.760°.
Mean anomaly 265.920°.
Argument of perigee 78.401°.
Motion of arg. of perigee —1.9168°/day.
Right asc. of ascending node 297.546°.
Motion of right ascension +0.9862°/day.
Anom. period 115.13799 min.
Height of perigee 1459.66 km.
Apogee 1463.70 km.
Velocity at perigee 25676.0 km./hr.
Velocity at apogee 25663.0 km./hr.
Geogr. lat. of perigee +73.539°W.
Local time of ascending node 2106.07.
Local time of descending node 0906.06.
Longitude increment 28.81°/orbit.

SATELLITE TRACK CALCULATOR

(continued from page 3)

cycle of orbits. Rotate the track so that the start of an orbit is at 173°W and assume the time is 1800 E.A.S.T.

Study the track and see that at 1 hr. 42 m. after the start it passes over ZL and to the east of VK to cross the equator at 201.8°W at 1955 hrs. Now rotate the perspex so that the start is now over 201.8°W to see the track for the next orbit. This will now be over VK and the times between a.o.s. and l.o.s. can be seen from where the track crosses the 0° elevation range ring, centred on your location, as well as the intermediate bearings and time.

Try the correct range ring for other locations to see the amount of overlap and whether the satellite will be in this overlap and at what time. Rotate the track around in 28.8° increments to see the other portion of the track that goes N-S. Continue to rotate the track around to find the next day's orbits. These will not be in the same place, but will appear to be further to the west and later by 55 minutes, but a pattern can be derived to make day to day predictions easier.

From Table 1 it will be seen that the tracks will be almost in the same position every second day and 5 minutes earlier. This may not be wholly true in practice as a variation of the nominal period of 0.1 minute will alter the time over two days by 2.5 minutes. The predictions can of course be updated by the time differences found in practice.

Orbit	Time	°W
100	1800	173
101	1955	201.8
113	1855	186.7
114	2050	215.5
125	1755	171.6
126	1950	200.4
139	2045	214.1
140	2245	242.9

Table 1.

USING THE PREDICTION INFORMATION

Generally following a satellite by beam swinging for maximum signal is unsatisfactory, especially for the lone operator who may be attempting to make a QSO at the same time. Due to the relative broadness of a typical 29 MHz. beam compared with the associated 144 MHz. beam, when using AO-C, a good signal could be received when the 144 MHz. beam is off the peak for transmission into the satellite.

To prepare for a particular pass, from the calculator find the bearing and times at a.o.s. and thence at two or three minute intervals up to l.o.s. Start with the aerial array at the first bearing and step it around at the correct times to the predicted bearings. Continue to do this even if the signals are weak or inaudible. The equipment set-up should ensure that the 29 MHz. output can be monitored while transmitting on 144 MHz. This enables you to listen for your return signal from the satellite and a check can be made of the correctness of the beam heading if desired. ●

ACKNOWLEDGMENTS

I wish to thank L. Dowl, VK7ZLD, for his work in drawing up the calculator and for the encouragement given to me by other local Amateurs when shown the calculator in the embryo state.

REFERENCES

1. "Satellites and Scientific Research," Desmond King-Hele.
2. "The Oscalator," "CQ" August 1965.
3. "Oscar Predictions," March 1965.

A SOLID STATE ELECTRONIC KEYER

I. E. HUSER, VK5QV*

● A not-too-difficult approach to the production of an all-electronic automatic key. Seven transistors and sundry other components, plus a few easily provided bits of hardware, result in a device which does all and more than the old electro-mechanical "bug" with no moving parts except the activating paddle.

With the acquisition of an FT200 transceiver, it was felt that a more suitable "shack" than the shed at the end of the garden should be sought. After a little "brainwashing," the XYL (with some reservation) allowed the rig to be installed in a corner of the bedroom—the loungeroom being definitely out of the question.

Headphones were installed so that the "banging, crashing, and good-day Jack I'm using, 'so and so' gear and the weather is lousy, etc." (the XYL's words) would not irritate anyone. So to achieve complete silence when working DX late at night, it was decided that a completely solid-state key should be obtained.

* 5 Mugford Street, Mt. Gambier, S.A., 5290.

Having read an article about a simple electronic key using two relays and a handful of parts, a key was built and it worked just as the article said it would. However, it was decided that better results might be obtained if the relays were eliminated, and so the challenge presented itself.

By using basic logic circuits, and burning a little "midnight oil," a solid-state keyer capable of keying the FT200 directly without the use of a relay was built.

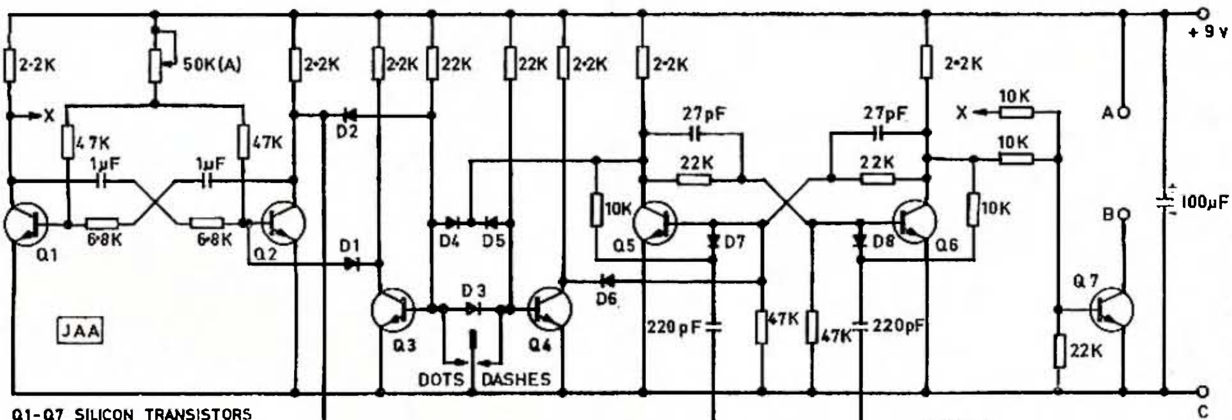
CIRCUIT OPERATION

With reference to Figs. 1 and 2, it can be seen that the keyer circuit consists basically of two multivibrators, controlled by gates, and a keying transistor. The free-running multivibrator (Q1-Q2) produces a series of square pulses having a 1:1 mark-space ratio; the repetition rate, and hence the keying speed, being continuously variable between set limits by the 50K variable resistor in the multivibrator timing circuit. The output from this multivibrator is fed to the keying transistor (Q7) to produce a series of "dots," each having the correct length and the correct spacing between them.

The bistable multivibrator (Q4-Q5) is triggered by pulses derived from the free-running multivibrator, and produces a square-wave output with a 2:1 mark-space ratio which is also fed to the keying transistor. The outputs from both multivibrators are thus combined to produce dashes of correct length and correct spacing (see Fig. 3).

With the paddle in the neutral position, both multivibrators are held off by the gating transistors (Q3-Q4) and no output is obtained from the keyer. If the paddle is moved to the "dot" position, gating transistor Q3 ceases to conduct, the clamp is removed from the free-running multivibrator and a series of dots will be produced for as long as the paddle is held in this position. If the paddle is moved to the "dash" position, the clamps are removed from both multivibrators and their combined outputs produce the required dashes.

It should be noted that gating is so arranged that once a dot or dash has been initiated, it will be completed together with the following space irrespective of the position of the paddle.



Q1-Q7 SILICON TRANSISTORS (SEE TEXT FOR TYPES.)
D1-D8 OA91 DIODES

FIG 1

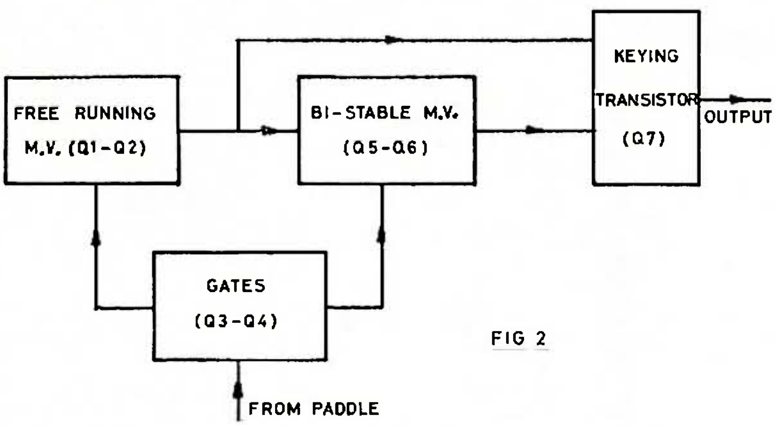


FIG 2

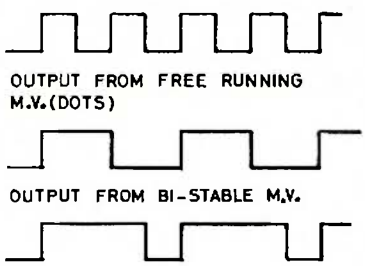


FIG 3

Hence it is a relatively simple matter to produce "copy book" Morse.

The output from the keyer (terminals A and B) could be used to operate a relay if so desided; however by suitably modifying the circuitry and choosing a suitable keying method, the device can be made to key directly a transmitter or tone oscillator.

CODE PRACTICE

It is desirable that a method of code practice be available to operators new to electronic keys before they go "on the air".

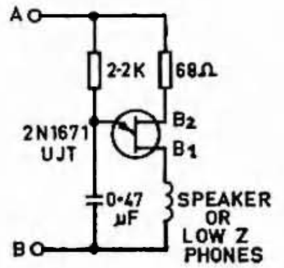


FIG 4a PRACTICE OSCILLATOR

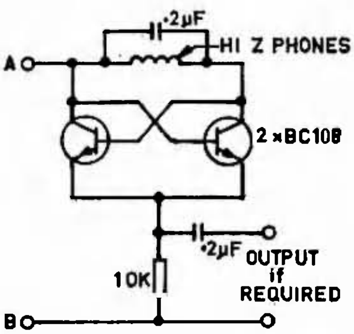


FIG 4b PRACTICE OSCILLATOR

Fig. 4 shows two circuits which can be connected between terminals A and B of the keyer for this purpose. Circuit values may have to be changed slightly to obtain a suitable tone consistent with the amount of inductance in circuit and the likes of the individual operator, etc. Either PNP or NPN transistors can be used in the circuit shown in Fig. 4b, bearing in mind that points A and B will have to be reversed when using PNP transistors to maintain correct polarity to the circuit.

TRANSMITTER KEYING

Fig. 5 shows how the keyer can be used in conjunction with an SCR to key the cathode of a low power stage of a transmitter. However, to ensure reliable turnoff, it is necessary that the cathode current of the tube be somewhat less than the holding current of the SCR used. Since the holding current for a low power 400 volt SCR is typically in the region of 10 mA., a stage having a low cathode current must be available.

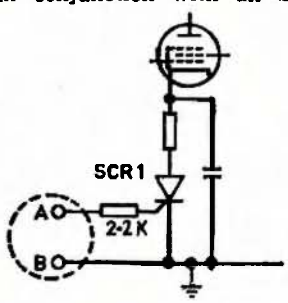


FIG 5 CATHODE KEYING of LOW POWER STAGE

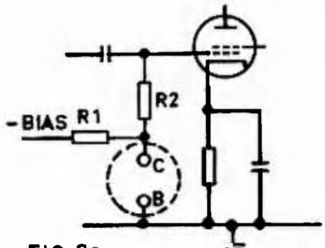


FIG 6a BLOCKED GRID KEYING

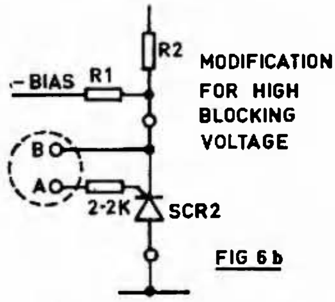


FIG 6b

In Fig. 6a, the keying transistor conducts under "key down" condition to remove blocking bias from the tube. Note that with this circuit the keying transistor must be able to withstand the "key up" voltage and it is suggested that a BC107 might be used for keying voltages up to say 40 volts. If PNP silicon transistors are used in the keyer, then a BC177 could be used as the keying transistor and point "C" would be more conveniently placed at ground potential. (N.B.—The diodes and rail polarities, etc., must be reversed when using PNP transistors.)

For blocking voltages greater than 40 voltages, the circuit in Fig. 6b could be tried if a suitable high voltage transistor is not available.

KEYING THE "FOX TANGO TWO HUNDRED"

When using the keyer in conjunction with an FT200 transceiver a high voltage transistor or the SCR circuit of Fig. 6b should be used since the "key up" voltage is in the region of 100 volts.

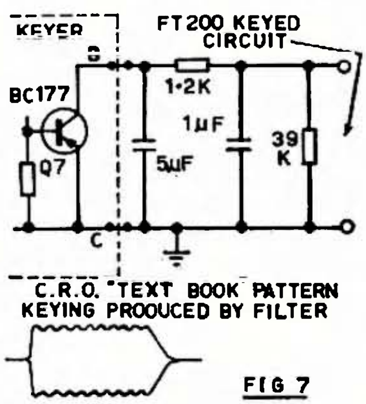


FIG 7

However, a small cheap low voltage transistor can be used if a 3.9K resistor is wired across the key socket. This has the effect of reducing the "key up"

(continued on page 16)

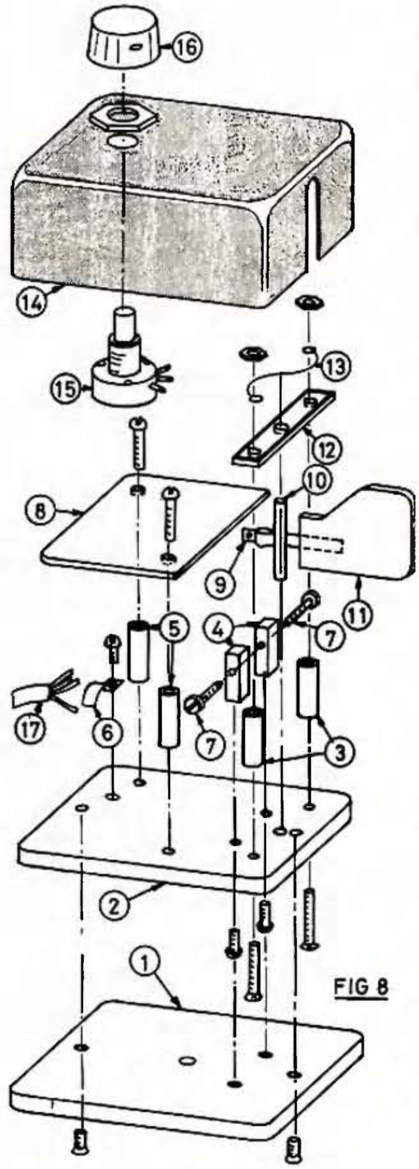


FIG 8

MATERIALS LIST

Part No.	Description and Material
1	Base plate—1/4" thick mild steel or brass plate.
2	Sub-assembly plate—1/4" thick bakelite or perspex.
3	Tubular spacers—brass tubing or bakelite.
4	Contact standoffs—brass (obtained from polarised relay).
5	P.C.B. standoff insulators—bakelite.
6	Cable clamp—brass, aluminium, etc.
7	Contact screws—obtained from polarised relay.
8	P.C.B.—P.C.B. or Veroboard.
9	Double-sided contact—obtained from polarised relay.
10	Paddle pivot—1/8" silver steel.
11	Paddle handle—3/16" bakelite or perspex.
12	Top bearing plate—3/16" bakelite or perspex.
13	Return spring—0.028" phosphor-bronze wire.
14	Cover—suitable plastic box.
15	Speed control—50KA potentiometer.
16	Control knob—any suitable knob.
17	Connecting cable—shielded multi-core cable.

AN INTEGRATED CIRCUIT I.F. STRIP

JOHN E. DUNKLEY, VK5JE*
(Ex VK5ZJD)

● An outboard i.f./detector strip suitable for improving the selectivity of a receiver for r.t.t.y. reception.

Having recently become interested in the r.t.t.y. mode of communication, it did not take me long to realise that my communications receiver needed some additions and/or modifications or it "had to go". After extensive modifications to the power supply (adding VR tube), b.f.o. and taking care of some mechanical details, the drift problem was made bearable but the set itself lacked the ability to be selective enough for close channel reception of r.t.t.y. transmissions. In conditions of crowded Amateur bands, perfect copy of r.t.ty. transmissions was almost impossible.

The 120 pF. capacitors across the input and output coils of the mechanical filter should be 5% types or better and preferably high stability types, e.g. silver mica (SM). The IC is conventionally wired and do not forget the capacitor (0.1 μF.) from pin 2 to earth. An R.C.S. type 178 455 kHz. i.f. transformer was used to couple the output of the IC to the product detector. This unit was used because it was in the junk box but other types could be used without circuit modification. This particular type is one of the larger variety i.f. transformers as used in the miniature valve mantle sets, but if size is a problem a miniature "transistorised" version could be substituted.

The product detector is one which works very well with a minimum number of parts and provided the b.f.o. injection is greater than 1 volt p-p no problems should be encountered in this section.

Finally, some amplification at audio frequencies is provided by T2.

As can be seen from Fig. 1 the whole unit operates from a +12v. supply and the current requirement is only 20 mA. The three sections are each decoupled from the supply and no instability was encountered even during the initial breadboard stage.

The IC has an in-built facility for a.g.c., having a range greater than 30 dB., but if this is not required, pin 4 must be left open, i.e. **not** connected to anything, however a 50K ohm potentiometer connected between pin 4 of the IC to earth provides a manual i.f. gain control (see Fig. 2). A 0.01 μF. capacitor connected from pin 4 to earth (provision for mounting this is provided on the p.c. card) takes care of any possible instability problems. This capacitor need not be used if the manual gain control is not incorporated.

A second independent amplifier providing some 30 dB. of gain is also available in this IC and although not used in this i.f. it is "earmarked" for use in the a.f.c. unit mentioned at the beginning of this article.

The leads to the a.m.-s.s.b. switch should be kept as short as possible, preferably shielded and the switch is normally open for s.s.b. and c.w., and normally closed for a.m.

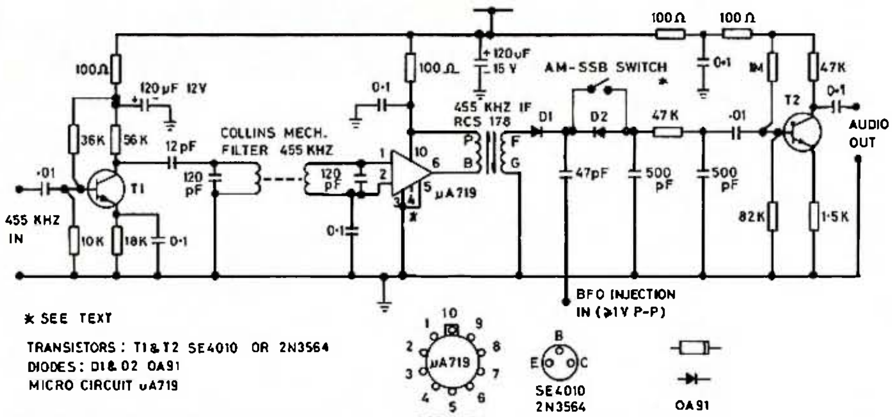


FIG.1 455 KHZ IF STRIP & DETECTOR

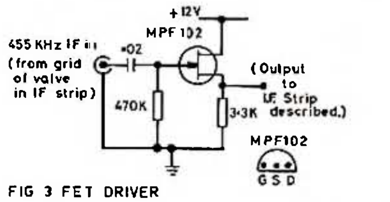


FIG 3 FET DRIVER

It was decided that an outboard i.f. strip and detector would be a good start to "updating" the receiver side of the shack equipment, and would also be a good interim start for an all transistorised a.f.c. controlled receiver for serious r.t.t.y., c.w., s.s.b. copy. Having decided that the i.f. strip would be a good place to start this project, things started to move.

The heart of the i.f. strip is a 455 kHz. mechanical filter having a pass band of 2.1 kHz. This is followed by a Fairchild IC type uA719.

Looking at the circuit (Fig. 1) we find that the first active device, T1, provides some amplification at 455 kHz. and also provides the correct matching for the mechanical filter. It should be pointed out that the coupling to the mechanical filter is done by a 12 pF. capacitor and this value is the **maximum** that can be used if the pass band characteristic of the filter is to remain unchanged.

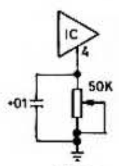


FIG 2 MANUAL GAIN CONTROL (IF REQUIRED)

The alignment procedure is about as simple as anyone could ask for. It involves providing a 455 kHz. modulated signal at the centre of the mechanical filter passband, selecting the a.m. switch position and monitoring the collector of T2 with a c.r.o. or a.c. voltmeter and adjusting the primary and secondary slugs in the i.f. coil for maximum reading. Measuring the d.c. current drawn (20 mA.) will give a good indication that all is well. The input signal to the i.f. for this alignment need only be in the region of 10 μV. When aligned, a 1 μV. 455 kHz. signal is detectable.

To connect the i.f. strip to a valve type receiver a FET driver can be added to the receiver. A suitable driver is shown in Fig. 3. Note: The driver unit should be mounted within the valve receiver. ●

* 9 Elva Avenue, Pooraka, South Aust., 5095.

A SOLID STATE ELECTRONIC KEYER

(continued from page 14)

voltage to approximately 30 volts without affecting the keying characteristics of the transmitter, thus allowing transistors such as the BC107 (NPN) and tthe BC177 (PNP) to be used.

The FT200 is renowned for keying transients and this, coupled with the inherent fast switching times of the keyer, caused some problems with "thumping".

Many ideas were tried, and eventually the "brute force" filter shown in Fig. 7 was adopted and wired **in place of** the original Yaesu filter. Values appear to be fairly critical, but a keying charasteristic with a slight "thump" on the make and a clean break was obtained using the values shown.

CONSTRUCTION

The keyer can be built using the hand tools normally found in the experimenter's workshop. Fig. 8, together with the materials list, should give intending "smoke signallers" a good idea of construction, however a few points should be made:—

1. The size of the keyer is necessarily a function of the box available and since the original was built around a plastic box of dubious origin, measurements have purposely been omitted.
2. The fixed and moving contacts were obtained from an old P.M.G. polarised relay which had been lying in the junk box for many years. A few of these are still available through disposal houses at a reasonable price.
3. All the electronic components were mounted on "vero-board" which fitted neatly inside the keyer. A printed circuit board of course would make for a neater job.
4. If steel or brass is used for the base plate, a piece of 1/32" sheet rubber glued (with contact adhesive) to the underside will prevent any tendency to slip even on quite smooth surfaces.

FINAL COMMENT

The arrangement used at VK5QV is the tone oscillator shown in Fig. 4b (using AC128 transistors) and the PNP keyer. A switch is used to allow the practice and transmitter keying functions to be readily selected. Output from the tone oscillator is fed to a tape recorder so that any practice sessions can be recorded and evaluated.

The unit is powered from 9 volts obtained from a simple transistor series regulator.

Good luck and good DX! ●

AMATEUR FREQUENCIES:
USE THEM OR LOSE THEM!

NEWCOMER'S NOTEBOOK

With Rodney Champness,* VK3UG

The contribution this month is rather short as I am in the process of shifting my home due to the nature of my employment. My thanks to those who have taken the trouble to write to me, with ideas, circuits and requests for help. I may not be in the position to reply to all directly, but I do expect to help via "Newcomer's Notebook" wherever this is possible.

I have an offer from Miles Turner, 45 Kent Street, Kallagur, Brisbane, 4503, of information on the old A.W.A. 709C series of eight-valve seven-wave band receivers. These sets, although bulky and using octal-based valves, should prove to be well worth overhauling. They tune narrow bands, with continuous coverage, from 530 kHz. through to 23 MHz. They have an r.f. stage, and in general are built very solidly. The r.f. section is rather cluttered but with care and the use of a small soldering iron, routine maintenance and modification should not cause much trouble.

The addition of a small oscillator bandspreading capacitor, as mentioned in September "A.R.," and the fitting of a product detector, which will be part of a future issue, would make these rather oldish but well designed sets suitable for the commonly used h.f. transmission modes.

I suggest you write to Miles if you require data on these sets.

I have been asked by a reader if I could build a converter to go on the front of an old dual-wave receiver. It would certainly be possible, but there are two reasons why I cannot oblige: (1) that my time is restricted, and (2) that it is the aim of "Newcomer's Notebook" to help you to build or assemble for yourself some or all of your receiving or transmitting/receiving station. "One-offs" for projects some time in the future may be a possibility.

Some future articles will be on television interference as caused by 6 metre Amateurs, basic test equipment, and learning morse code. ●

* 44 Rathmullen Road, Boronia, Vic., 3155.

CORRECTIONS TO VK-ZL 1972 CONTEST RESULTS

Phone Section

	14 MHz.	Total
VK4DO	7000	7000
VK2ABC	5570	5570
VK2EB	3480	3480

AROUND THE TRADE

R. H. Cunningham Pty. Ltd. announce their appointment as exclusive distributors in Australia for the complete line of wiring components (pan-ty sta strap cable ties, harness accessories and allied items) manufactured by Panduit Corporation of the U.S.A. Both open and bond stocks are available.

Commercial Kinks

With Ron Fisher,* VK3OM

Since starting this column several months ago, the Trio 9R 59DE/s receiver has without doubt stirred up the most interest. My incoming mail seems to indicate that there is at least ten times the demand for information on this receiver than there is even for the FT200. Perhaps there is a moral in this, but I must leave our readers to work it out. Therefore this month I am going to publish a few extracts from letters I have received over the last few months. I hope this will enable Trio owners to compare their problems and experiences. However, before getting onto them I intend to continue with the Carphone conversions from Peter Campbell, VK2AXJ.

CONVERSION OF A.W.A. F.M. CARPHONES, Part 2

High-band Carphone to 146 MHz.—Transmitter: Add 6.8 pF. across each winding of TR8. Add 1.8 pF. across L9. Rewind L11 with 4 turns of 16 s.w.g. Remove C94, C115 and relay RL2. Receiver: Add 1.8 pF. to L4.

Low-band MR10B to 52 MHz.—Transmitter: Add 15 pF. across both windings of LT4. Rewind both LT5a and LT5b with 8 turns of 16 s.w.g. Rewind both LT6a and LT6b with 5 turns of 16 s.w.g. Receiver conversion: Rewind L1 with 18 turns of 24 B. & S. and tap at 3 turns from the cold end. Rewind T1 in the same way. Add capacity across T9 until it resonates at 40 MHz.

Low-band MR10C and MR20A to 52 MHz.—Transmitter conversion: Add 15 pF. across both windings of T11. Rewind L11 with 8 turns of 16 s.w.g. 5/16″ diameter and ¾″ long. Rewind L12 in the same way. Rewind L13 with 6 turns of 16 s.w.g. 9/16″ diameter and ⅞″ long. Increase C125 to 100 pF. Receiver: Add 4.7 pF. to L1, 3.3 pF. to L2 and L3, and 10 pF. to L4 and L5.

Low-band MR20B to 52 MHz.—Transmitter conversion: Add 15 pF. to both L8 and L9. Rewind L11 with 6 turns, L12 with 18 turns and L15 with 10 turns. Receiver: Add 4.7 pF. to both L1 and L2. 3.3 pF. to L3, 10 pF. to L5 and L6. Increase C6 to 39 pF., but note that this value is critical and may vary on some units to achieve neutralisation.

In all the preceding modifications coils should be wound with the same diameter and spacing as the original unless otherwise specified.

If the narrow band filter, type 5Q57975, is removed and replaced with the wide band filter, type 3Q57975, the 2.2 pF. condenser across the input and output of the filter should be removed.

That completes the carphone data for the time being, but don't forget that circuits will continue to be available in the usual way.

THE TRIO 9R 59DE/DS

My thanks to all who have written to me with your ideas and comments about these receivers. Without exception, owners are generally happy with the performance of their sets. However, the Trio is very adaptable to small modifications similar to those covered in past issues of "Amateur Radio". One such change is a better tube in the r.f. stage in place of the 6BA6. There are several possibilities, the first being the 6BZ6. This would give a worthwhile lift in gain and only one small circuit change is necessary. Remove the earth connection to pin two of the r.f. tube V1. Now connect pin two to pin seven with a short piece of insulated wire. It is now possible to plug in either the original 6BA6 or the new 6BZ6.

A better choice, however, would be the EF183/6EH7. This tube has a transconductance of 12,500, nearly three times that of the 6BA6. To instal this tube in the Trio it is necessary to remove the existing 7-pin socket and replace it with a 9-pin socket. With such a hot tube some additional shielding is needed. Cut a piece of light gauge tin plate about 1″ high and 1½″ wide. Position this across the socket and solder it to pins 5, 6, the centre earth spigot and the nearby earth lug. The tube can now be wired up to the original circuit.

Chas Othen, VK5ON, reports some of his experiences. After making all the power supply improvements so far described, an extra electrolytic across the first section of C42 reduced the hum a further 50%. Chas used 16 μF., but I would think that 50 μF. would not be out of the way.

The b.f.o. developed trouble after about 12 months' use. It would either drift off frequency or drop out of oscillation altogether. After much searching, Chas traced the trouble to a 1,000 pF. 125v. condenser across the b.f.o. coil. This was replaced with a 1,000 pF. 600v. styroseal type.

He also reports improved reception with the help of a VK5AX preselector. This unit enjoyed great popularity during the middle 1950s, and was unique in that it tuned from 3 to 30 MHz. without the need for band switching. Apart from the extra gain, the front-end selectivity would be increased with a reduction in images on the higher bands.

An interesting modification comes from A. Graham, VK6ZCQ. He has transposed the b.f.o. and the i.f. input connections to the product detector V6 and says that this gives a more constant b.f.o. level. In a letter just received from Alex, he gives details of a cathode follower using the vacant half of the 6AQ8, and I will include circuit details in next month's issue. He reports an improvement in stability with this modification.

Neville Symons, L30448, also reported b.f.o. trouble. In the early 59DEs, the b.f.o. tuning condenser was apparently of poor design. After some use it developed wear and consequent frequency instability. Neville replaced this with the later type, which is the same as the one used for the antenna trimmer. Neville also improved warm-up drift by moving the OA2 regulator to the socket position intended for the calibrator tube. If you have already installed a calibrator, some form of heat shield might be worth a try.

I did intend to include some more FT200 modifications this month, but it looks as if I have run out of space again. Next month then, back to the FT200 and even more on the Trio 9R 59DE/DS. ●

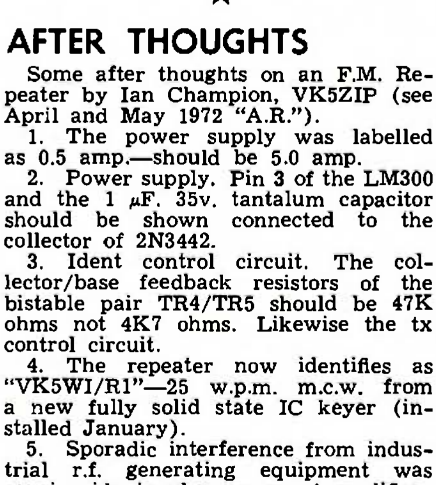
* 3 Fairview Avenue, Glen Waverley, Vic., 3150.

☆

AFTER THOUGHTS

Some after thoughts on an F.M. Repeater by Ian Champion, VK5ZIP (see April and May 1972 "A.R.").

1. The power supply was labelled as 0.5 amp.—should be 5.0 amp.
2. Power supply. Pin 3 of the LM300 and the 1 μF. 35v. tantalum capacitor should be shown connected to the collector of 2N3442.
3. Ident control circuit. The collector/base feedback resistors of the bistable pair TR4/TR5 should be 47K ohms not 4K7 ohms. Likewise the tx control circuit.
4. The repeater now identifies as "VK5WI/R1"—25 w.p.m. m.c.w. from a new fully solid state IC keyer (installed January).
5. Sporadic interference from industrial r.f. generating equipment was causing idents ad nauseam. A modification was incorporated such that a minimum of three seconds of input signal was required before the ident. circuit recognised its presence.



MODIFICATION TO IDENTIFICATION CONTROL CIRCUIT

The value of the base resistor of TR2 (33K) is dependent on the β (beta) of TR2 (suggest >200) and the time delay required.

6. Now 100 Channel 4 operators in VK5 (and growing). ●

AWARDS COLUMN

With Geoff Wilson,* VK3AMK

W.I.A.—TASMANIAN DIVISION
VK7 GOLDEN JUBILEE AWARD

(1) Radio Amateurs outside Australia and New Zealand to contact five (5) Tasmanian stations (VK7) during the period 1st January, 1973, to 31st December, 1973.

(2) Any recognised Amateur band may be used.

(3) Any Amateur mode of transmission may be used with cross mode being acceptable. Cross band working is not acceptable.

(4) A copy of the log showing date, time, band and other relevant details signed by the operator and two (2) other licensed Amateurs or by the operator and the Secretary of his Club to suffice for recognition of contacts. Isolated operators who are unable to comply with the above may request their logs be subject to check by the organisers.

(5) A suitable certificate inscribed with the number of Tasmanian stations worked will be issued to the operator as confirmation of the contacts.

(6) To ensure receipt of the certificate, IRCs will be sent with the log as follows: Sea Mail 3 IRCs, Air Mail 6 IRCs.

(7) Australian and New Zealand stations will be required to contact twenty (20) Tasmanian stations with the remainder of the Rules applying except that the QSL Bureaux be used for despatch of certificates unless the operator wanted service in (6) above, when 1 and 2 IRCs respectively will apply.

(8) Address for submission of logs:
VK7 Golden Jubilee Award,
Box 851J, G.P.O.,
Hobart, Tasmania, 7001.

HUNTER BRANCH AWARD

This certificate, awarded for outstanding performance in radio listening or two-way communications, is now available.

To qualify for the award, loggings must have been completed during any twelve-month period after 1st January, 1970. Certificates will be awarded in five classes.

(a) **For Overseas Stations.**—Must confirm that five different Hunter Valley Amateur stations have been contacted. No band limitation. Claims to be accompanied by a copy of the log and a declaration that QSL cards to confirm the contacts have been sent.

(b) **For Australian Stations.**—Must confirm that ten different Hunter Valley Amateur stations have been contacted. No band limitations. Does not apply to Amateurs resident in VK1 or VK2 call areas. Claims to be made as in class (a).

(c) **For N.S.W. and A.C.T. Stations.**—Must confirm that twenty different Hunter Valley Amateur stations have been contacted. No band limitations. Claims to be made as in class (a). Except that Hunter Valley stations must produce confirmation in the form of QSL cards.

(d) **For Hunter Valley Stations.**—Must confirm that one hundred different overseas countries have been contacted. No band limitation. Applies only to Hunter Valley stations and is an additional award to class (c). Claims must be accompanied by QSL cards.

(e) **For Hunter Valley Listening Stations.**—Must confirm that twenty-four different overseas countries have been logged while in contact with other Amateur stations. No band limitations. Loggings must include four stations each of the six continental areas as set out in the International Amateur Radio Union classification. Claims must be accompanied by QSL cards.

How to Claim the Hunter Branch Award.—The Hunter Branch Award may be claimed by submitting the necessary extract and QSL cards if required to:

Hunter Branch, W.I.A. Award Committee,
Box 134, P.O.,
Charlestown,
N.S.W., 2290, Australia.

Cost of the Hunter Branch Award Certificates to those applying for it will be $1.00 if posted airmail, 50 cents if surface mailed, 10 cents if it is collected at a Hunter Branch meeting.

Stations defined as being Hunter Valley stations must be established permanently as far as the definition accepted by the Radio Branch of the Postmaster-General's Department within the borders of the Hunter Valley as defined by the Hunter Valley Research Foundation.

The decision of the Hunter Branch W.I.A. Executive Committee will be final.

* 7 Norman Avenue, Frankston, Vic., 3199.

P.M.G. EXAMINATION PAPERS, AUGUST 1972

The following are the questions asked at the last examinations:—

SECTION K (REGULATIONS)
(Time allowed—30 minutes)

NOTE.—**Three** questions only to be attempted. Credit will not be given for more than three answers. **All questions carry equal marks.**

1. (a) State the regulatory requirements regarding the quality of transmissions from an amateur station.

   (b) Discuss the responsibilities of the licensee of an amateur station regarding the erection of an aerial mast.

2. (a) Give an example of a distress call sent by:
   (i) radiotelegraphy, and
   (ii) radiotelephony.

   (b) As an amateur station licensee what action would you take upon hearing a distress call?

3. What action should be taken by an amateur station licensee when informed that transmissions from his station are causing interference to the reception of television or broadcast programmes?

4. State the meaning of each of the following "Q" code signals:
   QRX QRT? QSY QRU QRH?

TELEGRAPHY
Section L (Receiving)
(Speed—10 words per minute)

Four months ago today Venus 8 departed this earth bound for

the searing planet The 472 degree Celsius heat prevents

soft landings by manned craft however a capsule dropped from

the spacecraft survived 50 minutes of this heat together

with the atmospheric pressure some 90 times greater than

Section L (Sending)
Time allowed—2½ minutes
(Speed—10 words per minute)

This was the second capsule to transmit from Venus The first

lasted 23 minutes and came from the spacecraft Venus 7 in

1970 No man made craft has

SECTION M (THEORY)
(Time allowed—2½ hours)

NOTE.—**Seven** questions only to be attempted. Credit will not be given for more than seven answers. **All questions carry equal marks.**

1. (a) Draw the circuit diagram of an amateur station transmitter suitable for operation in the 144-148 MHz. band. Explain briefly the theory of operation of each stage of the transmitter.

   (b) Describe how you would tune the transmitter described in (a).

2. Assisted by a circuit diagram, explain the operation of a cascode radio-frequency amplifier suitable for use in a v.h.f. receiver.

3. (a) Describe, with the aid of a sketch, the operation of a type of microphone suitable for use at an amateur station.

   (b) Draw a circuit diagram of a solid-state type pre-amplifier suitable for use with a high impedance type microphone.

4. Discuss the limitations of a heterodyne type frequency meter when used alone for measuring frequencies in amateur bands 144 MHz. and above. What additional apparatus would you use to ensure that the measured frequency does in fact lie in the desired band? Briefly discuss the theory of operation of this additional piece of apparatus.

5. (a) What is a parasitic oscillation and how is it produced?

   (b) Why are parasitics undesirable in a transmitter?

   (c) Explain the methods you would adopt to locate and suppress them.

6. (a) Explain the possible causes of interference to television receivers from amateur station transmitters.

   (b) Discuss the technical precautions you would adopt to avoid interference from a transmitter to television and broadcast receivers.

7. (a) Discuss the factors which affect the D.C. resistance of a conductor.

   (b) Explain why the radio-frequency resisttance of a conductor may differ from its D.C. resistance.

   (c) Describe a method of winding which will minimise inductive effects in a wire wound resistor.

8. (a) Discuss the features you consider an antenna, operating in the 14 MHz. amateur band, should possess to enable it to communicate effectively over very long distances.

   (b) With the aid of a sketch describe briefly an antenna possessing the features you have outlined in (a).

9. (a) Find the total capacity when three capacitors of 2, 4 and 5 microfarads respectively are connected:
   (i) in parallel, and
   (ii) in series.

   (b) Calculate the capacitive reactance of the series combination in (a) when connected across a 50 Hertz supply.

CONTESTS

With Peter Brown,* VK4PJ

Congratulations to VK5 on a fine effort which brought a well deserved win. Until the last few days it seemed to be a "pushover" for VK4, but VK5 made a great final effort with some 40 logs to win well. I would suggest that it was a case of VK5 making up their mind to win and getting "stuck into the job."

Geoff VK5TY himself posted the final batch, Phil VK5NN wrote a band plan and look at the percentage of high scorers.

VK4 was not far behind but is possibly getting complacent?

VK7 made another fine effort and participationwise they are easy winners. Congratulations on improving on last year's high.

I am pleased with this year's contest because we are on the "up" again. Only a small improvement but nevertheless an improvement. Next year let us aim for 700 logs, not very difficult really. Just 50 from VK3, 40 from VK2, and doubtless the small States could easily knock up 50 between them—VK6 could do that on its own. Let us make the effort for 1973.

Judging by the comments I was not the only person pleased with the contest and I have yet to work out how to acknowledge each note.

Frank VK4II, with such a fine score, is an experienced ex-Canadian contest operator and indicated that this was the best of over 100 contests in which he has participated.

Get that key out for next year—quite a few operators mentioned that they could not get a c.w. contact after a phone contact.

Next month I will pass on some of the comments for you to think about.

• • •

Now to the Ross Hull. Are you ready to help make a success of the contest?

As a matter of interest, VK1ZAD scored over 1800 points last Ross Hull Contest, but unfortunately I did not receive his log, although a copy was forwarded subsequently. Let me know immediately if your log is missing from results.

• • •

Look for the John Moyle National Field Day Contest rules in next "Amateur Radio". I am looking forward to you helping me make this a great contest. Have you thought of taking the XYL out for this day? The ZLs do just that; make it a picnic day for those who are in just to make the contest a success.

Don't forget that the ZLs will be around and I have written overseas to U.S.A., U.K., Japan and Germany offering certificates to the two overseas operators who make the greatest number of contacts with VK mobile or portable stations.

I am trying to make it a busy week-end.

• • •

Let us look at those dates again.

Nov. 25-26—CW "CQ" WW DX Contest.

Dec. 9-Jan. 21, 1973—Ross Hull Memorial VHF Contest.

Feb. 10-11, 1973—John Moyle Memorial National Field Day, Phone/CW, Portable/Mobile or VHF/HF.

• • •

Last thoughts. Have you thought of an R.D. Contest with one point per contact corrected for participation rate?? as an experiment??—VK4PJ.

R.D. CONTEST TO VK5

DETAILS OF DIVISIONAL SCORES

Division	Logs	Licensces	% Participation	Aver. Top Logs	State Pts.	State Score
VK5-8	125	779	16.1	1343	43177	8255
VK4-9	134	823	16.4	1196	36060	7043
VK7-0	66	227	29	855	13656	4827
VK2-1	121	2038	6	1309	40576	3718
VK3	89	1995	4.6	930	32349	2373
VK6	33	508	6.5	938	10411	1611

In the detailed Divisional results the first set of figures is for contacts made and the second set points scored. An asterisk indicates check log.

* Federal Contest Manager, Box 638, G.P.O., Brisbane, Qld., 4001.

AUSTRALIAN CAPITAL TERRITORY

VK1—Phone

GB	347	776	AN	164	355	MF	84	134
MP	305	642	GT	130	338	RH	43	62
GM	239	591	AOP	120	257	LN	5	11
BC	153	359	DI	82	201	ML	5	5
			ZT	83	161			

VK1—CW

VP	66	360
AG	16	58

VK1—Open

DA	302	875
EP	200	394
YR	159	311

NEW SOUTH WALES

VK2—Phone

XT	519	1389	RJ	148	324	ZZX	68	68
BNS	475	1349	CI	110	319	CF	22	67
BEC	517	1258	AIM	116	316	AFA	17	61
ASD	471	1057	AVJ	114	313	KQ	24	61
DM	382	1030	BDT	125	313	CU	17	52
RX	310	885	BKG	100	297	PZ	24	50
ATR	323	801	ADA	119	265	BLD	22	47
OH	237	632	HQ	100	256	YG	10	36
TS	208	581	NF	85	241	AWX	10	36
AGF	200	569	UJ	76	220	SW	28	30
QC	225	568	ACK	65	172	CS	16	29
APQ	197	559	BMX	56	166	AEC	9	23
VG	157	490	BYY	71	129	AAH	6	19
AWN	160	407	ATZ	59	135	ASJ	7	19
BDB	150	388	RU	31	124	ZMP	19	19
ZA	119	362	OS	41	114	ZVH	17	17
CO	141	361	AJL	31	106	LE	6	16
BDN	136	358	BMD	28	99	AKX	6	16
AXL	106	354	AGS	34	96	ZSG	16	16
AXJ	149	343	AYL	32	95	ZUT	13	13
ABC	103	326	APH	29	91	ZTP	11	11
			BJK	26	70			

VK2—CW

AGI	180	938	CX	149	390	AMB	61	173
BRA	168	916	BHO	163	302	IV	27	156
QL	126	768	WN	42	260	MT	41	108
VN	127	708	ZC	50	246	RY	20	106
GR	120	622	EO	48	244	BQQ	40	105
GT	111	602	ZO	33	188	BGG	15	70
HW	109	572	JY	41	184	XQ	17	33
YB	80	418				GS	8	30

VK2—Open

AHM	531	1352	BKH	118	398	AAC	31	149
BO	420	1280	PU	81	320	AQ	38	89
DO	470	1229	BRK	91	320	HZ	14	77
BNW	350	859	AJQ	85	310	BHD	20	71
ATT	218	556	BAZ	90	255	AGZ	13	35
			JM	71	209			

VK2—Receiving

C. Ferguson, L2046	957	S. Dwight	618
J. Hilliard L2074	720	W. Newport	398
Birrong D.I.R.C.	650		

VICTORIA

VK3—Phone

AQO	532	1150	AYF	100	252	ZYP	84	84
BCF	525	1098	FE	100	241	OL	33	82
WW	413	885	ZD	131	240	JK	40	64
ADW	340	769	KK	100	236	ZU	37	59
AVP	341	757	AIS	106	204	DY	27	56
AXV	340	677	BFN	100	201	AER	26	54
ZY	314	635	AVJ	101	190	YGQ	51	51
BJB	279	627	LP	58	181	TG	19	50
BDL	341	608	ASI	105	177	CIF	15	46
CCR	275	604	EG	60	157	BCZ	25	43
ASV	241	550	LV	50	151	ARO	12	40
AJX	253	519	BCT	60	134	ZYO	35	35
EF	201	416	QZ	57	129	AHG	30	32
BBV	205	378	YAP	124	124	GS	10	28
ARY	178	358	WY	51	117	ALD	7	17
AZQ	149	341	PY	58	117	TZ	11	11
ANP	140	278	HE	60	109	ARA	5	8
ZJ	100	277	AJP	57	108	YFL	6	6
SM	109	275	RN	31	33	RA	5	5
			WM	29	86			

VK3—CW

XB	224	837	AMA	82	276	ABR	35	112
OP	214	820	YF	156	265	RJ	55	107
APN	205	792	ARK	57	238	KX	34	70
MR	178	597	BGF	51	202	AMD	18	64
FC	152	570	AXK	23	166	ZM	10	36
ZT	114	428	ZO	75	159	CM	7	22
			ABS	30	130			

VK3—Open

AVP	341	757	AYL	224	448	EZ	91	173
JI	252	717	YQ	153	373	ADP	39	72
QP	237	566	KF	100	302	KS	24	55
BDE	238	463	ASE	103	192	ZBB	46	46
			BGR	102	184			

VK3—Receiving

A. Groen, J. Grech, and T. Jones	1035	St. John's Col.	573
E. Trebilcock (all c.w.)	636	A. Cash	80

QUEENSLAND

VK4—Phone

QD	528	1226	RO/6	58	159	HW	26	57
EQ	461	1108	ZBV	156	155	FP	19	55
DJ	368	1014	LR	54	150	VW	85	55
ZQ	455	927	XZ	93	142	GM	30	53
DZ	349	926	PX	49	135	LO	20	52
FD	335	911	OF	51	131	XN	12	51
LZ	336	854	SR	95	126	CR	52	51
OW	312	668	RL	50	124	BG	17	48
VU	300	633	PJ	35	115	GT	27	44
AK	201	632	QF	49	115	ZHS	44	44
IC	280	628	UM	74	114	IQ	42	42
IN	243	614	FN	46	112	ZRC	42	42
LE	228	573	PV/P	41	106	ZJE	42	41
PS	223	562	QW	36	103	ZTK	34	34
DO	200	517	IO	73	100	QJ	15	33
MW	171	490	KH	31	99	VS	12	31
ZJ	186	432	CY	33	97	ZDC	30	30
RT	186	396	SD	27	95	OR	10	28
FA	169	384	XO	39	86	YG	10	27
HB	130	357	UG	50	85	QT	25	25
RP	114	332	RJ	38	84	ZZ	8	23
ZB	100	320	ZLC	84	84	AV	11	23
NQ	105	297	IA	80	82	ZTL	23	23
LN	109	291	PU	24	79	UC	11	22
HJ	103	287	ZMV	82	77	GP	15	21
FE	111	272	YT	31	66	SF	10	18
EB	94	264	ZRG	60	66	BQ	7	15
QA	87	249	ZBH	64	66	DV/M	15	15
ES	66	236	FU	25	65	EO	15	15
CZ	58	173	ZJO	66	65	KS	6	13
ZP	75	168	ZAF	63	63	ZRI	10	10
NO	72	165	NP	20	61	RG	6	9
EH	75	164	GS	21	61	ZAP	8	8
LA	60	163	ZML	61	61	ZMI	7	7
			IE	32	58			

VK4—CW

KX	126	644	XJ	28	176	VO	8	34
XW	153	413	GH	34	116	CN	8	20
OD	44	202	FJ	15	61	NJ	7	20
HH	40	178				KK	7	19

VK4—Open

II	515	1745	UX	347	963	RF	100	370
XY	281	1046	LT	261	892	LC	21	133
VX	358	1034	NB	208	598	RE	18	33
FH	373	1020	UA	176	487	HZ	13	30
			MY	100	430			

VK4—Receiving

B. Lenehan, L4182	423	Chas Thorpe	240
L. R. W. Ernst	340		

SOUTH AUSTRALIA

VK5—Phone

BW	576	1404	FD	120	319	ZKT	102	102
NB	602	1273	ZQ	130	312	LQ	31	101
QX	494	1246	WI*	200	310	ZDX	101	101
BI	449	1198	EK	128	288	ZOF	101	101
JR	422	1068	ZU	90	281	ZIP	100	100
FT	399	1005	GZ	132	274	GU	45	99
NN	360	894	VI	120	273	DJ	60	98
SU	337	855	XV	100	250	ZFJ	92	92
ZZ	300	841	GX	86	227	ZJV	92	92
GM	332	833	PX	105	209	ZOS	91	91
LP	345	833	ZS	100	208	SS	64	80
WV	360	815	WO	70	203	LC	30	75
TY	333	809	ZDY	201	201	MS	30	62
TH	344	791	ID	70	194	ZHJ	55	55
UC	301	761	RR	80	179	ZK	41	53
PH	290	727	TW	112	176	ZNJ	52	52
VT	348	727	CY	68	174	ZBC	45	45
QV	287	685	ZKK	172	172	KS	19	42
ST	259	659	DK	76	165	AC	20	32
EF	227	610	OY	89	163	ZRH	28	28
UV	203	553	ZBB	154	154	QH	26	26
MC	214	543	RI	60	144	LL	15	25
ZB	206	519	HA	43	133	DF	12	23
ZT	277	481	WN	50	131	BF	7	21
LN	148	435	HN	110	126	KH	12	20
AX	157	430	QO	46	119	OT	11	18
VB	168	424	BQ	49	119	ZMO	18	18
NJ	125	343	ZN	118	118	DO	10	13
FL	112	319	TU	54	114	ZL	12	12
			AW	111	111			

VK5—CW

MY	150	674	LD	68	312	RK	24	134
FM	105	466	HR	50	234	TL	34	90
FY	100	440	KU	54	218	LG	20	68
OR	88	426	MZ	41	194	KY	9	54
AU	85	396	RX	27	142	GF	10	54
FH	68	326	HO	39	140	QR	11	30

VK5—Open

NO	513	1649	WR	200	540	HM	102	212
RG	435	1289	DX	226	495	MA	59	151
EN	337	883	CL	169	309	JC	82	82
QI	194	644	LM	134	299			

VK5—Receiving

I. Kirk, L50145	852	R. Edmeades, L50122	183
R. Whitford	836		
J. Rodgers	585		

(continued on page 20)

R.D. CONTEST RESULTS

(continued from page 19)

WESTERN AUSTRALIA

VK6—Phone

ID	556	1290	AWI*	120	288	DZ	35	81
KW	497	1148	TU	88	207	XY	37	75
DA	388	868	WI/P*	75	169	SM	21	67
NE	286	674	MB	63	133	SR	26	57
RS	124	508	KJ	52	118	HT	17	43
FI	202	487	VK	40	96	XO	17	30
MF	175	397	EG	37	87	LF	9	9
			AN	46	87			

VK6—CW			VK6—Open		
BQ	162	756	CT	292	891
WT	142	648	LG	181	403
RL	43	202	CR	17	62
GA	30	142	HU	10	28
HD	23	92	SH/P	10	24

VK6—Receiving

B. Dolphin 1572 T. McGrath, L60121 307

TASMANIA

VK7—Phone

JV	566	1287	ZGJ	119	119	RX	10	41
UX/P	255	491	ZIE	113	113	LD	37	37
MS	215	451	ZRF	98	98	NZ	33	35
MZ	135	417	CL	34	94	ZLH	35	35
MX	160	347	AB	30	80	ZGT	33	33
KH/P	137	312	ZLD	79	79	ZRJ	31	31
AK	117	311	ZWX	79	79	HW	21	29
KK	153	284	CK	21	66	ZSF	27	27
BM/P	131	236	PS	64	64	PD	25	25
GW	115	200	SF	22	53	ZX	24	24
LS	82	145	GB	36	50	ZMF	15	15
PF	102	144	ZJG	51	50	AX	12	12
ZIF	143	143	ZFR	44	44	RO	11	11
ZNR	143	143	MK	44	44	ZBE	10	10
VK	62	139	ZEC	42	42	BB	8	8

VK7—CW

CH	163	676	RY	128	408	BJ	31	112
LJ	137	528	CIC	78	293	RD	40	112
GV	133	502	OM	71	236	JB	30	89
MZ	135	417				YL	10	32

VK7—Open

KJ	614	1361	AL	93	241	LZ	32	89
FB	323	683	EJ	106	174	GB	36	50
RH	230	468	JA	42	120	ZBY	46	46
BC	91	323				CF	30	45

VK7—Receiving

R. J. Severett 799

NORTHERN TERRITORY

VK8—Phone			VK8—CW		
CM	336	773	HA	121	474
CW	206	390	ZZ	106	424
DI	132	277			
AZ	44	122			
JS	74	112			
KP	18	47			

PAPUA-NEW GUINEA

VK9—Phone			VK9—CW		
BK	367	860	VO	22	116
GA	265	605			
KA	232	569			
DM	243	520	**VK9—Open**		
RY	174	490	DH	203	551

CHRISTMAS ISLAND

XX 100 244

ANTARCTICA

VK0

JV 97-597

NEW ZEALAND

Phone			CW		
ZM1AMN	470	1064	ZL1DV	58	254
ZL1ARO	181	379	ZL2IQ	94	340
ZL1AGO	82	169			
ZM2ACP	181	651			
ZM2GJ	250	498	**Open**		
ZM2IK*	27		ZL1AXB	341	872
ZM3ABC	265	537	ZM1ACL	309	741
ZL3FM	217	447	ZL4CA	96	241

☆

You and DX

We regret the non-appearance of the notes this month caused by the Contributing Editor's change in QTH. Meanwhile a note from KH6BZF about the Kure and Midway Islands DX-pedition indicates that W7WOX (KH8HGP) and the group will head out of Honolulu about 22nd October so as to operate a few days before, during and after the "CQ" W.W. DX Test (s.s.b.) on 28th-29th Oct. from Midway. Frequencies given include 14205/14280 kHz., 21260/21300 kHz. and 7205/7290 kHz. QSL to KH6BZF with three IRCs plus SAE.

Congratulations to David Rankin, VK3QV, upon acquiring the call 9V1RH.

VHF UHF
an expanding world

With Eric Jamieson.* VK5LP

Closing date for copy: 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	52.100	VK0ZVS, Macquarie Island.†
	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK2	52.450	VK2WI, Dural.
VK3	144.700	VK3WI/R6, Vermont.
	144.925	VK3QZ, Traralgon.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Albany.
	145.000	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
	145.250	ZL2VHP, Palmerston North.
	431.850	ZL2VHP, Palmerston North.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

† VK0ZVS is again operating from Macquarie Island running 30 watts c.w. to a 3 el. beam on Australia. The keying cycle includes a pause during which stations may call in.

The listing of VK1VF in Canberra has been removed for the time being. Apparently I was misinformed that it was likely to be operational by September and the subsequent listing has caused some problems between the Canberra Radio Society and the P.M.G. Dept. I regret any inconvenience such listing may have caused. In future, I shall certainly be requiring definite evidence of the proper operation of any new beacons which may appear before adding to list, that's for sure!

2300 MHz. CONTACT—RECORD CLAIMED

Following an 18-month programme of building, testing and modification, a two-way contact was made on Sunday, 3rd Sept., 1972, using 2304 MHz. between Dick VK2BDN, operating portable at Glenbrook in the Lower Blue Mountains, and Bill VK2ZAC at his home QTH at Narwee, a distance of 28.5 statute miles. The contact commenced at 12.15 p.m. after a brief contact on 144 MHz. to finalise set-up details, and was maintained for 45 minutes, being limited by Dick's available battery power. Weather conditions were warm and calm, 20 degrees C. with some haze and the optical path exhibited some fading. Signal reports were VK2BDN reported 5 x 7 and VK2ZAC reporting 5 x 4. It is understood the previous best Australian Amateur contact on this frequency was 9 miles.

Equipment.—VK2BDN: transmitter, 144 MHz. exciter plus a series of varactor doublers to 2304 MHz., estimated power output 0.75 watt; modulation f.m., feed-line 7 feet of 50 ohm co-ax. to a 4-ft. dish with dipole feed, crystal controlled converter with 1N21D mixer, 144 MHz. first i.f. to a mobile communications receiver.

At VK2ZAC: Transmitter, 144 MHz. exciter, 3CX100A5 doublers to 576 MHz., 3CX100A5 quadrupler to 2304 MHz., estimated power output 1.5 watts. Modulation a.m. Feed-line—due to the need for home station operation at VK2ZAC—the antenna is supported on a lattice tower by means of an elevating truck which may be winched up and down for adjustment. To reduce feed-line losses a 15-ft. waveguide section plus co-axial transitions was built using 4 x 2 inch galvanised downpipe. Antenna 4-ft. dish with dipole feed. Receiver, crystal controlled converter, 1N21D mixer, 50 MHz. first i.f., transistor pre-amp. to a 6 metre converter and BC342 h.f. receiver fitted with a gated beam f.m. discriminator.

Congratulations to Dick and Bill for their efforts, and we hope to hear more from them as the operating distances are increased, and thanks to Bill for sending me the information.

* Forreston, S.A., 5233.

BLURB

I'm not trying to be rude! That's the title of the latest news bulletin to reach my office desk, this time from the "South East Radio Group" in Mt. Gambier, S.A., under the editorship of Dale VK5DA. Running to 10 pages, it has lots of information, even to including a recipe for a chocolate cake! I hope I may be able to select suitable paragraphs from its pages from time to time which will be of general interest. Good luck S.E.R.G. with the project.

QRM

This is another bulletin, and published by the Northern Zones of W.I.A. in Launceston, Tas., which I am grateful to receive. I note an interesting comment in the last issue regarding the Remembrance Day Contest, and I quote: "If Northern VK7 is any guide, adding the two hourly limit for reworking a v.h.f. station in the R.D. Contest must be the brain wave of the century. The enthusiasm of Z calls had to be heard to be believed—many of them made up to 150 contacts! Apparently 26 different call signs were heard through the Mt. Barrow repeater. Quite a few crystals around for a 'temporary' frequency!" Yes, I do believe the Federal Contest Committee has taken a step in the right direction and given v.h.f. operators extra incentive to join in our national contest, and hope they will support the idea.

50 MHz. MOONBOUNCE?

A letter has arrived at my desk in a very round-about way (through ZL3NB and VK-3AKN) asking if I am interested in moonbounce operation on 50 MHz., with Joe Muscanere, WA5HNK, 6914 South Park Street, Houston, Texas. Actually, while the thought does interest me to a point, I do not have the kind of time required for such a venture, and my prevailing noise level is so high as to make very low level signals impossible to read. If there are any others who would like to try with Joe, I suggest you contact him personally by letter. He runs 650 watts output, and has received his own signals back from the moon.

PORTABLE OPERATIONS

This is the time of the year when operators begin to think about selecting sites for portable operation mostly during the Christmas and New Year break. If anyone has definite details of such operation available by 30th October perhaps you might send the details to me for inclusion in these notes for December. I see from the pages of the Geelong Amateur Radio-Television Club bulletin that Mike VK3ASQ is a likely starter around the New Year period. Are there any others?

VK3 ANTENNA DAY MEASUREMENTS

The Victorian "VHF-er" for Sept. contains details of 52, 144 and 432 MHz. antenna measurements, and serves to indicate the wide range of results which can be obtained by different constructors. Looking over the results the 11 element yagi on an 18-ft. boom seems to have performed fairly closely to accepted figures; this was submitted by VK3AUU. A comment at the end of the results indicated some multipath problems existed with the tests and caution should be exercised in examining the results. However, readers of this page would find a look at the tabulated results quite worth while, if only further to add to your confusion.

Because you build an Orr and Johnson 10 element for 144 MHz. you might be lucky to get 12 or 13 dB. of gain, or it might be 5 dB. as these results have shown. The golden rule seems that "follow the specifications rigidly, vary them at your peril if you are not familiar with antenna behaviour".

TWO METRE SSB CALLING FREQUENCY

Also from the "VHF-er" is noted a motion passed at the August meeting of the VK3 V.h.f. Group that a frequency of 144.150 MHz. be used as a s.s.b. calling frequency. The idea of a calling frequency is good, but perhaps a final suitable frequency for all Australia might be considered by the present Band Planning Committee.

VHF FIELD DAYS

VK3 will be holding a special Field Day on 5th November using a miles per watt multiplier. On 3rd December there will be Field Days in VK3, VK5 and ZL, so perhaps it will be a Field Day for some. The National Field Day is scheduled for 10th and 11th February, 1973. It is time now to start planning for the National Field Day if you are likely to make a big effort and cover all bands.

MOBILE OPERATION

With the holiday season not so far away, many will be giving thought to interstate mobile operation. Bear in mind that for many years no special permission was needed, but now v.h.f. operators (as well as h.f.) require to notify the P.M.G. Dept. of the proposed dates of operation, and other relevant details as required by the Regulations as printed in the Handbook. Play safe, write early. [See page 2 of this issue.—Ed.]

That seems to be all the news for this month, and as space in these columns is still subject to pressure from the Editor of "A.R." no padding is used just to fill space. I close with the thought for the month: "The toughest part of politics is to satisfy the voter without giving him what he wants."—The Voice in the Hills.

NEW CALL SIGNS
JUNE-JULY 1972

VK1JD—J. Dalwood, Lawley House, Brisbane Ave., Barton, 2600.
VK1ZAZ—J. W. Carr, 34 Abernethy St., Weetangera, 2614.
VK2LL—C. L. Scully, 16/818 Victoria Rd., Ryde, 2112.
VK2ZS—W. J. Smith, 18 Prince St., Glenbrook, 2773.
VK2ZV—K. W. Gooley, Waldorf Private Hotel, 3 Milson Rd., Cremorne Point, 2090.
VK2AXG—J. H. Gingsberg, 1/282 Belmore Rd., Riverwood, 2210.
VK2BDI—R. Kilworth, 11/85 West Esplanade, Manly, 2095.
VK2BRF—R. G. Gill, 28 Lower Mount St., Wentworthville, 2145.
VK2BSX—W. F. Shepherd, 56 Wyong Rd., Mosman, 2088.
VK2BZX—P. J. Vernon, 12 Russell Ave., Lindfield, 2070.
VK2RAG—Central Coast Amateur Radio Club, Dandaloo St., Kariong, 2251.
VK2RAN/R2—Wireless Institute of Australia, Hunter Branch, 49 Valaud Cres., Highfields, 2289.
VK2RAO—Orange and District Radio Society, 255 Plesley St., Orange, 2800.
VK2RAS/R1—Wireless Institute of Australia, Station Dural; Postal: 14 Atcheson St., St. Leonards, 2065.
VK2ZNU—R. Ryback, 87 Evan St., Penrith, 2750.
VK2ZNX—P. Whaite, 5/51A Forsyth St., Kingford, 2032.
VK2ZQX—R. J. Martindale, 83 Windsor Rd., Dulwich Hill, 2203.
VK2ZXU—J. E. Anderson (Prof.), 75 Jabez St., Broken Hill, 2880.
VK2ZYQ—H. J. Smit, 9 Moore Cres., Faulconbridge, 2776.
VK2ZZP—G. S. Scott, 21 York St., Epping, 2121.
VK2ZZS—A. M. Adams, 3 Fernleigh Gardens, Rose Bay, 2029.
VK2ZZU—C. T. Coles, 111 Archer St., Chatswood, 2067.
VK2ZZY—P. L. Greaves, 80 Duffy Ave., Thornleigh, 2120.

VK3SA—J. Bocr, 10/135 Mooltan St., Ascot Vale, 3032.
VK3AMG—J. Mellor, Station: Princes Highway, Alberton, 3970; Postal: P.O. Box 69, Yarram, 3971.
VK3BDS/T—E. H. Schoell, Lot 79, Anderson St., Boronia, 3155.
VK3BGI—O. H. R. Hobuss, 15 Bentwood Cres., Frankston, 3199.
VK3BGK—S. L. Spayde, 2 Kurrajona Ave., Glen Waverley, 3150.
VK3BGM—L. Sambell, 4792 Carson Pl., Burnary Cl., Canada.
VK3YGK—I. J. Dalwood, 7/8 Middle Rd., Maribyrnong, 3032.
VK3YHB—E. L. Bennett, 2 Melva St., East Bentleigh, 3165.
VK3ZLC—W. R. Knight, 17 Lucas St., Newcombe, 3219.
VK3ZQZ—D. Zovi, 28 Arnold St., Princes Hill, 3054.
VK3ZTN—N. J. Melford, Old Coonara Rd., Olinda, 3780.
VK3ZWA—W. R. Deitch, 26 Cantala Dr., Doncaster, 3108.

VK6CU—C. T. Younger, Station: U.S. Navcom Stn., Exmouth, 6707; Postal: P.O. Box 2, Exmouth, 6707.
VK9BD—R. Whitney, Station: Drill Barge, "J. C. Marthens"; Postal: C/o. Mr. Middlebrook, Papua Agencies Pty. Ltd., P.O. Box 120, Port Moresby.
VK9BO—N. R. Gustafsson, Station: Sect. 41, Lot 32, Boroko; Postal: P.O. Box 1864, Boroko.
VK9EJ—K. V. Ford, Station: Quail St., Lae; Postal: P.O. Box 1486, Lae.
VK9ZIF—I. Fletcher, C/o. Manus High School, Lorongau.

Ionospheric Predictions

With Bruce Bathols,* VK3ASE NOV. '72

Listed hereunder are the Ionospheric Predictions for November 1972, from the charts supplied by the Ionospheric Prediction Service Division.

Taking into account the predicted M.U.F. and A.L.F., these listings should provide communication between the times stated for at least 50 per cent. of the month, but not all days.

All times are G.M.T.

28 MHz.—

VK1/2	to	W6		0100
VK3	,,	JA		0300-0500
VK4	,,	5Z	L.P.	2300-0100
VK5	,,	KH6		0200-0500

21 MHz.—

VK1/2	to	8P	S.P.	2000-0600, 1100
,,	,,	8P	L.P.	2100, 1000-1600
,,	,,	VE3	S.P.	1400-1600, 1900-0100
,,	,,	VE3	L.P.	1200
,,	,,	W6		1900-0300
,,	,,	ZS		0400-1100
,,	,,	PY		2300-1000
,,	,,	G	S.P.	0700-1500
,,	,,	G	L.P.	0900-1100
VK3	,,	UA		0400-1300
,,	,,	JA		2200-1300
,,	,,	I	S.P.	0500-1200
,,	,,	I	L.P.	0800-1100
,,	,,	W1		1300-1500, 2000-2400
VK4	,,	5Z	S.P.	0600-1100, 2200-0300
,,	,,	5Z	L.P.	1900-0300, 0800-1600
,,	,,	W1		1400, 1900-2400
,,	,,	PY		2200-0600, 0900-1100
,,	,,	G	S.P.	0800-1500
,,	,,	G	L.P.	0900-1100
VK5	,,	KH6		2000-1200
VK6	,,	SU		2400-1400
,,	,,	W6		2200-0300
ZL	,,	ZS		0500-1000
,,	,,	W1		1700-2400
,,	,,	G	S.P.	0900-1400
,,	,,	G	L.P.	0800

14 MHz.—

VK1/2	to	8P	S.P.	0300-0800, 1000-1500
,,	,,	8P	L.P.	0900-2400
,,	,,	VE3	S.P.	1300-2100
,,	,,	VE3	L.P.	1300-1700, 2000-0100
,,	,,	W6		1500-2100, 0400-0900
,,	,,	ZS		1200-1600, 2000-2200
,,	,,	PY		1800-1300
,,	,,	VK6		2300-1100
,,	,,	G	S.P.	0600-1800
,,	,,	G	L.P.	0800-1400
VK3	,,	UA		0700-1600
,,	,,	JA		0500-1800, 2100-2400
,,	,,	I	S.P.	0900-0100
,,	,,	I	L.P.	0700-1600
,,	,,	W1		1300-2000
,,	,,	VK0		2000-1300
VK4	,,	5Z	S.P.	1400-2400
,,	,,	5Z	L.P.	0400, 0700-2000
,,	,,	W1		1300-2100
,,	,,	PY		0400-1300, 1800-2300
,,	,,	G	S.P.	0600-1700
,,	,,	G	L.P.	0800-1300, 2000-2300
VK5	,,	KH6		0400-1500, 1700-2100
VK6	,,	SU		1000-0100
,,	,,	W6		1600-2200, 0700
ZL	,,	ZS		0300-0700
,,	,,	W1		1300-1800, 0200
,,	,,	G	S.P.	0700-1800
,,	,,	G	L.P.	1600-2300, 0100-0500
				0700-1400

7 MHz.—

VK1/2	to	W6		0800-1600
,,	,,	G	S.P.	1400-2000
,,	,,	G	L.P.	0900
VK3	,,	JA		0900-2000
,,	,,	W1		0800-1300
,,	,,	VK6		1000-2100
,,	,,	VK0		0900-1800
VK6	,,	SU		1500-2300
ZL	,,	ZS		1700

Smoothed monthly sunspot number predictions for November 54, December 51, January 51, February 45.

* 3 Connewarra Ave., Aspendale, 3195.

Magazine Index

With Syd Clark, VK3ASC

There has been a build-up in the number of magazines available this month due to a number which had been missed previously becoming available.

"BREAK-IN"

May: An RF Noise Bridge; The Experimenter's 2.5 Audio Amplifier; Three Simple ZC1 Modifications; SSB Topics with a Field Day Flavour; A Solid State Timer; Aligning the Tucker Tin Mk. II.

June: Cabinet Construction for the Amateur; Log-Periodic Antenna for 2 Metres; Simple Audio Frequency Meter; Dual Time AGC; 5/8 Wave Vertical for 2 Metres.

"RADIO COMMUNICATION"

May: Electronic Switching in Amateur Radio Equipment, Pt. 1 of three parts; Some Improvements in Digital Frequency Measurement Techniques; Speech Processing; Phased Verticals; A Cap-it-al (1) Job; The "Peg" Antennameter; Review, Heath SB303.

June: Audio Frequency Unit for RTTY Transmission; Electronic Switching, Pt. 2; More Modifications for the KW2000.

July: 144 MHz. Repeater Stations in the Amateur Service; A Transistorised Top-Band Transmitter; Electronic Switching, Pt. 3 (conclusion); A 30 MHz. IF Amp. for Microwave Receivers; A VHF Turnstile Aerial; Take to the Hills.

August: Aerial Masts and Rotation Systems, Pt. 1; Consumer Integrated Circuits in Amateur Design, Pt. 1; Equipment Reviews: Heath SB620, Yaesu YC-305 Counter, Eddystone 1000 Series Receivers.

"SHORT WAVE MAGAZINE"

April: The HW-17A Modified for Improved Performance on Two Metres; The Eddystone 888A; Transistor Transmitter for Top-Band; Miniature Monitor/Oscillator; Low Power NBFM for Seventy-cems; Tone Modulated Oscillator.

June: V-Beam as Multi-Band Aerial; JR-310 Top-Band Modification; More About the Personal Portable for Two Metres; Improving the HW-100; All-Transistor Ten-Watt Transmitter for Top-Band.

"HAM RADIO"

May: Three-Band Ground Plane; 9 Element Colinear Antenna for 2 Metres; Gamma-loop-fed Vertical Dipole; A Successful 1296 MHz. Yagi; Direct Reading and Expanded Scale SWR Meters (using surplus dual indicators); An All-Band Phased-Vertical Antenna System; Small Loop Antennas; An Antenna Coupler for the Three-Band Beam; Loading the Mobile Transmitter; Measuring Co-axial Line Loss with a Reflectometer.

"CQ"

June: "What's Past is Prologue": A Modern 2-Tube DX Receiver to meet 1931s Strict Operating Standards; A High Selectivity I.F. Filter; Tips for Working DX; Noise and Noise Generators, Pt. 2; Getting Ready for the Oscar-6 Satellite; Adriati Islands Expedition.

August: Increasing the Operating Capability of the Heathkit SSB Transceivers; The System (Candler's Morse System); Heath Triggered Oscilloscopes (Review); Adjusting and Cleaning Speed Keys; Testing Unknown Zener Diodes, Toroid Characteristics (Note: 88 mH. loading coils are commonly used by the Australian Post Office but they are now wound on pot cores. Ed.) Slow Scan TV.

"73"

January: RTTY Art Made Easy; The TT-63A as a Display Generator; Television Monitor; AFSK Revisited; Tuning Indicators for SSTV Monitors; Designing Diode Matrix Units; The Makings of a Modern Day Receiver; Simultaneous Multiband Transmissions; A Pre-Novice Transmitter; The Problem of Inversions; An MF Converter for HF Receivers; Easy End Feed Z-Match; Coat-hanger Ant. for 2 Metres.

June: Six Elements on Twenty Metres; Slow Scan Television; Beaming the Vertical Antenna; Active Filter Design and Use, Pt. 1; Antenna Party; Radio Astronomy and Amateur Radio; Patenting Your Invention; 20 dB. Beams; Phasing Multiband Vertical Antennas; Ham TV: A Public Service; The Modified Suction Cup Antenna; 300 MHz. Frequency Scaler; Elliptic Function Filters for RTTY; Trouble Shooting for the Novice; Improved Low-Cost CD Ignition, Lightning.

"QST"

May: Some Practical Aspects of VXO Design; A Frequency Calibrator for UHF Using an Avalanche Transistor; Increased Power for the Solid-State Transmitter; Conversion of Telefax Transceivers to Amateur Service; A Co-axial Line Amplifier for 220 MHz.; By the Light of a Diode; An Inexpensive Secondary Frequency Standard; Some Two Metre Solid-State RF Power Amp. Circuits; Adding Letter and Word Spacing to ICKEY; A Strip-Line Kilowatt Amplifier for 432 MHz.; Review Bird Ham-Mate Directional Wattmeters.

July: The Flashlight Sidebander; The Dit-Ditter; A Two Metre Pre-Amplifier for Repeaters; Improving CW Reception on the SB-303; A Home Made Duplexer for 2 Metre Repeaters; A Study of the DDRR Antenna; A "Stretcher" for End-Fed Multiband Wires; A Storage-Tube Monitor for SSTV; A Pip-Squeak Follower for 220 MHz.; D-Layer Absorption during a Solar Eclipse; Review: KW-107 Supermatch, Heath SB-610 Monitorscope; The Ailing Emporium; 220—What is it good for?; Amateur Radio—Privilege and Responsibility.

KEY SECTION

With Deane Blackman,* VK3TX

The personal problems of column editors should not of course enter into their column. However, I have on return from overseas, moved for a time to Sydney. In all that my system for compiling these notes has gone awry, so light on this month. I even missed the opportunity to tell you about VK2BQQ operating from Lord Howe—last month! My thanks to VK4PJ for the information, and if anyone hears of similar forthcoming events which promise plenty of c.w. (as this one did) I'd be happy to hear about them.

Listening to one of the slow morse transmissions on 3550 kHz. put out by the hard-working and public-spirited group up here in VK2 set me wondering what others do. I have listened to this from my home QTH on occasions, but 80 metres is not always kind even there, and must be very hard for someone insecure at receiving. What sort of copy do other States make of these, or do you rely on the tape service? Would some newly-licensed chap like to tell me what more could be done to make easier or more convenient the mastery of what most seem to think the most difficult part of getting on the air.

[Apologies for incorrect address given in October "A.R."—Ed.]

* P.O. Box 382, Clayton, Vic., 3168.

NEW POSTAL ADDRESS FOR W.I.A. FEDERAL EXECUTIVE P.O. BOX 150, TOORAK, VIC., 3142

"20 YEARS AGO"

With Ron Fisher, VK3OM

"I was televised in 1952". Last month in these notes mention was made of the All Models Exhibition held at the Melbourne Exhibition buildings. Twenty years later, the November 1952 editorial of "Amateur Radio" is worth quoting. "Twenty years from now—maybe less, maybe more—thousands of people can cast their minds back to a crowded, noisy, echoing building. At this time, when television will be as commonplace as ordinary amplitude modulated broadcasting is today, these same people will be telling their children and grand children, 'I was televised in 1952'." This was unique in that the equipment with which they were televised was Amateur equipment; the first known Amateur television equipment in Australia. It was completely home-built and installed at the Exhibition by Len Moncur, VK3LN.

V.h.f. conditions must have been really hot during the month of October. According to the V.h.f. Notes, VK3RR was heard in ZL. At the time, a two mx contact did not take place, but VK3RR was logged by ZL3AQ at 0807 GMT on 2nd October at R5, S5 to 6.

The 1952 R.D. Contest results headline the news that "Western Australia does it". Tasmania, who held the lead for the previous three years, slipped to third place with Queensland coming in second. Top individual scorers in each State were: VK6RU 728, VK4CB 784, VK7KB 734, VK2AHA 725, VK3JE 568, VK5FO 557 and VK9GW 630. These scores probably seem low by today's standards, but it was still hard work.

Technical articles for November included a gem. J. M. Coulter, VK5JD, wrote about "Odds and Ends". His opening paragraph is self explanatory. "Many Amateurs are unaware that a number of articles, designed primarily for other trades, are very easily adapted to their hobby". We need some one to write an up-to-date version of this now.

C. D. L. Tilbrook described "A Unique Crystal Converter for 50 and 144 Mc." The circuit used a 6J6 as a push-pull neutralised r.f. stage to a 6J6 push-push mixer, with a 6AC7 oscillator and 6J6 multiplier. Veteran "A.R." author, C. A. Cullinan, then VK7XW, described his "Crystal Marker for Amateur Receivers" and Vaughan Wilson, VK2VW, showed us how to build a simple 80 metre transmitter. The line up was a 6V6 operating either as a crystal oscillator or buffer from an external v.f.o., driving a pair of 807s in the final.

"CW Ratings of some Receiving Type Tubes" —C. A. Cullinan again—and this time Chris presented a handy chart showing the transmit ratings of a group of common receiving tubes.

SILENT KEY

It is with deep regret that we record the passing of—

VK2WH—W. H. R. Stitt.

Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

Editor "A.R.," Dear Sir,

May I respectfully make a few comments on "A.R." Firstly, the Newcomer's Notebook is a good idea—the more simple and fundamental type articles the better.

I am sorry you appear to no longer print call signs discontinued or transferred. This is greatly missed and would request resumption.

In the Call Book could the type be set so that all names are under each other in line? Could the suburbs or towns be put in line for easy reference? As the current book is soon out of date, could a supplement be printed of new calls, say each six months?

Many of us have friends studying for the A.O.C.P. examin. Why not print the latest theory papers in "A.R." The standard of the exam. is always a talking point among Amateurs—I think this would be appreciated.

With very best wishes, 73,

—E. L. Ross, VK3YEL.

[It is intended to resume publishing alterations and cancelled call signs immediately after the closing date for amendments for the 1973 Call Book, viz. 31st December, 1972. The costs of setting the names and towns in line under each other in the Call Book are prohibitive at the present time. The suggestion of printing the A.O.C.P. theory papers immediately after each examination is excellent, and the August 1972 A.O.C.P. examination paper appears on page 18 of this issue.—Ed.]

INTRUDER WATCH

With Alf Chandler, VK3LC

It may be co-incidence, but it seems significant that the following Intruders have not been heard in our bands recently after being reported by Intruder Watch Observers, both in Australia and in the U.S.A. They are:—

TCX—Turkey, point to point r.t.t.y. carrying British Embassy traffic.

YBU—Cuba. Apparently moved by U.S. reports, but reported here too.

HGX37—Czech Embassy station.

If we can get the Indonesian stations 7BD2, 7BD4, 7BQ2, 7BZ2 out of the 14 MHz. band, that would be something to crow about.

I'm trying hard enough but need more reports, the more the merrier. Also reports on information on traffic carried by the r.t.t.y. station KJG is required by the U.S. It's an F1 r.t.t.y. on 21104-7 kHz. and heard out here around 1000 GMT.

HAMADS

- A free service for individual members.
- Four lines of print free (200 characters/spaces); full charge at $6 (min.) per col. inch if exceeded or for repeats: includes name/address—use QTHR if correct in Call Book.
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- Excludes commercial-class advertising.
- Exceptions only by PRIOR arrangement.

For full details see January 1972 "A.R.." page 23.

FOR SALE

Mildura, Vic.: Hallicrafters HT32 transmitter and SX111 receiver, good condition with handbooks. 40 mx SSB home-brew transceiver with matching power supply. 6 ft. cabinet rack, including linear amp. (80, 40, 20, 2/805) and heavy duty power supplies. 50 ft. winch-up tower and guys. 3 el. 20 mx Yagi. Prices, details, VK3AGF, QTHR, Ph. (050) Bus. 23-4028, A.H. 23-2981.

Dural, N.S.W.: Telescopic 45 ft. tilt-over Tower, good condx., complete, $50. Also 95w. 2 mx AM Tx. has wkd. ZLs, complete with mod. and P.S.U., $30. VK2ZZI, QTHR, Ph. (02) 651-1425.

Girraween, N.S.W.: Trio TS-510 5-band 200 watt Transceiver, complete with noise blanker, external VFO, AC P.S.U. and DC-DC mobile supply. Ex. cond. $480 o.n.o. VK2AZY, 15 Mandoon Rd., Ph. (02) 631-7453.

Melbourne, Vic.: 4-pole 5.2 MHz. Filter, complete with USB/LSB carrier xtals, $15. VK3ARZ, QTHR, Ph. (03) 232-9492.

Sydney, N.S.W.: 6 metre: MR20A $35, Pye Reporter, tuneable, $15, Vinten MTR12T $30; T.C.A. 1674 2 mx $30. VK2ZZX, Ph. (02) 399-9392.

Reservoir, Vic.: Complete AM/CW station; Eddystone 888A, Geloso 222, G5RV, mike, etc. Very good condition, $225. Returning W-land Nov. VK3BGF, 162 Spring Street.

Melbourne, Vic.: Electronics Aust. SSB Xmtr. and 700v. power supply. Very neat, was all new parts, suit beginner. $60. VK3AJP, QTHR, Ph. (03) 288-1842.

Melbourne, Vic.: Geloso G4/225 SSB-CW Tx, 80 to 10 mx, 160-200w. PEP, pair 6146s in final, complete with companion PSU, $345.00; Geloso Nuvistor Converter for 144-148 MHz. and 431-436 MHz., complete with PSU, output 26-30 MHz., $35. Eddystone 770R VHF Rx, 19 to 165 MHz. in six ranges, working well, $480.00. Bob Cunningham, VK3ML, QTHR, Ph. (03) 329-9633.

Toukley, N.S.W.: Complete ATV Station. Tx, 60w., transistorised camera, sub carrier generator and monitor, 435 MHz. Or Exchange for SST equipment. P.O.A. VK2AJY/T, QTHR.

Melbourne, Vic.: Swap Mobile Power Supply, suit Swan, Galaxy, FT200, etc., for Vertical Antenna (18AVQ or sim.), or sell $45. VK3AQK, QTHR, Phone 57-1107.

Asquith, N.S.W.: 1 inch Vidicon Camera Tubes, 2nds, $15. Transistor Vidicon Deflection Yoke, new, $15. 5UP1(F) CRT, new, $4. Vidicons suitable for SSTV. VK2ZPM, QTHR, Ph. (02) 476-2304.

WANTED

Sydney, N.S.W.: Circuit and alignment data for AR88LF Receiver. VK2ZJF, QTHR, Ph. (02) 969-4539.

Balmoral, Qld.: Padder Condenser up to 500 pF., 200 pF. variation okay (Drake 2B modif.). VK4PJ, QTHR.

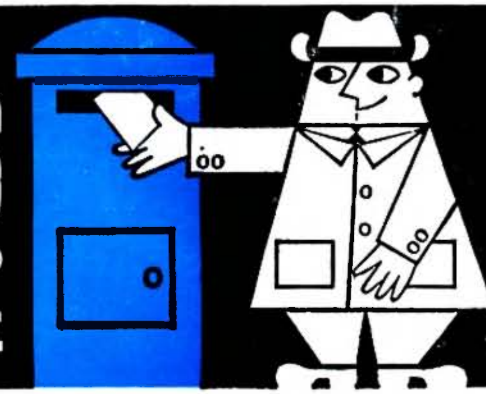
Mount Isa, Qld.: Commercial 12v. DC PSU, suit mobile operation of Swan 350. Must be A1 condition. Price/details to VK4OV, QTHR.

Sydney, N.S.W.: FT200 w/w.out PS, must be reasonably priced and in good order. Price and details VK2ABC, QTHR, Ph. (02) 451-1313.

Melbourne, Vic.: Collins Mechanical Filter (plus data), with or without crystals. R. J. Hoffmann, 4 Owen St., East Kew. Ph. (03) 80-1858.

Sydney, N.S.W.: Panadaptor or similar device. Details R. Graham, VK2ZOJ, QTHR, Ph. (work) (02) 642-0122.

Brisbane, Qld.: Transistorised 2 mx Transceiver, multi-channel, 25 watts, 12v. DC. G. Lee-Manwar, VK4ZML, 44 Webb St., Stafford, Brisbane, 4053.



amateur radio

DECEMBER, 1972

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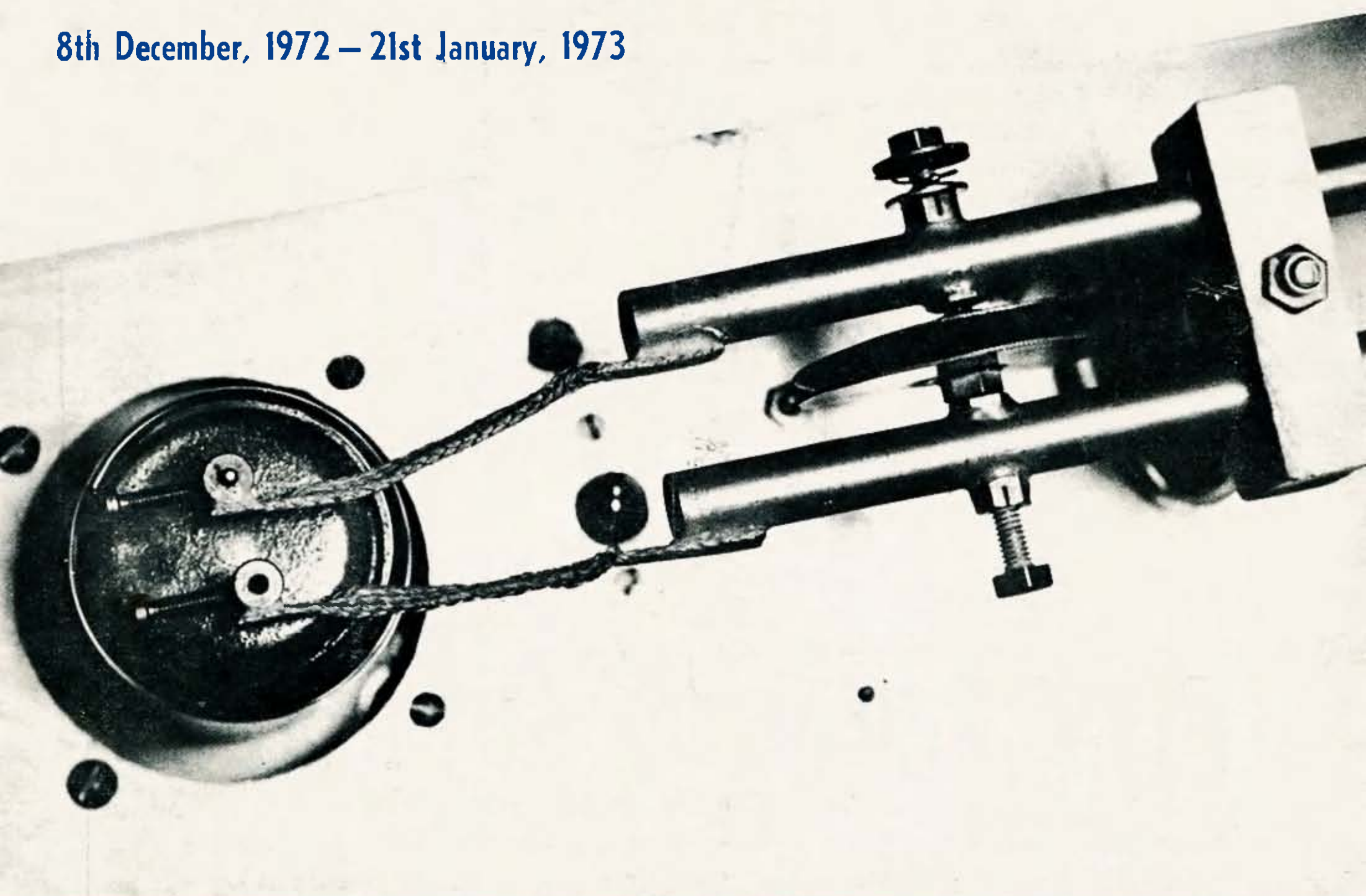

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MODEL AS-100D/P — Price $34.50

High 100,000 ohm/volt sensitivity on DC. Mirror scale, protected movement. AC volts: 6, 30, 120, 300, 600, 1200 (10K o.p.v.). DC volts: 3, 12, 60, 120, 300, 600, 1200 (100,000 o.p.v.). DC current: 12 uA., 6 mA., 60 mA., 300 mA., 12 amps. Resistance (ohms): 2K, 200K, 20M, 200M. dB. scale: minus 20 to plus 63 dB. Audio output (volts AC): 6, 30, 120, 300, 500 1200. Battery: internal. Approx. size: 7½ x 5½ x 2¾ inches.

MODEL OL-64D — Price $19.75

20,000 ohms per volt. DC volts: 0.025, 1, 10, 50, 250, 500, 1000 (at 20K o.p.v.), 5000 (at 10K o.p.v.). AC volts: 10, 50, 250, 1000 (at 8K o.p.v.). DC current: 50 uA., 1 mA., 50 mA., 500 mA., 10 amps. Resistance (ohms): 4K, 400K, 4M, 40 megohms. dB scale: minus 20 to plus 36 dB. Capacitance: 250 pF. to 0.02 uF. Inductance: 0-5000 Henries. Size: 5¾ x 4¼ x 1¾ inches.

MODEL C1000 — Price $6.95

This is the ideal low-cost pocket meter. AC volts: 10, 50, 250, 1000 (1000 o.p.v.). DC volts: 10, 50, 250, 1000 (1000 o.p.v.). DC current: 1 mA., 100 mA. Resistance (ohms): 150K. dB. scale: minus 10 to plus 22 dB. Dimensions: 4¾ x 3¼ x 1¼ inches.

MODEL CT-500/P — Price $16.75

Popular, medium-size, mirror scale, over-loaded protected. AC volts: 10, 50, 250, 500, 1000 (10K o.p.v.). DC volts: 2.5, 10, 50, 250, 500, 5000. DC current: 50 uA., 5 mA., 50 mA., 500 mA. Resistance (ohms): 12K, 120K, 1.2M, 12M. dB. scale: minus 20 to plus 62 dB. Approx. size: 5½ x 3½ x 1¾ inches.

MODEL A-10/P — Price $55.00

Giant 6½ inch meter. In-built signal injector, overload protected. AC volts: 2.5, 10, 50, 250, 500, 1000 (10K o.p.v.). DC volts: 0.5, 2.5, 10, 50, 250, 500, 1000 (30K o.p.v.), 5000 (10K o.p.v.). DC current: 50 uA., 1 mA., 50 mA., 250 mA., 1 amp., 10 amps. AC current: 1 amp., 10 amps. Resistance (ohms): 10K, 100K, 1M, 100M. dB. scale: minus 20 to plus 62 dB. Signal injector: Blocking oscillator circuit with a 2SA102 transistor. Approx. size: 6½ x 7¼ x 3¾ inches.

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amateur radio

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA. FOUNDED 1910

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Copy is required by the third of each month. Acknowledgment may not be made unless specially requested. All important items should be sent by certified mail.

The Editor reserves the right to edit all material, including Letters to the Editor and Hamads, and reserves the right to refuse acceptance of any material, without specifying any reason.

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CONTENTS

COVER

Linear tanks are as much a part of VHF/UHF as is the Annual Ross Hull Memorial VHF/UHF Contest. This summer the contest runs from 1401 hours GMT, 8th Dec., 1972, to 1400 hours GMT, 21st Jan., 1973.

Photo: VK3YAZ and VK3ZU.

QSP

OSCAR 6

"A long and successful life".

That is what is predicted for Oscar 6 which was launched by the National Aeronautics and Space Administration at 1719 hours GMT on 15th October, 1972, from the Western Test Range, U.S.A.

The November issue of "A.R." described the telemetry, command and 2-to-10 metre repeater systems of the package. George Long, the Chairman of the Project Australis Group suggested some of the uses to which the satellite could be put. I propose to suggest some aspects of the significance of Oscar 6.

Oscar 6 is the first truly successful Amateur repeater satellite. It is more sophisticated and more efficient and will operate longer than any previous Amateur Satellite. It therefore represents a further technical advance.

Because it provides an effective repeater system available to all Amateurs it provides a service. Because of its expected life, I am sure that it will attract many Amateurs throughout the world to use techniques and perhaps frequencies that they have not used before. Thus many will acquire new knowledge. Equally, we hope that we shall all acquire new knowledge as to the design and construction of satellites and the phenomena associated with their operation.

It is significant that Oscar 6 is the outcome of co-operation between Amateurs in a number of countries, primarily the United States of America and Australia. The command system was designed and built in Australia by the W.I.A. Project Australis Group, funded by Amateurs through the Wireless Institute of Australia. We can, therefore, allow ourselves some parochial pride.

But I suggest that the ultimate significance of Oscar 6 is deeper than any of the things to which I have already referred. The Region 3 member of the I.A.R.U. team to the 1971 I.T.U. Space Conference, Tom Clarkson, ZL2AZ, has forcibly pointed out that the use to which the Amateur Service puts its bands is of considerable consequence to the many countries that are undecided as to the worth of the Amateur Service and who express their reservations in their voting at frequency allocation conferences.

The Federal Council of the W.I.A. has encouraged the Australis Project because it believes that this kind of activity is in the long term in the best interests of Amateur Radio. It represents the sort of use of our bands which can justify our continued existence. I congratulate A.M.S.A.T. and the Project Australis Group on their technical success and I also thank them and everyone else concerned with the design, construction, launch, tracking and collation of data for what they are doing for the future of Amateur Radio.

MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

OSCAR-6

It's up! Launched 16th October, 0319 hours E.A.S.T., orbit close to that planned; going well. Numerous contacts Australia-wide, also to ZL, VK9, and VK6-ZE; JA's heard. Only major problem—switches itself off, or on, when moving into, or out of, sunlight. Planned to be commanded off, probably mid-week, for three days out of seven for battery re-charging. More data planned for January "A.R.," also listen to Divisional broadcasts, meanwhile watch out for, and report on, ionospheric scintillation when the 6 or 10 metre band is open.

"A SPECIAL FRIEND"

Yes, VK6RV is a special friend, "You may know him, he was general manager of R.S.G.B. (G3FRV) and knows how to try to manage some 16,000 members." (Quote from VK6PG)

RADIO REGULATIONS

N.Z.A.R.T's "Break-In" for September announces a special issue in Jan.-Feb. 1973 to celebrate the 50th Anniversary of the Radio Regulations.

LONG, LONG-WIRE AERIAL

WIBB's 160 metre DX bulletin No. 1 of 1972/73 (if you want it send him three I.R.C's per season) quotes a VK6 S.w.l. (Allen) as having a long wire around his yard on top of a fence about 5 feet high and mounted on insulators: "Has given most excellent account of itself on DX."

STANDARDS ASSOCIATION

The S.A.A. announces a revision being undertaken of the 1969 edition of Part 1 of the S.A.A. Wiring Rules, AS CC1, and invite constructive comments for consideration by the Committee EL/1.

S.S.T.V.

Listed 22nd in the 2nd World Slow Scan Contest, sponsored by "CQ Elektronica," held in February, was VK5MF, the only VK listed. ("CQ TV" Aug. 1972)

QUANDARY

The Publications Committee possesses splendid drawings, but no text, for the f.m. T.C.A. 1674 and an excellent article on modifications to the MR6A, but with a drawing nearly a yard in length. The problems are being worked on.

EXAMINATIONS

For those interested in this subject many would appreciate a different approach. Here is one of several questions asked in "Tuned Lines" Vo. 1 No. 1 from the N.S.W. V.h.f. and T.v. Group: "Define the universe; give three examples."

U.S. NAVAL RESEARCH LAB.

Celebrates its 50th anniversary this year and acknowledges a great debt to world-wide Amateurs for their assistance over the years. From 1st January to 16th July, 1973, the station W3NKF will call "CQ NRL", with concentrated effort from 23rd June to 16th July, using all modes including E.M.E. on 21st January and 1st April on 144.050 MHz. Commemorative QSLs will be sent out as well as a certificate award for successful S.S.T.V. and E.M.E. or for working five or more NRL Amateurs. In their circular the N.R.L. mentioned their equipment in the U.S. Fleet's visit to VK/ZL in 1925 operated by Fred Schnell, 1MD of A.R.R.L. Hqrs., as Fleet Radio Officer.

F.M. STEREO

The N.H.K. (Broadcasting Corp. of Japan) f.m. stations (342 in operation late 1971) are required to present 50 per cent. or more of their programmes in stereo and the commercial f.m. stations to include 70 per cent. or more of stereo programmes. (A. Br. Control Board Report on Frequency Modulation Broadcasting)

CALL BOOK 1973: REMINDER

If the P.M.G's Department does not have your correct address your listing in the 1973 Call Book will be wrong. You have up to the end of the month to write to them to register your correct listing for incorporation into the new Call Book.

MOBILE MANUAL

An item in "League Lines" of "QST" advises that the A.R.R.L's "Mobile Manual for Radio Amateurs" first appeared in 1955. "Over the years shifting interests . . . markedly lessened its usefulness to the Amateur and so it is being discontinued . . . to be effectively replaced by the special repeater manual now in production."

W.I.A. ADDRESS

Please note the Executive's address is P.O. Box 150, Toorak, Vic., 3142. This applies for subscriptions, "A.R.," "A.R." address changes, "Magpubs," Executive correspondence, Call Book and centralised information. **Delays or non-delivery of mail could occur if any other address is used.**

TX IDENTS.

In the editorial column of "73 Magazine" for September, Wayne Green mentions the possibility that the F.C.C. seems to be moving towards a system of automatic identification of all transmitters, by means of a built-in IC unit sending out binary blips over a period of 5 milliseconds every time the transmitter was operated.

SUBSCRIPTIONS 1973

At about the time that members receive this issue the subscriptions due notices for 1973 will also arrive. In order to avoid complications which always arise with late payments, please arrange to send in your subscription as early as possible and preferably before the end of the first month of the new year. For reasons of economy both in volunteers' time and in costs, the subscriptions are processed centrally along with membership EDP records. Please remit your subscription, therefore, direct to: **W.I.A., P.O. Box 150, Toorak, Vic, 3142.** Receipts will not be issued unless requested. Please remember that your last subscription (unless you joined, or were reinstated, during 1972) rendered you financial only up to 31st December, 1972.

I'VE BUILT A MONSTER

S. E. MOLEN,* VK2SG

● In this article VK2SG condenses the results of years of experimenting into a convincing argument for the multi-element, multi-band quad array. He also provides a great deal of practical information on quad construction, and (in a following article) will explain their tuning procedure.

Have you ever wanted to work DX when you wished to, and not when everyone was working it?

Have you ever had the desire to be the only station working real DX instead of just one of the pack trying to get through? Well really, it's not that hard to achieve, if one is willing to do a little work.

To achieve these results one usually thinks in terms of very large aerials. It depends of course on your interpretation of large aerials; to some people a dipole is a large aerial, whereas to others a rhombic is considered as a fair aerial. Of course, one of the considerations is that this aerial must be able to be rotated, and rhombics are sure hard to rotate! Again, the aerial must be a reasonable structure, be reasonably easy to raise in the air and fairly simple to rotate. This is all standard, but what type of aerial to use?

Before I go any further, let me point out that every type of aerial has its advantages and disadvantages, that is, considering both the structural and radiation points of view; while I might concentrate on one type of aerial, some of the structural details will apply equally to any type of aerial, so I hope some of the ideas will be useful to you all.

Fundamentally what we require is an aerial that will operate multiband, give the same gain on all bands and have a simple feed.

If we consider Yagi Antennas we immediately have the problem of multiband operation. Certainly there are multiband Yagis, but, to achieve this, they use traps, and have a variation of gain between bands. Personally, I always think of aerials with traps as rotatable r.f. chokes; maybe they are not that bad, but there are some unnecessary losses in these traps. Minute as these losses may be, they are there, and, to really work DX, every small extra amount of r.f. that you can radiate is that little more signal you can put into the DX station's receiver; and after all, this is what you are trying to do . . .

We could go through the whole gamut of aerials and point out their good points, but you can read all about these in books on aerials, and whilst we will compare several aerials we will not delve too deeply into them, but use them purely as a comparison.

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So having said all that, what are we really trying to say? After much testing and trying various scale models of aerials at 144 MHz. on the aerial test range that I constructed in my back yard (which was luckily large enough to give a good test area), I finally settled for a 4 element quad on a 34 foot boom. This gave the best forward gain for size of any of the aerials, and even gave more gain than some that had much longer booms (and were much harder to tune). The quad also gave a very interesting angle of radiation, and could be tri-banded easily.

But before we get involved in building a 4 element quad, let us consider what the other aerials are and why we finished up with the quad.

Firstly, I will describe the antenna range and the equipment that was used to measure the results. I think you will find this of some interest.

All test aerials were mounted at 25 feet above ground, and the aerials were tilted to fire into a corner reflector at 10 wavelengths. The sides of the corner reflector were seven wavelengths long with the dipole spaced 0.25 wavelength (Fig. 1) from the corner. This aerial in itself was subject to considerable testing before it was accepted as a test bed. Across the dipole a detector was connected and the resultant d.c. voltage was then fed back to the test aerial position, so that the result of any adjustment of the aerial under test could be seen immediately. In this way one person could do all the necessary tests.

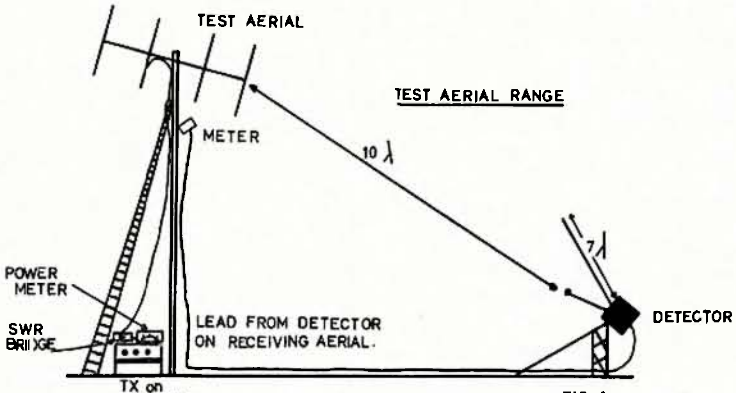


FIG. 1

The transmitter ran 10 watts input and the output was fed through a power meter then an s.w.r. bridge to the aerial. From this it can be seen that variables were kept to a minimum and could be monitored at all times. It could be argued that firing the antenna downwards might cause false readings to appear in the receiving aerial. In fact, owing to the long "wings" on the corner reflector, there were no ground reflections measurable. By using this set-up, I was able to measure forward gain, beamwidth and angle of radiation.

With the above test range I started to test aerials. Starting with two element beams I worked my way up to the larger aerials. One could, of course, write up each aerial separately, but I feel that these are adequately covered by various aerial handbooks so I will not write a lot about them, although I will admit some very interesting figures did come from the tests.

Some of the well used two element beams certainly do not give the figures that one hears quoted on the air; for instance the "ZL Special" has been claimed to have 7 dB. forward gain. The best I could get was 4.8 dB. with 20 dB. front-to-back; not as good as a two element quad, and certainly not as good as some of the claims.

Incidentally, trying to add a reflector to a "ZL Special" is lot of fun, but is completely useless! Adding a director gives between 1.3 dB. and 2.1 dB., depending on spacing.

Actually I tested 19 aerials, Delta loops, ZL Special, Yagi, Swiss Quad, Quads in various configurations, W8JK Two-Section, and Lazy H.

Some of these aerials were discarded after the first series of tests, owing to lack of gain, poor back-to-front, or some other problem that does not come into the scope of these tests. Finally, the field was reduced to two aerials, Yagis and Quads. By the way, both the Delta Loop and Swiss Quad showed some good figures, but they both had problems that needed further attention, again beyond the scope of these tests.

So comparing Yagis and Quads became the purpose of the operation, and subsequently 2, 3, 4, 5 and 6 element Yagis were tried out, and 2, 3, 4 and 5 element Quads. You will note that while I tested a 6 element Yagi, I did not test a 6 element Quad. There is a reason for this, because while a 2 element Quad has slightly less gain than a 3 element Yagi, the 3 element Quad has slightly more gain than a 4 element Yagi. This does not appear to be so if one reads the various "gain ladders" that appear in some aerial books! But, on actual measurements, the 4 element Yagi showed a forward gain of 8.9 dB. whereas the 3 element Quad gave 9 dB. The 4 element Quad showed 10.4 dB. forward gain, the 5 element Quad 11.8 dB. and the 6 ele-

ment Yagi 11.7 dB. Considering this, it was felt that we had gone far enough to prove the point, and had arrived at a set of basic figures which could be used as reference throughout further tests.

Having arrived at this point, it was decided to try the Quad Yagi combination. Using a Yagi driven element with a Quad reflector, the results were not very encouraging, and it really only looked like a 2 element Yagi beam. A Quad driven element with a Yagi reflector was only slightly better than a 2 element Yagi, but by stacking the reflectors so that they were parallel to the wires of the Quad element, we achieved slightly more gain than expected from a 2 element Quad. Actually, the extra gain was about 0.5 dB. Adding a director in the same form, that is stacked Yagi elements, we should find the gain is better than the 3 element Quad, because of the straight Yagi elements. But, if we consider the mechanical structure, there are certain difficulties that have to be overcome to maintain a stable beam. Of course, we could get rid of the Quad element and replace it with stacked 3 element Yagis, which, of course, is an excellent aerial.

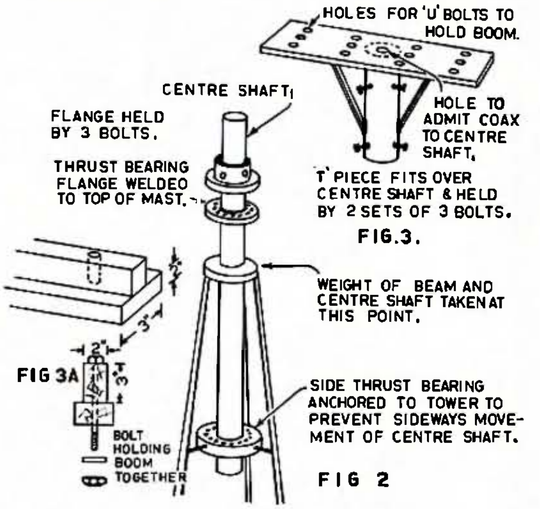
But generally speaking, I think that stacking 3 element Yagis will present some mechanical problems that are beyond the scope of the average Amateur. Yagis present difficulties when we try to triband them, and whilst stacked Yagis appear to be an ideal aerial for single-band operation, they do have their problems. The gain of two stacked 3 element Yagis at best twice the gain of one 3 element Yagi, that is 3 dB. more, and for the extra work put into stacking and tuning, I doubt if it would be worthwhile. So we will not go any further into stacking Yagis.

Considering all the foregoing, we seem to return continually to the main features of a Quad; in other words, we have almost the same forward gain as stacked Yagis without the mechanical and matching problems; also we can triband the aerial without any loss of efficiency on any band.

This is not exactly what we set out to prove, but what we were looking for was an aerial which gave us as many good features as possible without detracting from the results on any one band, so considering all, let us set out to build a Quad of a size to suit yourself.

KEEPING THE QUAD IN THE AIR!

One hears so much about Quads falling down, that I think I should concentrate on one main theme, and that is, how to make a Quad stay in the air! Fundamentally, if one is to build a structure one does not use glue and string! The same goes for aerials of any kind; one must build them strong enough to stand up to all kinds of



winds. From experiments I have carried out, turning a 3 element Quad in a 60 m.p.h. wind requires a steady pull of four tons in a bicycle chain between 4" sprockets. This is a torque of nearly one foot-ton. In a gusty wind it will be greater, so one must construct the turning mechanism to take this torque, and likewise the centre shaft and bearings. Some of the beam rotators available on the Australian market at the present time are not designed for loads like this, and would, in a very short time, be wrecked trying to hold the beam steady, let alone trying to turn it!

So here is the first point, use the strongest, most powerful rotator that you can find; it may be more expensive for a start, but it will be cheaper in the long run. Secondly, if it can be arranged, use the rotator only to rotate the beam, not to support it. Use a separate support bearing to carry the weight of the beam; then, at the bottom of the shaft, use another bearing to hold the shaft in the centre of the mast (Fig. 2).

Having constructed the centre shaft so that it carries all the weight and yet turns easily, we must now provide a method of mounting the boom securely to the top of this shaft; there are as many methods as there are aerials, but the main idea is to transfer the downward thrust and rotational torque to as much of the centre shaft as possible, and not to transfer it all to a small welded area. My idea is to use a 'T' piece to support the boom as in Fig. 3. This way, the thrust is transferred over a three-foot section of the centre shaft and adds a safety factor.

The boom does not present any problem. For a 2 element Quad we can use 3" x 2" oregon, for 3 element we can use two pieces of 3" x 2" oregon in a 'T' configuration (Fig. 3a). Or we can use a metal boom, but the metal boom must be as strong or stronger than the oregon. Of course, the longer we make the boom the more robust it must be, and when one starts thinking of 4 element Quads, one should start thinking seriously of metal booms, as with a long boom the twisting movement becomes important.

To attach the spreaders to the boom I use an angle iron cross as in Fig. 4. I use angle iron in preference to aluminium because it is stronger, if slightly heavier, and after all, it is the strength that we are interested in rather than the weight. The clamps used must be of good quality for they have to stand weather for many years. After trying many types I use 2½" "Utilux" hose clamps, cadmium plated. These are a little more expensive than galvanised, but they certainly last much longer and are worth the extra cost. To get a good grip on the bottom of the canes, the clamped area is wrapped in plastic insulation tape. This tape has a certain amount of compressibility, and in this way the clamps do not shift even after years in the air.

Regarding the spreaders, these are Rangoon Cane. They could be made of fibreglass, which would be excellent, if more costly, but whichever is used, they will need to be treated against weather. I gave the canes four coats of epoxy resin spread over a four-week period, then four coats of white hard gloss exterior enamel. These canes lasted nine years before they were taken down and even after that time, some of them could have been used again.

Treating the canes with fibreglass should be successful, but I have not, as yet, seen any canes treated this way

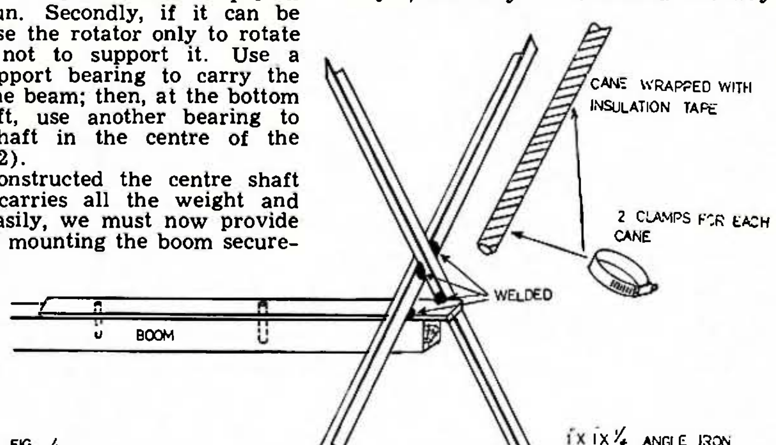


FIG. 4

that look smooth and neat, nor do they seem to last for more than four or five years. Of course, this may be the fault of the people using the fibreglass rather than the material itself! Some people have tried using wooden dowels as spreaders, but these have never been successful, because they are not flexible enough to stand up to the winds and weather, are much too brittle, and will snap at the most inopportune moment, irrespective of how they are treated!

Of course, one could use metal spreaders. A problem, however, if the spreaders are made of one section metal tube, is that the length will be 12 feet from centre to tip and will resonate on 15 metres as well as detracting from the performance on other bands. We can overcome this problem by splitting the spreaders into lengths of 6 feet or less and using a high grade insulation between segments, such as "Teflon". Make sure that all joins are weather tight, and that the metal used for the spreaders has sufficiently high tensile strength to withstand the whipping in the wind. It would be fairly useless to use thin walled soft aluminium tubing, so if you are going to use aluminium make sure it is hard-drawn and has sufficient strength. Because of the mechanical problems associated with the use of metal spreaders I tend to prefer treated cane or fibreglass.

While discussing spreaders, let us consider how we are to attach the wires. If we tie the wires directly to the spreaders and do not allow them to move, we will eventually finish up with broken wires caused by metal fatigue. To overcome this problem, I have used egg insulators wired to the spreaders in such a way that the wires of the elements can run freely through the insulators (Fig. 5), and whilst the Quad looks a bit untidy in a heavy wind the wires don't break and the Quad always looks normal after the wind drops, as we want it to do!

For element wire I used 7/0.029 semi hard-drawn copper; this is good substantial wire with a fair flexibility. One could use heavier or thinner wire to suit the circumstances, but do not use hard-drawn or stiff wire. If you want to discover why, try holding some differently annealed wires in a vyce and bending them back and forth. You will find that the stiffer wire will always break first, so the more flexible the wire is, the longer it will last. The size of the wire is your choice, but if one goes to the ridiculous and uses 36 gauge soft drawn copper, one can only expect it to break in the first light breath of air!

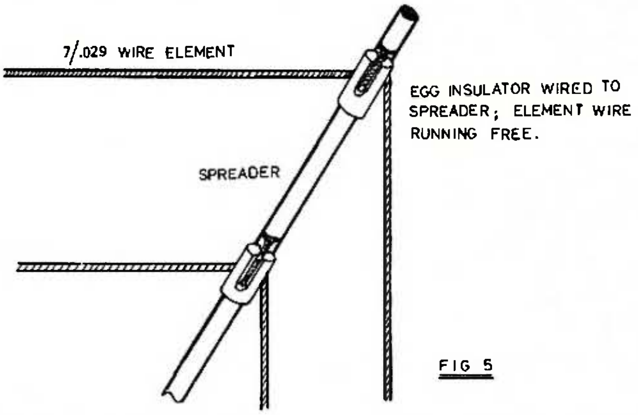


FIG 5

CONSTRUCTION

So now we have all the hardware for the Quad and we can start to construct it. This is the point where a lot of people run into trouble, in that they try to construct all the elements at the same time, which will take up considerable space on the ground. Actually the whole thing can be constructed in a 17-ft. square if we use the space correctly. Instead of constructing all the elements together, if we construct them one at a time, we only need one square area to do the job. If we tie the boom on to the side of the tower at about 11 feet above ground, we can lift each element up on to the boom as we finish it and get it out of the way. This can be a risky procedure, for, if care is not taken, it is very easy to break the spreaders and lose the whole element; but if the element is lifted by the centre spider using a light pole, say, 20 feet long, we can lift the element easily and hang it on the boom (Fig. 6). It's as easy as that; as each element is made and hung on the boom, it can be bolted into place, for when we have all the elements constructed we may start our tuning at this height.

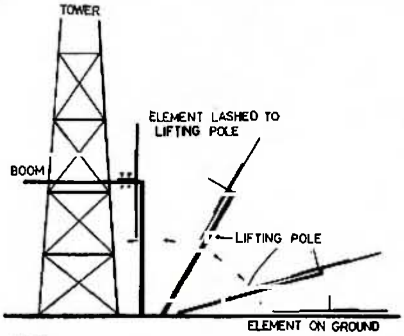


FIG. 6

Here we arrive at the point, how many elements are we going to use? Let us consider the radiation pattern of various numbers of elements, both in the vertical and horizontal plane. As you can see in Fig. 7, the 2 element Quad has a 60° beamwidth with a 17° (Fig. 8) angle of radiation. It also has 5.8 dB. forward gain, whereas the 3 element Quad has a 44° beamwidth, 12° angle of radiation and a forward gain of 9 dB. The 4 element Quad has a beamwidth of 27°, an angle of radiation of 9° and a forward gain of approximately 10.4 dB. Now if we add another element to make it five, the beamwidth is 20°, the angle of radiation is 7.5° and the forward gain 11.6 dB. [Note: The angle of radiation will also be a function of the aerial height above ground.—Tech. Ed.]

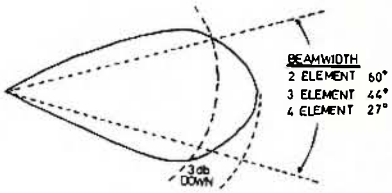


FIG 7 HORIZONTAL PATTERN (Major lobe)

So from these figures you can make up your own mind as to the number of elements you are going to use, and accordingly the size of the aerial you are going to construct.

Regarding the tuning stubs in both the reflector and directors, these may be constructed in various forms, such as inductances or condensers, neither of which I favour, owing to several factors. One is the weight of the coils and/or condensers, another is that the solder joints at these points tend to get brittle after being in the weather for some time under continuous stress. Whereas by using stubs, these are tuned and cut and will not vary due to weathering or break because of movement. After much experimenting, it was found that if we used half the stub in the top of the element and the other half in the bottom, we arrived at a much better electrical balance for the whole aerial. It is not necessary to tune the top stubs provided they are made half the estimated length of the complete stub; then if we tune the bottom stubs we will find that the element will tune as normal with a better electrical balance than is obtainable with only the bottom stubs. If you only use stubs at the bottom of the elements, the quad will still work very well, but it will not be as well balanced, electrically. If you carry out tests you will find that, if you use both top and bottom stubs, the angle of radiation will come down appreciably, depending upon the number of elements you use; but irrespective of the number of

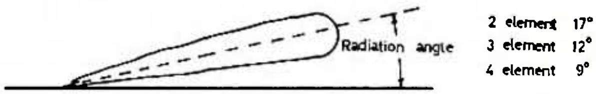


FIG 8 VERTICAL PATTERN (Major lobe)

elements, the lowering of the angle of radiation is worth the effort of putting the extra stubs in your aerial.

So having constructed the reflector and director elements, let us now consider the driven element. This element is the same size as the reflector and directors, but instead of having stubs it is made as a complete loop. Then if we use gamma matching we can feed the element irrespective of its impedance. Also, with gamma matching we can feed three bands with only one feed line and without any peculiar interaction between bands, and still indicate a good s.w.r. on these three bands. The construction of the gamma matching is fairly simple. Fig. 9 is the single-band gamma match. The length of the gamma bar, the size of the condenser, and the spacing of the gamma bar from the element depend on the frequency in use.

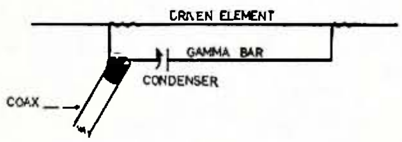


FIG 9 ONE BAND GAMMA' MATCH

Using gamma matches with Quads for more than one band, requires only one feed line if we position it correctly. If we place the feed line half way between the highest and lowest frequency feed points and connect the gamma condensers by an open wire 300 ohm line it will be found that each can be easily tuned. A warning here, do not connect the gamma condensers with co-ax as the capacity of co-ax. is sufficient to prevent properly tuning the gamma condensers. If the 300 ohm open wire is constructed as in Fig. 10, the condensers and the gamma bars will all be supported by the 3" x 1" pine which is attached to the boom.

Incidentally, the safest way to lead the feedline down to the shack without it tangling around the mast, etc., is to run it down the centre of the rotating shaft; then you will be able to turn the Quad more than 360° without fear of the co-ax. getting caught on the mast and breaking.

That is all the hardware and construction details. All that is left is to give a few measurements. Firstly, the boom length. Most people use an element spacing of 8 feet. Maybe this is fair enough for 10 metres, but if you are using 20 metres the spacing will be much better at 11 feet 6 inches. This will give a much better beamwidth and slightly better forward gain. As for 10 and 15 metres, this spacing will be slightly more than optimum and thus the gain slightly less, but as the loss is only about 0.3 dB. it is not worrying.

Owing to the increased spacing we have closed the beamwidth by a few extra degrees and therefore the apparent gain at the receiving point could be greater than expected. On tests carried out on the antenna range, it was not until 0.5λ spacing that there was any loss of signal and, even so, this was only about 0.5 dB. At this point, on a two element Quad, the beamwidth is about 50°, so that in effect we have overcome the 0.5 dB. loss by increasing the spacing. Of course, after we pass 0.5λ spacing the gain drops rather dramatically, and even though the beamwidth closes further, it does not overcome the loss. As 11 feet 6 inches is less than 0.5λ spacing we do not have this problem, and it is possible to use this spacing for a triband, two, three, or four element Quad, and still obtain better than average results.

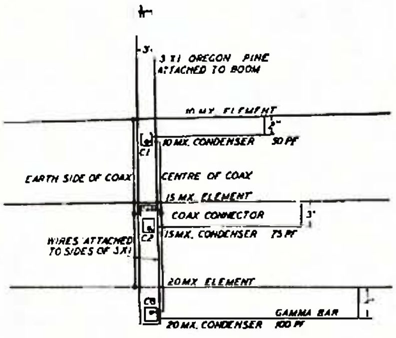


FIG. 10 3 BAND GAMMA MATCH

The length of the sides of the element varies according to which book one reads! Personally, I use the following measurements:

20 mx	16 feet 9 inches
15 mx	11 feet 4 inches
10 mx	8 feet 7 inches

Gamma Bars:

20 mx	38 inches
15 mx	27 inches
10 mx	18 inches

Gamma Condensers:

20 mx	100 pF.
15 mx	75 pF.
10 mx	50 pF.

Reflector/Director Stubs:

20 mx	Same length as gamma
15 mx	bars. Half length top
10 mx	and bottom.

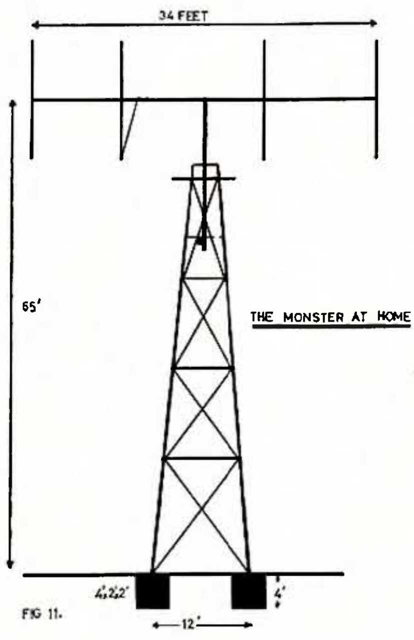


FIG 11.

Finally, to give you some idea of actual performance as compared with a dipole, consistent testing at various times throughout the night and day and allowing for inconsistency in reporting actual S meter readings, has proved that the Quad when "aimed" accurately, gives consistent reports of 26 dB. above the dipole at the DX receiving point which varied from 10,000 to 15,000 miles.

Also, tests carried out against triband Yagis, without giving any indication that they were tests (because of the possibility of people trying to help by giving exalted reports) have indicated a consistently better signal by 12 dB. I think this, in itself, speaks for the efficiency of the beam.

One final thought, if you think this is a big beam, well there is at least one much better. On South America to Sweden point-to-point service they use a 25 element Quad on 11 MHz. with a 254-foot boom on a 184-foot tower and they feed it with 50 kW. Now that, I calculate, to have 32 dB. gain, beamwidth of approximately 5° and about 3° angle of radiation. I wonder; if I put my house on the street and bought the houses on either side, re-possessed the school yard at the back; I wonder?

THE NATIONAL FIELD DAY IS
12th and 13th FEBRUARY, 1973

BUILDING MODERN FILTERS

PART TWO

By "CABBAGE-TREE NED"*

We are justified for our purposes in using the specialist's terms simply as a shorthand if they save wordiness later. So, having seen (Part One) that a synthesised filter is one designed as a whole, let us further agree that:

(a) **Maximally-flat** (or Butterworth) means constant level of response over most of the pass-band, falling smoothly through the 3 dB. point of nominal cut-off.

(b) **Equal-Ripple** (or Chebyshef) means a filter permitting some ripples in the pass-band for the sake of getting much greater skirt-steepness.

(c) **Complete-Ripple** (or Elliptic) is an equal-ripple filter with an optional extra in the form of very useful peaks of attenuation in the stop-band.

(d) **Order of Filter** is the number of sections (each of which may be a parallel-pair or a series-pair) as occurs in the Butterworth bandpass.

SPECIFICATIONS—STATING WHAT YOU WANT

The filters we aim at are sufficiently described if any **three** of the following four quantities are stated:

(a) Ratio $f_S \div f_{CO}$, which defines the skirt steepness (f_S is the frequency at which the desired number of dB attenuation is first reached).

(b) Order of Filter, N: i.e. number of elements or sections.

(c) Maximum Allowable Ripple in the pass-band: A_{MAX}.

(d) Minimum Attenuation needed in the stop-band: A_{MIN}.

NORMALISING

This is simply a process of scaling both impedance and frequency to more convenient values, so that **one set** of tables or graphs will serve to find the L and C values for **any** filter of a given type.

The normalised element-value in the tables is to be thought of simply as a reference-value.

For instance, the only difference between a 1 kHz. filter and a 10 kHz. filter is that all L and C values are 10 times as large in the 1 kHz. model as the 10 kHz. model. Similarly, on the impedance score, the element values in a 100-ohm filter differ from those in a 300-ohm filter only by a numerical factor, 3 in this example.

Most conveniently the tables normalise element values as if the filter were working into a 1-ohm load, with a cut-off frequency of one cycle/sec. (Hz.).

Then, to obtain the real circuit values we "de-normalise". That is, we must:

(a) Divide all L and C by the actual frequency;

(b) Multiply all R and L values by the actual impedance;

(c) Divide all C values by the actual impedance.

In symbols:

$$L_{ACTUAL} = L_T \frac{\text{Actual Impedance}}{\text{Actual Frequency}}$$

$$= L_T \frac{Z}{f}$$

$$C_{ACTUAL} = \frac{C_T}{f\,Z}$$

where the subscript $_T$ means normalised or table values.

IMPEDANCE MATCHING

All lossless filter circuits can be designed to work for any chosen ratio of output impedance to input impedance, but different ratios imply different element values.

Hence to be realistic as to size of table, we must severely limit our choice to suit only the most common needs. Thus our tables will provide only for two types of filter impedance:

(a) **Voltage Source**: Implying low source impedance and hence a "stiff" voltage that changes negligibly as load alters. Here the tables are for R_S (source) = 0, and R_{LOAD} = 1.

(b) **Power Source**: Maximum power transfer is required. Hence R_S = 1 ohm = R_L in the tables.

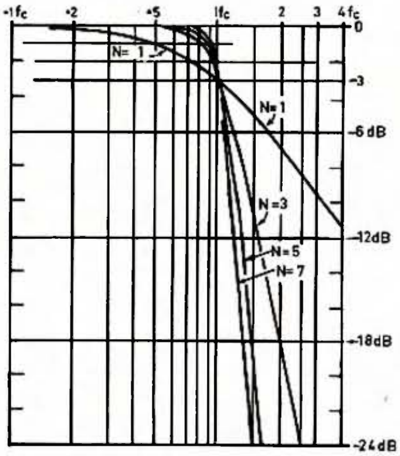


Fig. 1.—Frequency Response (attenuation v. frequency) of Butterworth Low-Pass Filters.

f_c = Cut-off Frequency.

N = Number of Elements.

If the response must be flat within, say, 1 dB. to a given frequency, f_c will have to be considerably higher, e.g. if a 3 element filter is to be not more than 1 dB. down at 15 kHz., the curves show that 15 kHz. must occur at 0.8 of f_c, so we make f_c = 19 kHz.

VITAL PRECAUTIONS

The user must observe the following two rules if he is to reap the reward of predicted performance:

(a) A filter will only operate properly when driven from its proper source, and into its designed load. Failure to do this almost invariably worsens the performance.

(b) Do not use ordinary commercial r.f. chokes. Wind the coils in self-shielding pot-cores, and use polystyrene, mica, or polycarbonate capacitors, or back-to-back tantalums for the large C values often required at very low audio frequencies (few hundred Hz.).

MAXIMALLY-FLAT FILTERS (Fig. 1)

Low-Pass and High-Pass

The rate of change of attenuation of the sloping **skirts** of the response is 6N dB/octave, where an octave means a doubling of frequency, and N is the order of the filter (or number of elements).

Thus the flat filter of the last article had five elements, as it was needed that the skirt should slope or fall 30 dB. within 1 octave of the cut-off frequency of 3.5 kHz. That is, frequencies beyond 7 kHz. should be down in magnitude by a factor of 1,000 in power.

Band-Pass

The important notions are:

Bandwidth = B-W = f_H — f_L = high freq. cut-off — low freq. cut-off.

Centre frequency = f_{CN} is the geometric mean of the upper and lower 3 dB. or cut-off frequencies.

It appears further on as: $f_{CN} = f_H\, f_L$.

The B-P filter is commonly composed of:

(a) Series-connected L and C in the series arm;

(b) Paralleled L and C in the shunt arm.

If these pairs of elements are chosen to be resonant in the pass-band, the series-arms will be low impedance and often no opposition to the transmission of signal, while the shunt arms will be high impedance and prevent leakage of the signal through a path parallel to the load.

On either side of the pass-band, of course, both series and shunt arms will prevent signal from reaching the load —as desired in a B-P filter.

PERSPECTIVE

The writer freely admits, by the way, that the simplest—where it will do the job—is the best. The double-tuned transformer adjusted for critical coupling is the simplest of all approximations to maximal flatness. Hence its

* VK3ZRQ, A. G. Birch, 5 Harrison Street, Bendigo, Vic., 3550.

use in commercial apparatus unless more exacting requirements demand a more costly filter.

Example 1

Consider a typical set of filters to provide band separation at audio frequencies, as in a cross-over network:

Specifications:

3 dB. cut-off frequencies—
LP 500 Hz.
HP 1500 Hz.
B-P: f_L = 500 Hz.
f_H = 1500 Hz.

Skirt steepness: Response is to fall off by 18 dB. within 1 octave of cut-off.

Impedance: Filter is to work from a voltage source into an 8-ohm load.

Solution: Since 18 dB. must equal 6N dB., we must have N = 18 ÷ 6 = 3 sections.

Low-Pass Section

Since the signal source is a voltage type, enter Table 2, voltage-source filters, at N = 3, and read off the normalised values of L and C.

As directed earlier, de-normalise these figures to obtain the real circuit values:

$$L1 = \frac{0.238 \times 8}{500} = 1.272 \text{ mH.} = 1.27 \text{ mH. (approx.)}$$

$$L2 = \frac{0.0795 \times 8}{500} = 3.808 \text{ mH.} = 3.81 \text{ mH. (approx.)}$$

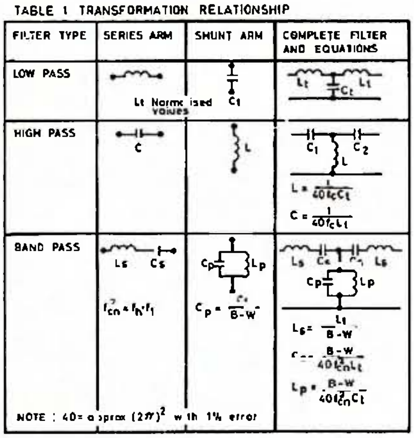
$$C = \frac{0.212}{500 \times 8} = 53\ \mu\text{F.}$$

Transforming the Low-Pass to a High-Pass or Band-Pass Model

This may seem like gambling that a ghost will turn out to have substance. Nevertheless, it can be shown quite rigorously that the pictorial summary given in Table 1 presents a valid set of instructions.

Following the Table, we shall transform the LP filter of the last paragraph into a HP section, and a band-pass section in that order.

TABLE 1 TRANSFORMATION RELATIONSHIP



High-Pass Section: Find, in Table 1, the two simple instructions for transforming the normalised low-pass L-value into a high-pass C-value, and similarly the low-pass C-value into a high-pass L-value. The f_c-value appearing in these two instructions must, of course, be the proper HP cut-off frequency, here 1500 Hz. The L and C values so obtained must be finally scaled by the impedance factor as shown in the tabulated calculations of Table 1A for our filter.

The resultant cross-over network is shown in Fig. 2.

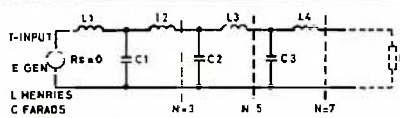
(Continued on Page 19)

Normalised L-P Values	H-P Values for 1 Ohm	Real-Circuit Values for H-P
L_{T1} = 0.238 H.	$\frac{1}{0.238 \times 1500 \times 40} = 70.2\ \mu$F. $= \frac{70.2}{10^6}$ F.	Divide by Z = 8 (because we are finding a capacitance). Obtain C1 = 8.8 μF.
L_{T2} = 0.0795	$\frac{1}{0.0795 \times 1500 \times 40} = \frac{210}{10^6}$ F.	Scale for Z = 8. Obtain C2 = 26.2 μF.
C_T = 0.212	$\frac{1}{0.212 \times 1500 \times 40} = \frac{0.0785}{10^3}$ H.	Multiply by Z = 8, since we are finding an inductance value. Obtain L = 0.628 mH.

Table 1A.

Band-Pass Section:		(Multiply L's by 8) (Divide C's by 8)
$L_{S1} = \frac{0.238}{1000}$	= 0.238 mH.	1.9 mH.
$C_{S1} = \frac{1000}{40 \times 750{,}000 \times 0.238}$	$= \frac{1}{7.14 \times 1000}$ = 140 μF.	17.5 μF.
$L_{S2} = \frac{0.0795}{1000}$	= 0.0795 mH.	0.636 mH.
$C_{S2} = \frac{1000}{40 \times 750{,}000 \times 0.0795}$	= 420 μF.	52.5 μF.
$L_P = \frac{1000}{40 \times 750{,}000 \times 0.212}$	= 0.157 mH.	1.26 mH.
$C_P = \frac{0.212}{1000}$	= 212 μF.	26.5 μF.

Table 1B.



Filter Order N	Element Values	L1	C1	L2	C2	L3	C3	L4
3		0.238	0.212	0.0795				
5		0.245	0.269	0.220	0.142	0.049		
7		0.248	0.268	0.263	0.222	0.168	0.104	0.0357

Table 2.—Voltage Source

Filter Order N	Element Values	L1	C1	L2	C2	L3	C3	L4
3		0.159	0.318	0.159				
5		0.0983	0.258	0.318	0.258	0.0983		
7		0.0708	0.199	0.286	0.318	0.286	0.199	0.0708

Table 3.—Matched Filters (R_S = 1 ohm = R_L)

Commercial Kinks

With Ron Fisher,* VK3OM

THE FT200, Part 4

It seems that FT200 mods will go on for ever, at least I rather hope they will. Two letters just to hand are from Phil VK5NN and Kerry VK5SU, both of whom report on modifications and adjustments they have made. First off, over to Phil.

"Further to the valuable material already published, there are several matters which appear to require attention and for which solutions are not yet available. Everybody wants information, but it seems most are quite happy to wait for Yaesu to come out with new mods for all to copy. I am numbered with the many as time is at a premium, but here are a few tips on the adjustment of the FT200 which may overcome common defects:

Balancing of Product Detector Injection

"After replacement of L106 in the cathode of the product detector V102 by a 10K resistor, the set sometimes lacks sensitivity, and even on some unmodified sets there are complaints of this; also the fact that the S meter gives different readings on the various bands. It has been found necessary to re-balance the b.f.o. injection by adjusting C165. This, of course, is difficult as this component is only a few pF. of twisted wire between pins 2 and 8 of V102 (12AX7). This may be done by putting in two pieces of wire ½" longer than the original ones, but as the adjustment is best done by reducing capacitance, a 1-4 pF. trimmer is preferred. A small 'Polar' concentric capacitor was used with 40% of the plunger screw removed.

"To adjust correctly, first remove the antenna co-ax plug and switch to 21 or 28 MHz. Screw in C165 until there is an increase in the S meter reading due to an excess of b.f.o. signal on the a.g.c. tube. Now slowly reduce C165 to the point where the S meter is just back to zero. You can hear the receiver sensitivity come up to maximum. The calibrator may be used as a strong signal source on 3.6 MHz. and a weak signal source on 28 MHz. This adjustment is recommended to those who have complaints about the FT200 S meter.

Setting the BFO/Carrier Oscillator Frequencies

"Most FT200s and FT101s give very good clean signals when seen on a spectrum analyser, but there are some that sound rather low pitched and the speech is therefore indistinct. The manual simply says that the carrier crystals should be adjusted for best speech quality, but gives no instruction as to how this is best done.

"The filters employed in these transceivers are not always symmetrical, but are good enough to produce good crisp speech on all bands with either upper or lower sideband. The filter has three peaks, the outer two about 1.8 or 1.9 kHz. apart and the third somewhere in between. There may be 6 to 8 dB. of difference between them, but this appears to be of little consequence.

"Setting the carrier crystals can be done by means of a plastic knitting needle sharpened as a screw driver to go between the slots in the top cover for adjusting the trimmers adjacent to the carrier crystals. Remove the antenna plug, zero the S meter and use the calibrator crystal as a signal for alignment on the 3.6 MHz. band. Tuning through the signal the peaks should appear at about 600-700 Hz. for the lower one and 2400 Hz. for the upper one. Adjust the r.f. tuning for a 20 dB. over S9 indication on the S meter, then tune down in beat frequency until zero beat gives a pulsation on the meter between S3 and S5, dropping to zero as the beat note rises in pitch when the signal slides further down the skirt of the pass-band.

"Repeat with the sideband switch in the reverse position, adjusting the input signal lower peak to 20 over S9 again if the peaks are not symmetrical—as usually they are not. Re-adjust the carrier frequency trimmers until you achieve a result something like the above for both the normal and reverse sidebands. The zero beats should then be about 3 kHz. apart on the main dial.

"Similar tests may be done with many other makes of equipment with worthwhile results. This test costs nothing and requires no test equipment. If you have either an audio signal generator, piano, or even a guitar, you can check where the peak frequencies lie. The lower peak is about D sharp or E above middle C, and the upper peak two octaves higher.

"This series of adjustments will change the sound of a transmission from what could best be described as muffled, to one which can be said to have 'presence' even with only 2.7 kHz. of band width."

* * *

Over now to Kerry VK5SU who has worked out a few very simple but interesting modifications.

Peak-Reading Type of Meter

The action of the meter can be slowed down and made into a peak-reading type by connecting a 100 μF. electrolytic condenser across the meter terminals. As the voltage across the meter is very low, a ten-volt working type would be quite large enough.

Kerry reports that the a.l.c. indication is now slowed down and easier to read.

Sensitivity on 28 MHz.

Sensitivity is a problem on the 28 MHz. band. Kerry makes the suggestion that amongst other things the oscillator injection at the 6U8 is insufficient, and that perhaps a buffer amp. after the heterodyne oscillator could be tried. However, one way round the problem is to substitute a 6GM6 for the 6BZ6 r.f. amplifier stage. The 6GM6 has a gm. of 13,000, quite a bit up on the 6BZ6. The following changes need to be made to the circuitry round the r.f. stage.

(a) A resistor of about 66 ohms across the 6CB6 filament which is wired in series with the new 6GM6, to balance heater voltages.

(b) Replace the existing 100 ohm cathode resistor R25 with one of 56 ohms.

(c) Replace R32 1K ohm decoupling resistor with one of 1.5K ohms in order to bring the h.t. down to 125 volts for the 6GM6.

(d) Wire a 3.9K ohm resistor in parallel with R24, the 15K ohm screen divider, to increase to 125 volts the voltage on the 6GM6 screen.

Finally, Kerry passes on a hint to improve the insulation of the e.h.t. wiring. After an h.t. short one night, Kerry traced the fault to the bolt holding the r.f. choke in the final compartment. The bolt was just long enough to cause an arc to the lug anchoring one end of the r.f. choke winding. Cure: Put a spacer washer under the choke.

Kerry is also the proud owner of an FT-DX401 and with a bit of luck might be tempted to come up with a few ideas on this set in the near future.

* * *

I seem to run out of space each month, just when I really get going. In other words, the Trio modifications will have to wait until next month. To all those who have written to me for carphone circuits, I am getting these out as fast as I can, however sometimes there is an unavoidable delay of a week or two before I can arrange copying of them.

* 3 Fairview Avenue, Glen Waverley, Vic., 3150.

NEW TRANSCEIVER FROM YAESU!

MODEL FT-75

YAESU

Compact,

Solid State,

80-10 mx,

SSB and CW

This small size Transceiver, with a choice of FP-75 AC Power Supply or DC-75 DC-DC Converter, enables home station or mobile installation in a minimum of space. All solid state except transmitter driver 12BY7 and PA 12DQ6 valves. PEP output, 30 watts max. Tappings on the power transformer HT secondary enable transceiver power to be reduced if required. The transceiver is crystal controlled, with VXO to pull crystal frequency a few kHz., from approx. 3 kHz. on 80 mx to 15 kHz. on 10 mx. Optional VFO, type FV-50C, available for full coverage home station use.

Pre-tuned driver and PA circuits reduce controls to a minimum; just switch on, press the mic. button and talk! Simple and safe mobile operation. Noise blanker and squelch incorporated.

Makes an ideal exciter for VHF transverter.

Three crystal channel capability for each band, with three push button channel selector switches, plus one for VFO selection. One crystal is provided for each band except 20 mx. Extra crystals available.

Sidebands are automatically selected: LSB 80 and 40 mx, USB 20, 15 and 10 mx.

Front panel: Bandswitch, eight push buttons for crystal selection, ext. VFO, and power control switching; VXO control, meter, mic. socket, noise blanker, squelch, AF gain, and RF gain.

Rear panel: Antenna, power, and VFO sockets; meter switch.

Meter functions as S meter on receive, PA cathode current or relative RF output on transmit. Panel lights indicate channel or switch in use.

Separate heater switch enables reduction of current drain on battery operation, when receiving only.

Transceiver includes a PTT mic., antenna plug, key plug, and four crystals for 3565, 7085, 21400 and 28550 kHz. A total of 15 crystals may be installed, three for each band.

See review article, September 1972 "Amateur Radio".

SPECIFICATIONS

Transmitter power input, 60 watts max.
Transmitting modes, SSB and CW.
Antenna impedance, 50 ohms unbalanced.
Carrier suppression, better than 40 dB.
Sideband suppression, better than 40 dB. at 1 kHz.
Transmitter audio bandwidth, 400 - 2700 kHz., plus or minus 3 dB.
Crystal filter, 5173.9 kHz.
Receiver sensitivity, better than 0.5 uV. for 10 dB. S/N.
Image ratio, better than 50 dB.
Selectivity, 2.3 kHz. at —6 dB.; 4.5 kHz. at —60 dB.
Audio output impedance, 4 ohms.
Audio output power, 1.8 watts at 10% dist.
Operating voltages: FP-75 (AC PS), 117v. or 234v. AC 50-60 Hz.
DC-75 (DC PS), 13.5v. DC neg. earth.
Current drain on DC:
Receive (heaters off), 0.3 amp.
Receive (heaters on), 1.4 amp. Transmit peak, approx. 6 amp.
Valves & semiconductors: 2 valves, 16 transistors, 6 FETs, 3 ICs, 23 diodes.
Dimensions:
FT-75, W 210 mm. (8¼") x H 80 mm. (3") x D 300 mm. (12").
FP-75, W 210 mm. (8¼") x H 80 mm. (3") x D 300 mm. (12").
DC-75, W 210 mm. (8¼") x H 65 mm. (2½") x D 170 mm. (6¾").
Weight:
FT-75, 3.8 Kg. (8½ lb.); FP-75, 4.5 Kg. (10 lb.); DC-75, 1.46 Kg. (3½ lb.).
Cabinet finish: two tone grey, silver edging.
Both power supplies have built-in speakers, with black Arlon cloth grille; and power cables with high quality multi-contact plugs attached. DC-75 includes a mobile mount bracket.

PRICES: FT-75 $289. FP-75 $49.90. DC-75 $49.90. FV-50C $39.90.

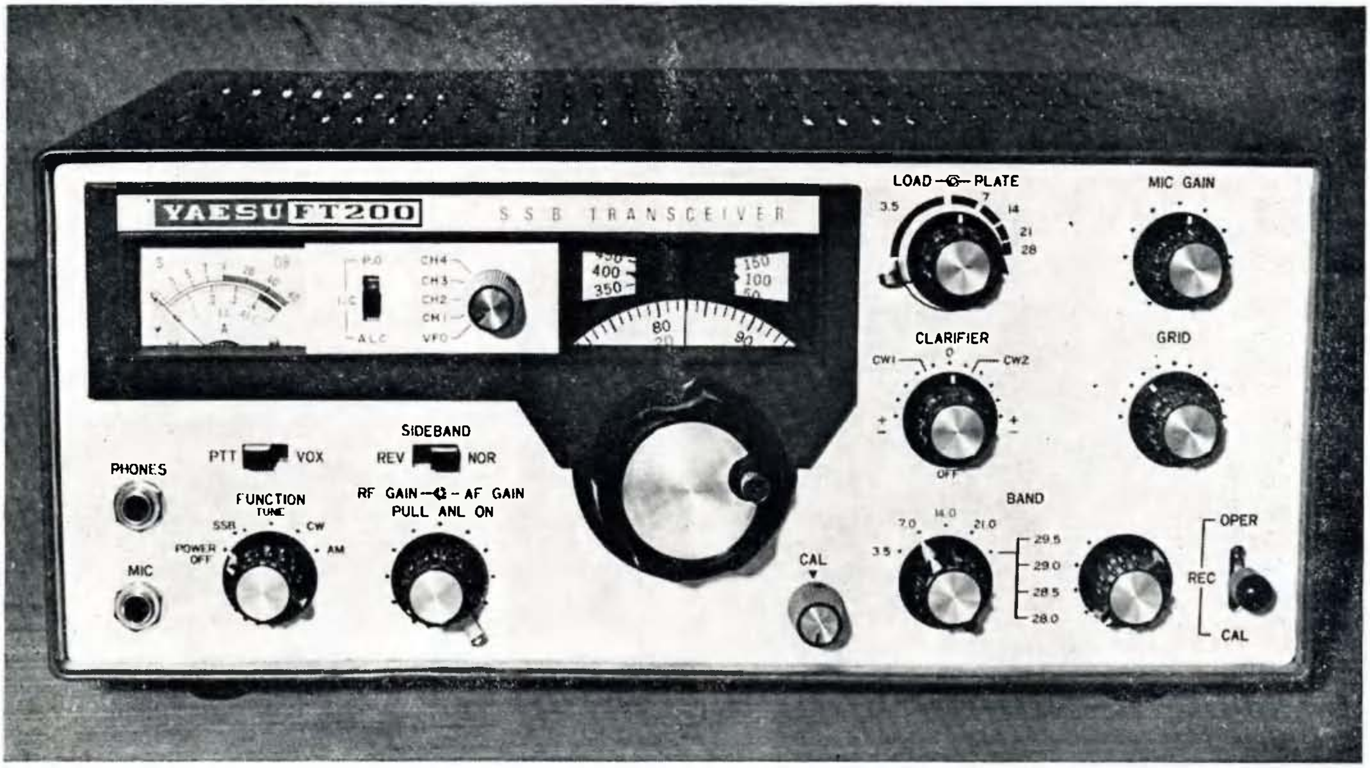
All Prices inc. S.T. 90-day warranty. Freight is extra. Prices and specs. subject to change without prior notice.

Australian Agents—

BAIL ELECTRONIC SERVICES

60 SHANNON STREET, BOX HILL NORTH, VIC., 3129. Telephone 89-2213

N.S.W. Rep.: **STEPHEN KUHL, P.O. Box 56, Mascot, N.S.W., 2020.** Telephone: Day 667-1650 (AH 371-5445)
South Aust. Rep.: **FARMERS RADIO PTY. LTD., 257 Angas St., Adelaide, S.A., 5000.** Telephone 23-1268
Western Aust. Rep.: **H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152.** Telephone 60-4379



YAESU

ECONOMICAL SSB! *from YAESU*

FT-200 FIVE-BAND TRANSCEIVER

A superb quality, low cost, versatile transceiver. Covers 80-10 mx, tuning range 500 Kc. each band. On 10 mx, crystal supplied for 28.5-29 Mc. (Crystals available optional extra for full 10 mx coverage.) SSB, CW, AM; with a speech peak input of 300w. Transistorised VFO, voltage regulator, and calibrator. 16 valves, 12 diodes, 6 transistors. PA two 6JS6A pentodes. ALC, AGC, ANL, PTT and VOX. Calibrated metering for PA cathode current, relative power output, and receiver S units. Offset tuning ±5 Kc. Uses a 9 Mc. crystal filter with bandwidth of 2.3 Kc. at —6 db. Selectable sidebands, carrier suppression better than —40 db. Sideband suppression better than —50 db.

Provision for use of optional external VFO, FV-200. VFO includes fixed channel facility.

Operates from conservatively rated separate 230 volt 50 c.p.s. AC power supply, FP-200, which includes built-in speaker. A 12 voit DC power supply, DC-200, is also available. Transceiver incorporates power take-off and low level R.F. drive outlets suitable for transverters.

Latest model includes (1) provision for use of external VFO FV-200, and (2) factory installed key-click filter.

Cabinet finished in communication grey lacquer. Panel, etched, satin finish aluminium.

FT-200 Transceiver	$395
FP-200 AC Power Supply	$90
DC-200 DC Power Supply	$135
FV-200 External VFO	$115
M-200 Mobile Mount	$14

Prices include S.T. Freight is extra. Prices and specs. subject to change.

All sets checked before despatch. After sales service, spares availability, warranty. All Yaesu sets sold by us are complete with plugs, power cables, English language instruction manuals, and three-core AC cable and 3-pin plug installed where applicable.

Sole Australian Agent:

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Western Aust. Rep.: **H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152.** Telephone 60-4379

NEWCOMER'S NOTEBOOK

With Rodney Champness,* VK3UG

LEARNING MORSE CODE

Part 1, Receiving

Many people have trouble learning Morse Code, and I freely admit I did too. I have heard some say that they cannot learn Morse Code, that it is useless and if a full Amateur licence were obtained they would not use Morse anyway.

To those who do claim that it is impossible for them to learn Morse to 10 w.p.m., all I can say is that if you brain-wash yourself in this anti-way, I cannot help you. If, though, you are prepared to assert yourself to the learning of Morse with an unbiased attitude, you will pass the Amateur Morse with little trouble. Like anything worthwhile, such as studying for the theory part of the exam., it takes time to become proficient. After all, the certificate we sit for is called a Certificate of Proficiency.

What is the value of Morse in this day and age where teleprinters and other exotic modes of communications are the in thing, and Morse is old hat, "obsolete"? The points I see for Morse Code are as follows:

(1) A sense of achievement; after all it is a thrill to pass after the 20th try at a Morse exam.

(2) It is the most effective DX mode that is easily used, and the most effective for the Oscar Satellite.

(3) The equipment is simple, but effective.

(4) The satisfaction of a quiet QSO without every vahoo eaves-dropping.

There is one reason why I didn't use Morse after obtaining my full call. **Fright**. Yes, that is right, being plain scared of it and of how any seasoned operator would treat me if I dared call. Don't worry, I've used QRS many times, the best operators don't mind at all. It's a long story, I do use Morse on occasions now—I am not the fastest or slowest, but I do try to make my sending of as high a quality as I can. I use an ordinary hand key as well as an electronic keyer.

The first part of this article has been to show you why I think Morse is worthwhile and to the limited extent the troubles I had learning to the standard required for a pass. Now the hard facts on how long you can expect to take to become proficient in the speed range 10 to 14 w.p.m. It pays to be a bit better than the exam. speed to allow for exam. jitters. If you are prepared to do half an hour of receiving practice at least four days per week, the A.O.C.P. should be within your grasp in about six months.

How do you learn to receive Morse Code? You undoubtedly have heard Morse on your own or someone else's short wave receiver. Speech is a sound method of communication and so is Morse. Each is picked up and automatically analysed by your brain and transformed into intelligence — it is hoped. This means that Morse, like English, is a sound language and therefore should be learnt as such. For instance, the letter "V" is "d'd'd'dah" not "dot dot dot dah", the letter "P" is "d'dah dah dit" not "dot dash dash dot", and "E" is "dit". From this it will be observed that when a dot is at the end of a character it is pronounced as "dit", but wherever it is followed by some other element it is pronounced as "d' ".

You should learn each letter in a rhythmical singing way. Everyone around your household will think you've finally gone round the bend. Who cares, you want to learn the Morse so let them think what they like.

Having learnt each letter of the alphabet, the numerals and a few punctuation marks, etc., in all about 40 to 45 characters, you will be ready to start taking slow Morse. This may be from tape recordings, disc recordings, a friend's sending, or reception off the air. Before doing this, get some patient person to ask you letters, numerals, etc., at random. This will help you get away from the parrot fashion memorising of the alphabet. Having satisfied yourself on this point, now is the time to get down to serious practice to get your speed up.

It then becomes necessary to receive Morse Code at about 5 w.p.m. You should read this with difficulty. Where do you get this practice? The N.S.W. Division of the W.I.A. run Morse on VK2BWI nightly on a frequency of 3550 kHz. nominally from 7.30 p.m. local time with speeds from 5 to 18 w.p.m. This is good copy in the winter months at least for the Eastern States. Copy may be difficult in summer due to static, etc.

ZKY, the Royal New Zealand Air Force station, on frequencies of 3236 and particularly 6885 kHz., should be good copy at times. Eastern States Summer Time, the transmissions start 8 a.m. for $1\frac{1}{4}$ hours, and 5.15 p.m. for $\frac{3}{4}$ hour. Reports on this transmission would be appreciated by the Air Force. They transmit m.c.w. with a power of 300 watts.

Tapes are available from various Amateurs and I suggest you consult the Divisional Directory on page 3 of March 1972 "Amateur Radio" for further details.

I have been informed that the Youth Radio Club Scheme also have tapes available. I would suggest that you contact your State Supervisor for details. Their call signs are shown in the Directory mentioned above. For Morse records I would suggest a recently advertised course. A review of those available may appear in "A.R." soon I believe.

That's about all on the receiving side. Part 2, "Sending", will appear soon. In the meantime don't try sending; concentrate on receiving; **don't** buy one of those "beginner's" Morse keys. The ones I have seen are unsuitable for beginner and old-hand alike. More of this in the second part.

* * *

Following on the first article on converting old radios, how does the thought affect you of converting an old mains radio into a low power 160 metre or 80 metre transmitter, using very few parts other than those already in the set?

As mentioned last month, I have just shifted location and my workshop is not yet in being, so for the moment I must concentrate on the theory side of "Newcomer's Notebook". There are a number of simple accessories coming up for use in converted domestic radios, and this will be the follow up on the conversion of these sets, recently described.

* 44 Rathmullen Road, Boronia, Vic., 3155.

FEDERAL W.I.A. NEW ADDRESS:
P.O. BOX 150,
TOORAK, VIC., 3142
Victorian Division address is unchanged as P.O. Box 36, East Melbourne, Vic., 3002.

"20 YEARS AGO"

With Ron Fisher, VK3OM

Two excellent technical articles were featured in the December 1952 issue of "Amateur Radio". A Phasing Type Single Sideband Suppressed Carrier Exciter by N. Southwell, VK-2ZF, probably represented the ultimate in technical thinking of the time. In 1952 only a handful of Amateurs were using s.s.b. and probably most of the others thought it a passing fad; after all, how could you improve on a.m. The circuit basically consisted of a pair of 6SN7s as balanced modulators driving a 6BA6, with an 807 in the final. Full details of the design of the phase shift network were included.

Hans Albrecht, VK3AHH, described his simple v.f.o. with temperature compensation. A good deal of design data was included on the calculation of bandspread tuning and on the selection of the correct degree of temperature compensation. A very complete article containing information that could be hard come by even these days.

A front cover advertisement announced the arrival of the Innoval series of valves. Developed in Australia by Philips, the following types were included: 6V4, 6M5, 6AN7, 6N8, 6BD7, 6BH5 and 6AD8.

The Editorial page looked back over the preceding twelve months and opened with the following paragraph: "Over the past twelve months it is gratifying to note that in the realm of Amateur Radio events have taken place not only indicating the true Amateur zest and enthusiasm for his hobby, but also his willingness and ability to organise and function emergency communications in time of need." Quite a tribute.

Federal Executive Proceedings reported on the following: Request for Divisional status by VK9 Amateurs; emergency network plans for Civil Defence; disposition of unclaimed QSL cards; 1956 Olympic Games suggestions; Federal Policy Book; combining of Federal and Uniform Divisional Constitutions, and finally standard log sheet.

The best DX bands for the month were 7 and 14 MHz. The DX page edited that month by VK7RK for the first time, showed that 21 MHz. was still improving with Europeans peaking at 1000 to 1100z. The 10 metre band was still at a very low ebb, with the only report of activity coming from VK4XJ.

Y.R.C.S.

With Bob Guthberlet*

Following the request made by the Conference of State Supervisors, the appointment of Rex Black, VK2YA, as convener of a Standards and Syllabus Committee, is confirmed. The matter of a "Novice Licence" may influence certain trends in our syllabus. In the meantime, we can be confident that Rex and his committee will appraise the general situation to the end that in due time we may achieve standardisation.

After months of preparation, correspondence, etc., there appears to be a strange silence regarding the fate of "Novice Licensing". The introduction of such a licence would be a real shot in the arm for Y.R.C.S. It would give a boost to the electronics industry in Australia, as it has done in the United States. Perhaps some crystal gazing prophet will break the silence and make a forecast. Who knows?

Allen Dunn, S.A's Supervisor, has conveyed the news that Bert Grove of the Elizabeth Radio Club has accepted the position of Editor for "Zero Beat". Thanks, Bert.

Quest for Projects. Many of our clubs have instructional and interesting bits of equipment. It would be helpful to many instructors if we could pool such ideas. If clubs will send me copies of circuits and constructional details, I will undertake compiling a brochure for distribution to all States.

* Federal Y.R.C.S. Co-ordinator, Methodist Manse, Kadina, S.A., 5554.

NEW CALL SIGNS

AUGUST 1972

VK1ZBL—B. F. Lavery, 65 James St., Curtin, 2605.
VK1ZRB—R. F. Blyton, 21 Glasgow Pl., Hughes, 2605.
VK2ZW—A. J. Perkins, 4 May St., Sawtell, 2452.
VK2ADR—D. W. Reed, 22 Rundle St., Ulladulla, 2539.
VK2BDW—W. E. Dunn, 53 Mississippi Ave., Seven Hills, 2147.
VK2BOH—R. Baty, 66 Coorienbah Heights Rd., Engadine, 2233.
VK2BXX—C. M. Walker, 10 Trigalana Pl., Frenchs Forest, 2086.
VK2ZDY—D. R. De Cean, 25 Blacket Dr., Castle Hill, 2154.
VK2ZXB—F. R. O'Hare, 805 Henry Lawson Dr., Picnic Point, 2213.
VK3BY—J. W. Williamson, 30 Latona Ave., Knoxfield, 3180.
VK3JN—J. N. Blake, 7 Josephine St., Oak Park, 3046.
VK3MV—M. A. Hibbett, 15 Yanigin Dr., Glen Waverley, 3150.
VK3AXK—B. J. Kemp, 3 Cedar Crt., Glen Waverley, 3150.
VK3BGN—R. W. Rogers, Station: 31 Thompson Crt., Werribee, 3030; Postal: P.O. Box 30, Werribee, 3030.
VK3BGT—H. J. Brice, 94 Jasper Rd., Bentleigh, 3204.
VK3YGY—D. J. McManus, Barkers Creek, via Castlemaine, 3458.
VK3YHA—L. MacDonald, Geelong Rd., Buninyong, 3357.
VK3ZEE—K. G. Burlinson, 9a Park Cres., Fairfield, 3078.
VK3ZST—K. M. Stephens, 6 Cameron Ave., Mildura, 3500.
VK4OO—F. E. Griffith, 5/5 Laycock St., Surfers Paradise, 4217.
VK4ZD—R. Catton, No. 4 Lodge Flats, Cr. Burgess and Edmund Sts., Caloundra, 4551.
VK4ZAT—R. J. Kerle, 32 Evan St., Mackay, 4740.
VK4ZAV—R. F. Beak, 69 Koorong St., The Gap, 4061.
VK4ZFC—T. D. Gregory, Danga, Welpa, 4874.
VK6CH—C. A. Hermiston, Station: O.T.C., Carnarvon, 6701; Postal: P.O. Box 706, Carnarvon, 6701.
VK6HH—Hamilton Senior High School Amateur Radio Club, Purvis St., Hamilton Hill, 6163.
VK6HZ—R. L. Huisenga, 16 Ningaloo St., Exmouth, 6707.
VK6WF—R. Wawzynski, U.S. Navcomsta Holt, Exmouth, 6707.
VK8KS—K. C. Smith, Station: 2 Stasinowsky St., Alawa, Darwin, 5794; Postal: P.O. Box 2099, Darwin, 5794.
VK8PF—J. McWood, 25 Johannsten St., Alice Springs, 5750.
VK9LP—L. Pedrini, Station: Mobile; Postal: P.O. Box 88, Lae.

THE ROSS HULL VHF CONTEST IS NOW

CONTESTS

With Peter Brown,* VK4PJ

JOHN MOYLE MEMORIAL NATIONAL FIELD DAY

Some comments on the rules published here. You will note that I have not gone ahead with the proposal to use repeaters. I received comment from members who may have stood most to gain and as they were not keen on the idea it has been dropped.

V.h.f. operators please note the Section (e) which I trust will appeal to you. Please give it a good trial. The scoring rate has not been altered although mobiles may make more than one contact with the same mobile station with the usual 2-hour space. There should be some high scores in this section. "Drive carefully".

Apart from the mobile section, rules are as last year with the one important exception—c.w.-c.w. contacts count double. I am looking forward to some overseas interest and you might comment in your log.

Look out for the ZLs on 80 and 40 metres. It is their Field Day. I include some of Jock's (ZL2GX) comments: ". . . our National Field Day is primarily a means of simulated emergency practice . . . for example, the use of emergency power . . . to be under temporary shelter . . . use of only 80 and 40 . . . choice of time is designed to help cater for others who might be involved . . . such as wives, their co-operation is very desirable . . . and I know of many who go out and make the operation a picnic one." Whatever serial number you receive will be okay. If the ZLs can make it a picnic day, why not you???

Get some of your friends together and have a good day. Remember that certificates have been offered to the two overseas stations with the greatest number of Portable or Mobile Australian contacts. I wonder if we will get any mobile/mobile DX?

ROSS HULL MEMORIAL VHF-UHF CONTEST, 1972-73

I trust that the rules for the next contest were to your liking and that you have already checked your rig for the arduous time ahead. If it is not to be an arduous time, I am sure that those having such a time will be appreciating a call from you.

The contest may even be under way now. If we go to round figures in metric, what do you suggest? Move up or move down; what range?

CONTEST DATES

Ross Hull: On now. 1401 GMT 4th Dec., 1972, to 1400 hrs. GMT, 21st January, 1973.

John Moyle National Field Day: 0600 GMT, 10th Feb., 1973, to 0800 GMT, 11th Feb., 1973. The second week-end in February.

Remembrance Day 1973: August, get that c.w. operational, not much time.

* Federal Contest Manager, Box 638, G.P.O., Brisbane, Qld., 4001.

John Moyle Memorial National Field Day Contest, 1973

The Wireless Institute of Australia invites Amateurs and Short Wave Listeners to take part in this contest which is held in memory of a great supporter of the Institute, John Moyle. John passed away not long after returning to Australia after representing us at an International Conference.

This contest is either an individual effort or a group effort. There are two Divisions (parts) of this contest, one of 24 hours' continuous operation, and one of six hours' continuous operation, within the 26 hours available.

DATES AND TIMES

From 0600 GMT, February 10, 1973, to 0800 GMT, February 11, 1973.

OBJECTS

The operators of Portable or Mobile Stations within VK call areas will endeavour to contact other Portable or Mobile and Fixed Stations in VK, ZL and foreign call areas.

RULES

1. In each Division, 24-hour or 6-hour, the operating period must be continuous.

2. In each Division there are seven sections:
(a) Portable, fixed field station, transmitting, phone.
(b) Portable, fixed field station, transmitting, c.w.
(c) Portable, fixed field station, transmitting, open.
(d) Portable, fixed field station, transmitting, open, multiple operation.
(e) Mobile, transmitting, phone.
(f) Fixed transmitting stations.
(g) Receiving of portable and mobile stations.

3. Contestants must operate within the terms of their licence.

4. A Portable, fixed field station must operate from a power supply which is not used to move a vehicle or which is not connected to a permanent installation.

5. A Mobile station must be installed in a vehicle.

6. No apparatus used by a field station may be set up on site earlier than 24 hours prior to the contest.

7. All Amateur bands may be used, but no cross-band operation is permitted.

8. Cross mode operation is permitted.

9. All operators of a multiple operator station must be located within a half-mile diameter circle.

10. For each transmitter of a multiple operator station a separate log shall be kept with serial numbers starting from 001 and increasing for each successive contact by one.
All logs of a Multiple Operator Station shall be submitted by the operator under whose call sign the transmitters are working.
No two transmitters of a Multiple Operator Station are permitted to operate on the same band at one time.

11. Amateurs may enter for any section.

12. An Amateur may enter for both Mobile and Portable sections but a separate log must be forwarded for each section which must be for one continuous period in each case, i.e. operators must not keep alternating between mobile and portable.

13. Entrants must call "Mobile" or "Portable" as the case may be, e.g. "VK3XY Mobile if a fixed field station.

14. Mobile stations and portable stations can contact each other as well as contacting fixed transmitting stations.

15. The usual method of giving RS or RST reports followed by serial numbers starting with 001 shall be adopted.

16. **Scoring.**

A: For Portable or Mobile Stations—

Portable or Mobile Stations outside entrant's call area .... 15 pts.
Portable or Mobile Stations within entrant's call area .... 10 pts.
Fixed Stations outside the entrant's call area .... 5 pts.
Fixed stations within the entrant's call area .... 2 pts.

B: For Fixed Stations—

Portable or Mobile Stations outside entrant's call area .... 15 pts.
Portable or Mobile Stations within the entrant's call area .... 10 pts.

17. Mobile operators may contact the same **mobile** station repeatedly provided that two full hours elapses after the previous contact.

18. Operation via active repeaters or translators is not allowed for scoring purposes.

19. All logs shall be set out under headings of Date/Time in GMT, Band, Emission, Call Sign, RST Sent, RST Received, Points Claimed. List contacts in numerical order.

A quarto front sheet to show the following information:
Name...Division ....
Address...Section.................................
....Call Sign.............................
Call Signs of other operators...
....
Location ....Points.................................
Operating times, from........................to.......................

I hereby certify that I have operated in accordance with the rules and spirit of the contest: ....
Details of equipment.

20. Certificates will be awarded to the highest scorer of each section of the 6-hour and the 24-hour Divisions provided there is a minimum of three logs submitted in that section. The 6-hour certificate cannot be won by a 24-hour entrant.

21. Entries must be forwarded in time to be opened on 23rd March, 1973. Mark your envelope to indicate that it is a **John Moyle Memorial National Field Day** entry and address to **Federal Contest Manager, W.I.A., Box 638, G.P.O., Brisbane, Qld., 4001.**

22. All c.w./c.w. contacts count double. Refer sections (b), (c), (d).

Written comments will be received with interest. The decision of the Federal Contest Manager is final and no disputes will be entered into.

RECEIVING SECTION

This section is open to all Short Wave Listeners in VK call areas. The rules shall be the same as for the transmitting stations but may omit the serial numbers received.

Logs must show the call sign of the Portable or Mobile Station heard, the serial number sent by it and the call sign of the station being contacted.

Scoring will be on the same basis as for transmitting stations. It will not be sufficient to log a station calling CQ. For scoring purposes the left hand column of the log example must have only Portable or Mobile stations.

A certificate will be awarded to the highest scorer of each of the 6-hour and 24-hour Divisions, both individual and club entries.

EXAMPLE OF VICTORIAN SWL's LOG

Date/ Time GMT	Band	Call Sign Heard	RST Sent	Station Contacted	Pts. Claim
0600	80	VK2AA/P	58001	VK3ATL/P	15
0605	80	VK3ATL	49016	VK5QV	10
0640	20	VK3WW	59010	VK5QV/P	*
0650	2	VK4ZZA/M	59007	VK4ZAZ/M	10

* No score (fixed station).

WIN A FT101 FOR XMAS OR A HOLIDAY TRIP TO U.K.

These and many other prizes are offered in the W.A. Division's first BIG RAFFLE. Below is a list of prizes that you could win if you buy a ticket.

1st Prize: **YAESU FT101 TRANSCEIVER**
or **Qantas Excursion to London ($654).**
or **14 Days' Holiday, Motel accommodation by Ansett ($650).**
or **Any Holiday to winner's choice to $650.**
2nd Prize: **Five Years' Subscription to the W.I.A.**
3rd .. **Portable Typewriter ($50).**
4th .. **Five L.P. Records of choice ($30)**
5th .. **Bedroom Rug ($25).**
6th .. **Hamper of Groceries ($25).**
7th .. **50 Gallons of Petrol ($24).**
8th .. **$20 Bill.**
9th .. **Christmas Turkey.**
10th .. **Perfume ($15).**

Send your Cheque, M.O., or P.N. for full book at $4, half book at $2, 5 tickets for $1.
To **TREASURER, W.I.A., W.A. DIVISION, BOX N1002, G.P.O., PERTH, W.A., 6001.**

AWARDS COLUMN

With Geoff Wilson,* VK3AMK

W.I.A. D.X.C.C.

PHONE—

VK5MS	317/343	VK5AB	295/314
VK6RU	316/344	VK4UC	292/300
VK4KS	312/328	VK2APK	291/300
VK3AHO	308/326	VK4PX	285/288
VK6MK	304/327	VK4FJ	284/307
VK4VX	300/302	VK4TY	282/288

New Member:

Cert. No.	Call	Total
137	VK2GV	101/102

Amendments:

VK5WV	140/141	VK3ALM	203/204
VK1VP	151/152	VK4RF	237/238
VK3JF	192/193	VK3AMK	241/242

C.W.—

VK3AHQ	307/326	VK3NC	272/297
VK2QL	302/327	VK6RU	264/289
VK3YL	293/312	VK3YD	262/281
VK2APK	287/296	VK4TY	257/272
VK4FJ	287/315	VK4VX	254/255
VK3XB	284/300	VK3TL	252/280

New Member:

Cert. No.	Call	Total
100	VK2GR	104/105

Amendments:

VK3LV	125/126	VK4RF	213/226
VK4DO	195/213	VK4KX	216/217
VK3JF	198/206		

OPEN—

VK6RU	316/344	VK4TY	304/321
VK4KS	313/333	VK6MK	304/327
VK4SD	313/330	VK4UC	301/303
VK2VN	311/332	VK2EO	299/324
VK4VX	307/309	VK2SG	299/306
VK2APK	304/318	VK4FJ	295/323

New Member:

Cert. No.	Call	Total
147	VK8KP	103/104

Amendments:

VK3LV	130/131	VK4RF	269/282
VK3JF	230/238	VK4PX	293/300
VK4DO	243/256		

Deleted Country: 1M—Minerva Reefs. Only contacts prior to 15/7/72 will count as a separate country. All contacts after this date will count as for Tonga.

Country withdrawn from D.X.C.C. Listing: FO8M—Maria Theresa Reefs. All credit for this country has been withdrawn.

W.I.A. V.H.F.C.C. AWARD

New Members:

Cert. No.	Call	Confirmations 52 MHz.	144 MHz.
85	VK4ZAM	105	—
86	VK3BFG	—	100

Amendments:

29	VK1VP	249	—
61	VK1VP	—	113
80	VK4ZIM	717	—

W.I.A. 52 MHz. W.A.S. AWARD

Amendment:

Cert. No.	Call	Additional Countries
57	VK1VP	3

"CQ" AWARDS

Applications for awards issued by "CQ" Magazine are now being checked for Australian applicants by the Redcliffe Radio Club. All applications and inquiries should be addressed to:

Redcliffe Radio Club,
P.O. Box 20,
Woody Point, Qld., 4019.

W.I.A. AUSTRALIAN D.X.C.C. COUNTRIES LIST

The annual listing normally issued with the January issue of "A.R." will not be included next year. Instead, the Countries List will be contained in the new Call Book and it is hoped some additional awards information will also be presented if sufficient space is available. Alterations to the list of countries will be notified through this column as they occur.

* 7 Norman Avenue, Frankston, Vic., 3199.

Letters to the Editor

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

AMATEUR RADIO AND RADIO ASTRONOMY

To All VK Amateurs,

Recently, the National Australian Federation of Amateur Astronomical Societies (N.A.F.A.A.S.) was formed, with the object of federating and unifying the actions of the 90-odd amateur astronomical societies in Australia. One problem facing N.A.F.A.A.S. is that of quick communication. As a prospective amateur myself, Amateur Radio was considered. This letter is an attempt to get in contact with those amateur operators with an interest in astronomy, and associated sciences.

Here is a chance for you to increase your knowledge in astronomy and radio astronomy, by assisting in the operation of Astranet, the Australian Astronomical Radio Network. As well as this, you will be helping and increasing the status and knowledge of amateur astronomers in Australia and helping a good cause. If you can help, please contact me at the address given below.

Yours faithfully,

S. Russell, Secretary, I.A.S.Y.S.
92 Garden Avenue,
Figtree, N.S.W., 2500.
Phone (042) 28-6270.

"WILL AMATEUR RADIO BE KILLED BY SINGLE SIDEBAND?"

Editor "A.R.," Dear Sir,

Single sideband has more talk power than ancient modulation and will punch through where the other cannot. It does not set up heterodynes with other stations because the carrier is missing. It occupies less bandwidth because one sideband is missing.

This we all know and appreciate. But have we considered the cost? Not only the beautiful dollars for the transceiver and the beam, but also the cost in other directions. Consider the young short wave listener. He was (past tense) a lad whose sole equipment was the domestic radio with shortwave facility. This enabled him to listen to VK2AAA talking to VK3BBB. His interest was immediately kindled and he lost no time in making enquiries, and in many cases eventually became an Amateur himself.

His modern counterpart has his own transistor radio but when he switches to shortwave what does he hear on the Amateur bands but a lot of indecipherable duck talk? His interest is lost in about ten seconds, during which he decides the fault is not in his radio; there must be something wrong with that transmission, whatever it may be. The spark, never having been kindled in the first place, cannot become a flame and the lad's interest moves off in some other direction.

If the places left by "Silent Keys" are not filled by young lads (and lasses) then sometime in the not very distant future the ranks of Amateur Radio are going to be considerably thinned. The question arises, "Will Amateur Radio be killed by single sideband?"

Our hobby is worth nurturing; it has something of interest to give to the community. We have derived a lot of pleasure from it so let us share it with the up and coming. How? By blowing the dust off that old a.m. gear and using it occasionally, especially on short-haul contacts, where it works quite well and, secondly, by developing and using low power transistorised a.m. equipment which can be built by the relatively unskilled (incidentally, how many people build their own s.s.b. equipment?) at a cost of a few dollars and which is powered at sub-lethal voltages, for example, from a 12-volt car battery.

—G. Craggs, VK2AYG.

Writing about the VK5 Intrastate Contest held on 1st October, Rod Cunningham, VK5UV, said that good v.h.f. contacts were had from the mobile QTH on Bumbunga Hill (1,355 ft. a.s.l.) about 75 miles N.E. of Adelaide, both back into Adelaide and to country stations VK5UJ at Whyalla, VK5ZMJ at Port Pirie and the three Ians (VKs 5IZ, 5ZIN and 5VJ) on Yorke Peninsula.

He and Peter VK5ZPS nearly froze overnight and made 58 contacts with the comment that activity this year seemed lower because of good weather and the car race.

Picture of station set up on the trig point on Bumbunga Hill by VK5UV and VK5ZPS.

OBITUARY

HUGH STITT, VK2WH

The late Hugh Stitt, VK2WH, widely known as Hugo, was the descendant of an old Scottish family which settled on the Lauchlin, near Forbes, about a century ago. Hugo was educated at the Kings School, Parramatta, and developed great keenness on wireless, being the first to receive t.v. over the mountains.

A man of charming personality with a wide circle of friends including golfers of the Forster-Tuncurry Golf Club where he had been chairman.

Deepest sympathy is extended to his wife Jean and to members of the family —John, David, Helen, Robert and Angus.

BUILDING MODERN FILTERS

(Continued from Page 9)

Band-Pass Section

Refer to Table 1B for the tabulated calculations for this type of filter.

NORMALISED LOW-PASS FILTER-ELEMENTS

Column headings in Table 2 are to be read with respect to labelled elements in the reference circuit shown, which is seen to have a T-type input.

(For current-sources, or transistor-circuits, it may be desirable to use a π-type input. The appropriate set of column headings would then be, starting from the first shunt capacitor, C1, L1, C2, L2, C3, reading across the second line, N = 5, for a 5th order π-input filter. Similar remarks apply to Table 3. Sufficient will be gained if we master the T-type circuits first.)

Example 2:

An RF Low-Pass Filter

For brevity, let us assume we have a 50-ohm mixer producing a 2 MHz. output signal from a local oscillator and input such that the bandwidth is 200 kHz. The filter is to attenuate input, local oscillator and sum frequencies by not less than 30 dB., but pass the upper limit of the difference-frequency bandwidth with not more than 1 dB. of loss, and be matched for power.

Solution: Upper limit of the difference-frequency band is 2.1 MHz. For 30 dB./octave, we require N = 5 sections. We need to check that the 3 dB. down point for N = 5 will be somewhat above 2.1 MHz., since we are only allowed to be —1 dB. at 2.1 MHz. A curve of attenuation v. frequency for an N = 5 flat filter would show that the response is just 1 dB. down when the frequency is 0.8 of the 3 dB. frequency. Thus our cut-off frequency has to be read as 2.62 MHz.

Entering Table 2 for N = 5, and following precisely the same pattern as for the LP filter of the previous example, we should obtain:

$$L1 = L3 = \frac{0.0983 \times 50}{2.6 \times 10^6}$$

$$= 1.88\ \mu H.$$

$$L2 = \frac{0.318 \times 50}{2.6 \times 10^6}$$

$$= 6.06\ \mu H.$$

$$C1 = C2 = \frac{0.258}{50 \times 2.6 \times 10^6}$$

$$= 0.00197\ \mu F.$$

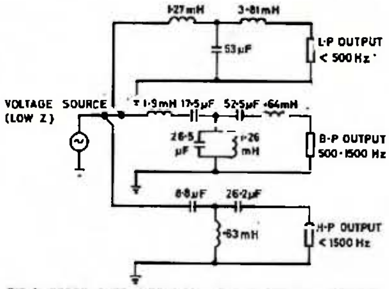

FIG 2 CROSS OVER NETWORK. LOAD IMPEDANCE 8 OHMS

CONCLUSION ON BUTTERWORTHS

The capacitor values are a little difficult at very low audio frequencies, but as the 3.5 kHz. filter showed are quite easy by the time the frequency requirement rises to a few kHz., and become no problem at all at radio frequencies.

Finally, for higher attenuation the number of sections can be a constructional problem. This, of course, is where the equal-ripple and elliptic filters show their power. ●

(to be concluded)

KEY SECTION

With Deane Blackman,* VK3TX

The Ross Hull (VHF) Contest starts this month and there is a c.w. only section which should get some support from readers of this column if it is to remain as part of the contest. The rules appeared in October "A.R."—good luck!

Since the last list we have the following new members: 39, VK7RD; 40, VK3LV; 41, VK2AXK and a few more in the pipeline.

We are presently working on schemes to involve s.w.l's and DX working c.w.; the idea will be to encourage c.w. contacts with VK (particularly K/S members). Details will be published as soon as agreement between Divisional Co-ordinators has been obtained.

Notwithstanding what you hear on the air, there is a prescribed relation between the length of dots, dashes and the spaces between them in International Morse Code. I happen to find particularly annoying the fellow using an elbug set at 35 w.p.m. but in fact getting his traffic out at 15. There are other perversions. Proper Morse sending normal English at any speed has a duty cycle of 47 per cent., by the way, if you want to extract a bit more from your final.

Warmest Christmas Greetings from the Key Section, and f.b. operating in 1973.

* P.O. Box 382, Clayton, Vic., 3168.

160 MX TRANS-PACIFIC TESTS

Dates: December 23, January 13, and February 10.

Times: 1330-1600 GMT.

Frequencies: VK 1800-1805; ZL 1875; W/VE 1800-1807; JA 1907.5-1912.5; others 1800-1805.

Procedure: Call "CQ DX TEST" for the second 2½ minutes of each 5-minute period. W/VE stations will be calling CQ DX during the first 2½ minutes of each 5-minute period. Keep to the 5-minute periods accurately, unless in QSO.

The Trans-Pacific Tests are not a DX contest. They are "activity nights", organised for the whole of the Pacific area. They enable many stations to be active on the same night, enabling DX contacts that may otherwise not be made. Contest logs are not required, but reports of interesting or unusual contacts would be appreciated by your DX Editor and/or W1BB for publication in his "160 Metre DX Bulletin". —Peter VK3APN.

FEDERAL W.I.A. NEW ADDRESS:

P.O. BOX 150, TOORAK, VIC., 3142

Victorian Division address is unchanged as P.O. Box 36, East Melbourne, Vic., 3002.

VHF UHF
an expanding world

With Eric Jamieson,* VK5LP

Closing date for copy: 30th of month.
Times: E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0MA, Mawson.
	53.200	VK0GR, Casey.
VK2	52.450	VK2WI, Dural.
VK3	144.700	VK3WI/R6, Vermont.
	144.925	VK3QZ, Traralgon.
VK4	52.400	VK4WI/2, Townsville.
	144.390	VK4WI/R1, Toowoomba.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	52.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Albany.
	145.000	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	52.200	VK8VF, Darwin.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
	145.250	ZL2VHP, Palmerston North.
	431.850	ZL2VHP, Palmerston North.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	52.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.
	52.010	HL9WI, South Korea.†
ZK	50.100	ZK1AA, Cook Island.†
3D3	50.100	3D3AA, Fiji Island.†
5W1	50.100	5W1AR, West Samoa.†
CE0	50.100	CE0TS, Easter Island.†
KX6	50.110	KX6HK, Marshall Islands.†

† Denotes new listing.

Additional beacons which may be worth considering if conditions are right include WB6KAP on 50.013; K5AGI 50.015; VE8YT 50.098; VE2BYG 50.065; KH6EQI 50.104; JA4, 6, 8, 9IGY 50.500.

TELEVISION STATIONS

The sound carriers from various television stations are useful as beacons quite a lot of the time, DX season and otherwise.

50.750	Channel 1 from New Zealand.
51.740	Channel 0 from Wagga.
51.750	Channel 0 from Brisbane.
51.760	Channel 0 from Melbourne.
143.750	Channel 5A from Wollongong.

Note that there is a 10 kHz. separation between the various Channel 0 stations, and by this means it is possible to identify the location of the station. As the power of these stations is 100 kw. e.r.p. it follows that they need generally to be very strong before Amateur signals can be heard. Channel 5A should be watched carefully for the next few years during DX periods as it seems likely 2 metre long distance contacts should be available for paths of 1,000 miles and more as accomplished during the 1962-64 era.

I am indebted to the VK6 V.h.f. Group News Bulletin which provided the additional beacon information this month. Readers should note that this list is the longest yet published in "A.R." so far, and is intended as a reminder as to what could be available during the peak of the DX season during December and January. The long listing therefore will not appear again until next December, but it is anticipated ordinary listings will continue, plus alterations and any new beacons.

SIX METRES IN BARBADOS

I was pleased to receive a letter from Alan Isaachsen, 8P6EN, ex-VK5IR, VK5ZEI, and here are some extracts. "The 6 metre season during May, June and July was the best I have experienced, with 350 contacts into the U.S.—a minimum of 1,700 miles. Of these, 250 would have been over 2,200 miles and five over 4,000 miles. Most contacts were double hop Es (some triple hop?) with one or two F2 openings. I am the only 6 metre station in Barbados and as far as I can make out the second ever and he never made it to the U.S. I use my 6/40 home-brew transverter and the antenna a 4 element quad.

"I read with interest the article in 'A.R.' by VK2ZTB on TEP. This puts Barbados right on the line for both Class I. and II. TEP. I have had Class II. TEP to Argentina so far (only mid-September equinox period as VK2ZTB predicts), but until I read the article had little hope of using TEP here. So far I have worked six countries on 6 mx.

"Another item of interest is that Cable and Wireless operate commercial tropo stations here on 200 MHz. over 200 miles. Inversions over 1,000 mile paths here are common. I have just finished a 6/40 2 mx transverter and a 2 metre quad, so I'm setting up skeds pretty soon with the Florida boys . . . Would you believe a Channel B 146 MHz. f.m. net is operating on the island? Five stations operating."

Thanks for the letter, Alan, and hope to hear from you further. Mouths will be drooling at your prospects on 6 and 2 mx over there. Glad to know the v.h.f. notes keep you in touch with VK activity.

AUSTRALIS OSCAR 6

This column acknowledges the great achievement by the Amateurs responsible in establishing Oscar 6 in such a functional way that all who are prepared to go to a little trouble can either listen to others or make use of the facilities themselves.

Oscar 6 has provided a means for contacts to be made between ZL and VK stations, and VK to VK right across Australia. As the first flush of excitement dies down it will be possible to have better contacts than at present as power sharing becomes less, and possibly contacts from areas away from our own may be completed. My 600 foot long wire being used to receive on the 29.450 MHz. downlink is giving excellent results, with probably VK6HK at S9 being one of the more consistent good signals. It is not proposed to go further into Oscar 6 matters at present in this column as I believe relevant details will be the subject of a separate article in this issue. Anyway, a fine effort.

TWO METRE INVERSION

The 16th October saw the start of an inversion across southern Australia, which resulted in some long distance contacts. Bob VK6BE observed the VK5VF beacon about S9 at nightfall, and he and Wally VK6WG spent a long time trying to arouse activity on the band, finally coming across George VK5GG on 40 metres! George had a faulty converter, but his 2 metre s.s.b. was plainly audible in Albany. Tony VK5ZAI at Bordertown, about 180 miles S.E. of Adelaide, worked VK6XY and VK6KJ 5 x 9 on Channel B f.m. The Channel 4 repeater provided contacts into Adelaide for VK6XY, BE and WG. Bob VK5DDX spent more than 1½ hours nattering to Wally VK6WG on 2 mx tuneable from midnight, with signals peaking over S9. The conditions were still very good on the next night, Tuesday, VK7ZGT mobile was noise free through Adelaide repeater, and it took until Wednesday night for conditions gradually to resume normality.

An unusual feature of the above 144 MHz. propagation conditions was the effect upon television reception in the Adelaide Hills. There are several locations in the hills which are classed as fringe areas due to topography, although only 15 miles from the t.v. transmitters. On the peak Monday night, many residents of these areas lost Channels 7, 9 and 10 entirely through a blanket of snow, something which had never occurred before. Tuesday night was almost as bad, and still some snow Wednesday night. Checking the situation during the week, it appears almost everyone without line-of-sight conditions to the t.v. stations were affected in some way or other. My telephone ran hot answering viewers questions!!

FROM THE MAIL BAG

Roger VK9RI (ex-VK2ZTB) now on Cocos Island, advises he is constructing beacons for 6 and 2 metres having voice ident. He says he will be in attendance all the time—the place is so small he can hardly do anything else! Frequencies, etc., later. He tunes 6 metres every day using an Eddystone 990R covering 27 to 250 MHz. Few weak signals, but no contacts yet. Runs skeds with VK6CH in Carnarvon on 6 and 2, but no results. Will be operating through Oscar 6 soon. Eastern States of VK are 3,700 miles away. This year's Es season might have lots of things to interest you, and us, Roger.

Mike VK2AM mentions Barry VK2ZAY as being the heart-throb of Rod VK2ZQJ, Roger VK2ZRH and Keith VK2BKL. Situated at Boggabri, 280 miles north-north-west of Sydney, and all stations use s.s.b. Frequency generally 144.010, 2100 hours Sundays, Mondays and Wednesdays. Not that far away at Tamworth are VK2s ZCV, ZOY and ASI. Barry VK2ZAY frequently hears VK5VF on 144.800, so perhaps the big guns of VK5 might consider some skeds soon.

Mike also reports Roger VK2ZRH has four 10/10 for 144 MHz. and 64 element collinear on 432 MHz., and is currently looking for m.s. skeds on 144. Rod VK2ZQJ is also available for such skeds.

The first issue of "Tuned Lines", the new bulletin of the VK2 V.h.f. and T.v. Group has arrived and this month features Amateur Television. Also included is an article on adapting household radios to work on 1.8 MHz. (in a v.h.f. publication!). Anyway, I wish the editorial committee well, and hope to continue to receive copies.

NEWS FLASH

Michael VK4ZMI, of Kingaroy, 100 miles north of Brisbane, took the trouble to telephone me while these notes were being prepared, to advise of the first substantial 6 mx DX opening to Japan for this season occuring on Saturday, 28th October, from 1530 to 1730, signals peaking to 5 x 9 both ways. Malcolm VK4ZEL in Brisbane also worked quite a number and he runs only 1 watt of s.s.b! Districts represented were JH1, JA3, 3, 5 and 9. The band re-opened briefly during Saturday night, 2000 to 2200. The shortage of VK4 stations during Channel 0 hours might gradually be overcome with 4 or 5 more operating s.s.b. this year, Michael reports, so this is good news for the other States.

BEACONS AGAIN!

Briefly, the VK2WI beacon is to operate with c.w. and not m.c.w. VK0VS seems unlikely to be in operation at present. The VK1 beacon awaits the P.M.G. licence.

That looks like most of the news for this month. December should see the peak of the DX season reached, and again keep an eye on 2 metres, remember, when the skip distance shortens the MUF rises, so if you can hear and work stations 300 to 400 miles on 6, a few calls on 2 metres would be advisable. Also remember this year there will again be a lot more stations on s.s.b., many only with transceive facilities, so net on to their operating frequency. Of course there may be a dog-pile if he is a popular station, but this sort of thing goes on all the time on 20 metres for the rare one's, everyone will eventually get an answer!

Christmas is coming, may I extend Seasons Greetings to everyone and hope to hear you on 6 and/or 2 mx this year. Special thanks to all my contributors and an extra greeting to them. I would like to include Bill Roper, the Editor, for his support and interest during the time he has been in office, and few outside the circle of "Amateur Radio" know the efforts and sacrifices he makes to ensure that our national magazine is something to look forward to each month. A job well done, Bill. Closing with the thought for the month: "The electronic computer saves man a lot of guesswork—but so does a bikini!" The Voice in the Hills.

* Forreston, S.A., 5233.

BEACON CALL SIGNS

Correspondence with the Controller, Regulatory and Licensing, of the P.M.G's Dept. (Ref. RB4/4/23) has clarified the standard call signs to be issued for beacons.

It was hoped to obtain single letter call signs but this series has already been allotted to Experimental Stations.

The following call sign blocks have been reserved for Amateur beacon stations:—

State	Initial Issue	Back-up
A.C.T.	VK1RTA—RTF	VK1RSA—RSF
N.S.W.	VK2RTA—RTF	VK2RSA—RSF
Vic.	VK3RTG—RTK	VK3RSG—RSK
Qld.	VK4RTL—RTO	VK4RSL—RSO
S.A.	VK5RTP—RTS	VK5RSP—RSS
W.A.	VK6RTT—RTW	VK6RST—RSW
Tas.	VK7RTX—RTZ	VK7RSX—RSZ
N.T.	VK8RTP—RTS	VK8RSP—RSS
T.P.N.G.	VK9RTG—RTK	
VK9 other	VK9RSG—RSK	
Antarctica	VK0RSG—RSK	

The Department requests that representations should now be made to the State offices to change the identification call signs of existing stations if this is desired, but, it is stated in this respect, quote, "In situations where there is reluctance to change the call sign at present allotted to an Amateur beacon station, the licensee should be given a reasonable time in which to make the alteration with a maximum period of five years."

WANTED—LOGS FOR THE ROSS HULL VHF CONTEST

you and DX

With Don Grantley*

Times: GMT

Reports coming to hand indicate that there have been some good openings on the major DX bands over recent weeks, unfortunately I am still unable to check the doings personally as my gear is in VK4. I do understand that the segment commonly known as the citizens band has been coming in extremely well from across the Pacific, and if this is any indication, then we could well have some good 10 metre activity. It would not be out of order if I suggested that some positive action by the Authorities in respect to the 27 MHz. band would prove quite rewarding. This band and many of its unauthorised occupants need a clean-up. They persist in imitating those undesirable types who play havoc with the U.S. Citizen Band in that country, and I believe that there is no place here for them in any part of the spectrum.

I must thank the Illawarra Branch for their regular newsletter, mailed on by Hank VK2BHL. Hank has gone to a lot of trouble to prepare the DX news in this newsletter and it is greatly appreciated, much of it being scattered through this page.

Recent operation by SV0WJJ, SV0II and SV1DB using the call SY1MA is of interest. The operation was from a Monastry of an independent religious order on Mt. Athos, and according to info relayed through I1IIZ by K3RLY, it will have separate country status. The operation was scheduled to be on s.s.b. only, and the manager is WA1HAA, Wm. B. de Lage, 238 Slater St., Attleboro, Mass., 02703, U.S.A. A late news-sheet from Geoff Watts describes Mt. Athos as an Autonomous Dept. of Greece since 1927, and consists of about 20 monasteries on the Acte peninsula. The operation was from a temporary shelter 5,000 ft. up the mountainside, and heavy rain made the job difficult. It is understood that there will be a further operation at a later time by about 10 SV1 operators using c.w./s.s.b. on all bands. There is some discussion about this operation. The SV1 chaps say that the operation was illegal and the SY1MA call was not issued, however Vince, the main operator, says that he has the necessary documentation.

W3HNK and KV4EY are at present operating as FG0AFC/FS7, period of operation from October 17 to 31, also on from that location during the last week-end in October was FG0AMC/FS with F5ZW doing the job. QSLs for the latter to go to F2QQ whose new address is R. Gemehl, Domaine du Petit Beauregard, Bat 9, APT 14, F-78 La Celle Saint Cloud, France.

Minami Toroshima is again in the news with KA1DX operating from the former Marcus Is. over the last week-end of October until Nov. 1. All QSLs to WA6AHF please.

Some of the DX listed for the contest week-end at the end of October: ZD3X (QSL OH-2MM), XV5AC (to W1YRC), XD1AK (to XE1AK), XI1IX (to XE1IX), W4GIW/VP7 who will move to VP2VAV from Nov. 13 to 15, then to VP2E on Nov. 16 and 17. PJ1AA (Box 383, Curacao), KS4KZ from Serrana Bank (to WA3TDY), IG9BAF from Lampedusa Is. in the Pelagic group (to I1BAF), DK6NC and DK8FZ from HB0 (to home calls), and HT0A (to YN1DS).

There are still many new prefixes to be found around the dial, the 5N2 chaps are using 5N5 during October, several of the XE gang will be using 6D and 6J prefixes over the contest period, PY stations were using PW during September, VA8NC was a special operation by VE6LQ and other North Alberta ARC chaps. 9H5 is being used by British military personnel on Malta. One who is fairly active is Geoff 9H5D, he being ex G3POX, DL2OX and VK8OX. His manager is G3PRS. YO0XPO from Oct. 15 to 25 was in session from the International Fair in Bucharest.

No doubt about it. We sure do get some queer situations in Amateur Radio. Take for instance the Phoenix Islands. Bert VR1PA is also licensed as WB4LGK/KB6, and subject to the base commander he can, by using reciprocal licensing facilities, sign KB6 and VR1 from the same room and count as two countries for D.X.C.C. QSLs go to Box F-82, APO San Francisco, California, 96401.

7Z3AB, well known to operators in this area as MC of the Arabian Knights Net, will be visiting this country in the latter part of January. He expects to be here for the last two weeks, visiting Perth, Albury, Adelaide and Sydney.

C31 continues to be on the air with C31FQ being quite active in the 28 MHz. band; his manager is DJ5PN. C31CH, whose QSLs go to F8YY, and C31FG (ON6RO) assisted by C31FD are keeping the country on the map. The latter's manager, DL2BK, has a new address, Gerold Stueherenberg, Widdelswehrsterstr 3, 297 Emden-Hilmarsum, Germany.

WA8QOX/VE8, who has been operating on 14270 s.s.b. quite regularly around 0900z, is located on Baffin Isl.; QSLs should be sent to manager WA1PEL.

Those chaps who are using, or contemplating using, Scotts QSL service are now in for a rude shock according to a report in Geoff Watts DX News sheet. Scott is now a member of the U.S. Navy and his QSL service has been forced to close down.

Future operation from XU1AA will be from Phnom Penh University, mainly by Vong Sarin, XU1VS. QSLs for past operations by Tony Kathro may go to his home address, 10 Erw Wen, Rhiwbina, Cardiff, Wales.

From Bhutan we have news that A51PN is quite active on c.w., usually on 14075 at about 1200-1500, address is Pradham, C/o. Post Office, Thimphu, Bhutan. A51TY who has been on the air up till recently is now back in India, but should return to Bhutan by the latter part of Oct. JA3DJ, Masaya Nakajima, 652-101 Takamiya, Neyagawa, Osaka, Japan, and a group consisting of JA3WT and JA3GZN should be operating from Bhutan from Nov. 7 to 13 on all bands including 160 metres.

Some VP8 stations have been heard of late. VP8ME from the South Orkneys is QRV 14/21 MHz. 1830-2200z daily, and from 1100 on the week-ends. He has also been reported on 7220 at 0700 and 3800 at 1000z. VP8MS on Argentine Is. is using 14127 and 21250, manager is C/o. Box 137, Port Stanley, Falkland Is. VP8MX is on South Georgia, ZS1ACD is his manager, he also uses the same frequencies as 8MS.

A MERRY CHRISTMAS AND A HAPPY NEW YEAR TO ALL

A change in address for 9H4 cards has been announced, the new manager is 9H4G, Eric Rogers, Dar Ghall-Kwiet, Ghajn Melel St., Zebbug, Gozo, Malta. Only 9H4 cards should go to Eric please.

ZK1MA from Manihiki, ZK2BD from Niue, and ZL3KK/C are causing some interest in the Pacific Area. ZK2BD wants his cards sent to Box 37, Niue, whilst ZL3KK/C's go to ZM4CR.

Islands of the Air Winners for 1971 have just been announced. World Champion and winner of the Silver Cup was IT9JT, Frank Paone, with 168 islands in all continents, other winners UK G3RWQ, Europe IT9JT, North America W2TP, Africa 5H3LV and Asia JA8ZO.

Silent Keys.—Roy Alciatore, W5RU, well known as the proprietor of Antoine's Restaurant in New Orleans, passed away on 29th Sept. W. Dalmijn, PA0DD, treasurer of I.A.R.U. Region I., passed away on 18th Sept.

I am writing these notes at Penrith on 27th Oct. at 4 a.m., they will appear in the Dec. issue which means that these few items will wind up what has been a very poor year radio-wise, as far as I am concerned. Many thanks to those of you who have supported my efforts over the year, also to the several overseas clubs which have supplied information regularly. My best wishes to all.

Mellish Reef.—The following will appear in the December 1972 issue of "QST":—

"The October 1972 issue of 'QST' carried a DXCC Note announcing the addition to the A.R.R.L. Countries List of Mellish Reef. Acceptance date for DXCC submissions for Mellish Reef was announced as November 1, 1972. Most unfortunately, serious questions have been raised concerning the operations that have taken place from Mellish Reef and until such time as the validity of the points in question have been ascertained, no DXCC credits for Mellish Reef have been, or will be, made. Therefore, please do not submit any Mellish Reef confirmations for DXCC credits until an announcement does appear in 'QST'.

"Because of the delay in granting DXCC credits for Mellish Reef, the bottom number for the December submissions for DXCC Honor Roll will be 311 deleted and submissions for that total will be accepted."

* P.O. Box 222, Penrith, N.S.W., 2750.

Ionospheric Predictions

With Bruce Bathols,* VK3ASE **DEC. '72**

Listed below are the Ionospheric Predictions for December 1972 from the charts supplied by the Ionospheric Prediction Service Division.

Allowing for the predicted M.U.F. and A.L.F., these listings should provide radio communications between the stated times for most days of the month.

All times are G.M.T. VK0 is Macquarie Island, VK4 is Brisbane, and ZL is Auckland.

28 MHz.—

VK1/2	to	VS6		0200-0500
VK3	,,	JA		0400-0600
VK4	,,	5Z	L.P.	2400-0100
,,	,,	W6		0100
VK6	,,	G	S.P.	0800
,,	,,	W2		2200

21 MHz.—

VK1/2	to	8P	S.P.	2000-0500, 1100-1400
,,	,,	8P	L.P.	1000-1600, 2100
,,	,,	VE3	S.P.	1500, 1800-2400
,,	,,	W6		1900-0200
,,	,,	ZS		0600-1200
,,	,,	PY		2300-0600, 0900-1100
,,	,,	VS6		1900-1100
,,	,,	SU		0400-1600
VK3	,,	G	S.P.	0700-1500
,,	,,	G	L.P.	1000-1200
,,	,,	UA		0500-1300
,,	,,	JA		2200-1200
,,	,,	W2		1400, 2000-2400
VK4	,,	5Z	S.P.	0700-1100
,,	,,	5Z	L.P.	0800-1600, 1900-0300
,,	,,	W6		1900-0200
,,	,,	PY		0900-1200, 2100-0500
,,	,,	G	S.P.	0800-1500
,,	,,	G	L.P.	0900-1400
VK5	,,	KH6		2000-1000
VK6	,,	W2		1500-1700, 2300
,,	,,	G	S.P.	0700-1500
,,	,,	G	L.P.	1000-1200
ZL	,,	W2		1700-2400
,,	,,	ZE		0600-1000
,,	,,	G	S.P.	1000-1400
,,	,,	G	L.P.	0800-1000

14 MHz.—

VK1/2	to	8P	S.P.	0300-0800, 1000-1500
,,	,,	8P	L.P.	0900-2400
,,	,,	VE3	S.P.	1400-2100
,,	,,	VE3	L.P.	1300-2400
,,	,,	W6		1600-2100, 0400-0600
,,	,,	ZS		1200-2300
,,	,,	PY		1800-2400, 0400-1200
,,	,,	VK6		2400-1200
,,	,,	VS6		0600-2000, 2200-2400
,,	,,	SU		0900-2400
VK3	,,	G	S.P.	0700-1700
,,	,,	G	L.P.	0900-1500
,,	,,	UA		0700-1500
,,	,,	JA		0500-1700, 2100-2300
,,	,,	W2		1300-2000
,,	,,	VK0		2000-1400
VK4	,,	5Z	S.P.	1400-2400
,,	,,	5Z	L.P.	0400-2100
,,	,,	W6		0400-0600, 1600-2100
,,	,,	PY		0400-1200, 1800-2200
,,	,,	G	S.P.	0700-1700
,,	,,	G	L.P.	0800-1200, 2100
VK5	,,	KH6		0500-1400, 1700-2200
VK6	,,	W2		1400-2400
,,	,,	G	S.P.	0900-1800
,,	,,	G	L.P.	0900-1600
ZL	,,	W2		1300-1900
,,	,,	ZS		0400-0600, 1300-2100
,,	,,	G	S.P.	0800-1700
,,	,,	G	L.P.	0200-0400, 0700-1000 1600-2200

7 MHz.—

VK1/2	to	ZL		0800-1800
,,	,,	W6		0700-1600
,,	,,	G	S.P.	1400-2000
,,	,,	G	L.P.	0900
VK3	,,	JA		0900-2000
,,	,,	W2		0800-1400
,,	,,	VK6		1000-2000
,,	,,	VK0		0900-1900
,,	,,	8P		0900-1100
VK6	,,	ZS		1600-2200

Smoothed monthly sunspot number predictions for December 52, January 50, February 47, March 45.

Swiss Fed. Observatory, Zurich.

ARE YOU ORGANISED FOR THE NATIONAL FIELD DAY?

Magazine Index

With Syd Clark, VK3ASC

"BREAK-IN"

August: The Kwik-Mix Module; A Simplified Design Procedure for a Band-Pass Coupler.

"RADIO COMMUNICATION"

July: 144 MHz. Repeater Stations in the Amateur Service; A Keyed A.F. Oscillator; A Transistorised Top-Band Transmitter; Electronic Switching in Amateur Radio Equipment, Part 3; A Turnstile Omnidirectional Aerial for VHF; Take to the Hills (going portable on u.h.f. and v.h.f.).

"SHORTWAVE MAGAZINE"

July: Extending Digital Frequency Meter Range; Getting a 5/8th Wave for Top-Band; Frequency Modulation, Part 1; Aerial Adaptor for Top-Band; On the Relative Effectiveness of Beams and Linears.

"CQ MAGAZINE"

July: Further Enhancing the Yaesu FT-DX-560 Transceiver; Slow Scan TV (new feature); "CQ" Review: Bird Ham-Mate RF Wattmeters, 2 Metre Coverage with ARN-30; How not to Erect a 56-ft. Tower; The Blink-O-Nil; The 10-80 degrees Antenna for 75 and 40 metres; Noise and Noise Generators, Part 3.

"HAM RADIO"

July: Five-Band Conduction Cooled Linear Amplifier; Crystal Controlled AFSK Generator; RC Oscillators; Optimising the Super-regenerative Detector; Cooled Pre-amplifier for VHF/URF Reception; A Multi-Band QRP Transmitter; Using Y Parameters in RF Amplifier Design.

"73 MAGAZINE"

July: Modern VHF Counter, Part 2; Solid State VHF Amplifier; The Phase Locked Loop; VHF Converters; Add $15 T-Power; 1296 MHz. Mixer; Thick Film RF Pre-amplifier; Meteor Shower DXing; Tone Decoder and Carrier Relay Circuits; Flying Spot Scanner for SSTV; Active Filter Design, Part 2.

"QST"

August: A Single Conversion 2 Metre FM Receiver; A Twelve-Foot Stressed Parabolic Dish; The Mountaineer, an Ultra Portable Station; The Flashlight Sidebander; Antenna Switching and Transmatch Unit; Phased Verticals in a 40 Metre Beam-Switched Array; Why not use the Standard Values?; The Vest Pocket Logic Probe; A Two Metre Amplifier for Transceiver Users; Learning Morse.

WANTED

Left-Right Output Transformers for Bendix MN26 Radio Compass Receivers. Units are marked T16 or A15064. Pay $4 each if okay.
M. O'Brien, Edgar Rd., San Remo, Vic., 3925. Phone 107.

FOR SALE

Type A Mark 3 gear, 3-9 MHz., 6v. DC and 240v AC, key or phone Transceivers, cheap.
M. O'Brien, Edgar Rd., San Remo, Vic., 3925. Phone 107.

SILENT KEY

It is with deep regret that we record the passing of—

VK2AR—W. H. Hudson

L60001—E. Hardwick

St. George Y.R.C.S. Training Annex students and Instructors 1971/72. L. to R. back row are Godfrey and Noel Ericsson (Instructor), Don Sims, Barry Nivison-Smith, Major Cupit and Neville Muir. Front row students are James Truant, Mark Bookhardt, Nigel Cupit and Peter Fitzroy. Many honours were obtained, stated as a tribute to the Audio/Visual Training aids at the "Annex".

INTRUDER WATCH

With Alf Chandler, VK3LC

In Australia it is most difficult to get any reliable reports on identifications of r.t.t.y. or similar stations, of which there are many intruding into our Amateur bands, especially the 14 MHz. band. Just reports of "multiplex" are not of much use, because there are many types of "multiplex"—F2, F6, A7A are all "multiplex", but F1 r.t.t.y. with suitable gear can be often identified.

So far only one Observer has given me any worthwhile identifications by way of read-out of r.t.t.y. stations. Norm VK4NP has suitable gear and has been a tower of strength in this regard. His extensive read-outs of station TCX situated in Ankara, Turkey, have been very much appreciated. Unfortunately, this station was noted in my last month's report as having become silent. It has recently re-appeared testing (sending endless RYR, RYR) and transmitting to CWY in Uruguay, South America. How we can be misled!!

I know there are many more Amateurs in Australia with suitable r.t.t.y. gear who could take read-outs of intruder r.t.t.y. stations interfering with legitimate Amateur transmissions, and who could supply me with identifications of same. These are insidious intruders.

How about it? It would be most beneficial both from my point of view as Intruder Watch Co-ordinator, and from the points of view of all Amateurs to get reports flowing of these intruders before they classify themselves as "owning" the frequency which they are using.

These and other types of signals are urgently in need of identifying. Please do something!!

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- **Copy, please in typescript if possible, and signed.**
- **Excludes commercial-class advertising.**
- **Exceptions only by PRIOR arrangement.**

For full details see January 1972 "A.R.," page 23.

FOR SALE

Melbourne, Vic.: FV101 external VFO for FT101, $75. SP-101P loudspeaker/phone patch for FT-101 or similar, $35. Both items brand new. Collins KWM-2 Transceiver in exceptional condition, $620. Extra heavy duty fully metered PSU for KWM-2, $40. VK3TD, Ph. (03) 787-1407 or QTHR.

Melbourne, Vic.: Hammarlund Super Pro Rx, AC and DC PSUs, excellent condition, $145. AR7 Rx, PSU and all coils, $60. VK3AQB Ph. (03) 337-4902.

Byron Bay, N.S.W.: Heathkit HW32A Transceiver, SS Power Supply, Microphone and Spkr., good condition, $150 o.n.o. VK2AFP, OTHR (7 Keats St.).

Moresby, P.N.G.: Heath HP13A, DC PSU, $50. Offers for SB102, SB600 and HP13A. T. Fishpool, VK9KE, C/o. Posts and Telegraphs, Port Moresby

Morwell, Vic.: Digital Freq. Counter, 5 digit Nixie readout, 0-200 MHz., neat constr., $200 o.n.o. VK3ZX, OTHR, Ph. (051) 40598.

Geelong, Vic.: Swan 350 Transceiver, 5 bands, complete with AC/DC PSU, spares available, good condition, little use, $400 o.n.o. VK3BFL/T, OTHR.

Sydney, N.S.W.: Modulation Transformer Woden UM1, 60 watts Class C, with data sheet, $5. VK2BAK, Ph. (02) 48-6241.

Sydney, N.S.W.: Trio 9R-59DE Rx, 0.55-30 MHz., volt. stab., not used, station inactive, new condition, original box, instruction book, etc., $120. VK2ZGS, Ph. (02) 34-8441 nights, week-ends.

Melbourne, Vic.: Several Communications Rx's for SWLs. Ring H. Roach, 28 Foster Ave., Glenhuntly, Vic. Ph. (03) 58-3757.

Melbourne, Vic.: Unitrex 1200 Electronic Desk Calculator, 12 digit, mains operated, $75. Dr. Lloyd, Ph. 698-6058 working hours only, after Dec. 11.

Melbourne, Vic.: Astatic Dynamic 10-DA, the only microphone engineered purely for SSB. Response 300-3000 Hz. Gives greatly increased talk power. Never used. Roth Jones, 1 Albert Rd., Melbourne, Vic., 3004.

Melbourne, Vic.: AR88D Communications Rx in mint condition, complete with original instruction book. Offers. Phone (03) 786-3980.

Melbourne, Vic.: National NCX-5, complete with PSU, $500. VK3ASC, OTHR, Ph. (03) 45-3002.

Melbourne, Vic.: 5-band SSB Transceiver, 100w. PEP output, Swan 500CX filter, hi-stab. VFO with 12 kHz. per knob rev., audio AGC, etc., etc. Complete and operating perfectly on 80 metres, requires instal. of coils and het. crystals (supplied) for other bands. Must sell, $100. AC PSU to match, $20. VK3ARZ, QTHR, Ph. (03) 232-9492.

Brisbane, Qld.: 10 new R.C.A. 6146B Tubes, $6 each incl. postage. 1-in. Vidicon, $14. 4CX250B, $8. Barneveld, 50 Withington St., East Brisbane, Qld., 4169. Mail only.

Burwood, Vic.: Home-brew SSB Xmtr. and PSU, 813 final, 10/80 mx, wkd. 200 countries, $60. VK3WM, OTHR, Ph. (03) 288-2180.

WANTED

Rokewood Junction, Vic.: Amateur bands only Rx, valved. Must be in very good condx. Not interested in Trio or Lafayette. Please write giving full relevant details/price asked. All replies answered. Box 1, Rokewood Junction, Vic., 3351.

Garvoc, Vic.: Heathkit Monitor Scope SBW610, also Hamscan. VK3XI, OTHR.

Sydney, N.S.W.: TV Yoke and magnetic focus magnet as per list on page 5 of March '72 "A.R." VK2BKG, QTHR, Ph. (02) 451-9435.

Dimboola, Vic.: Collins 51J1, 2, 3 or 4 Rx. Johnson Valiant or Ranger Tx. Must be clean condition with cabinets. VK3IB, OTHR.

Melbourne, Vic.: For private museum of early radio equipment: Ex R.A.A.F. Avro Anson HF Tx Rx type 1082 and 1083, Command Rx 1.5 to 3 MHz., output valve type VT38 (38233) suit R18 Rx, AR88D Rx Handbook. VK3AQB, Ph. (03) 337-4902.

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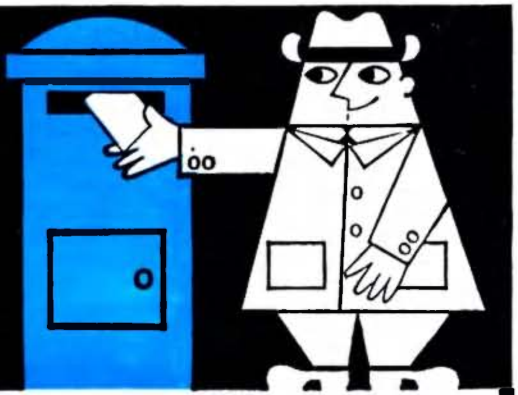

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MODEL M303: 30K O.P.V.
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MODEL SK120: 20K O.P.V.
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D.C. V.: 0.5, 5, 50, 250, 500, 1,000.
A.C. V.: 10, 50, 250, 500, 1,000.
D.C. mA.: 5, 50, 500.
OHMS: 0.5 MΩ in 4 ranges.
PRICE: **$15.00** + 15% sales tax.

MODEL 500B: 30K O.P.V.
D.C. V.: 0.25, 1, 2.5, 10, 25, 100, 250, 500, 1,000.
A.C. V.: 2.5, 10, 25, 100, 250, 500, 1,000.
D.C. mA.: 0.05, 5, 50, 500; 12A.
OHMS: 1 Ω to 8 MΩ in 3 ranges.
PRICE: **$25.00** + 15% sales tax.

MODEL MVA5: 20K O.P.V.
D.C. V.: 5, 25, 50, 250, 500, 2,500.
A.C. V.: 10, 50, 100, 500, 1,000.
D.C. mA.: 2.5, 250.
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MODEL TS-60R: 1K O.P.V.
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