amateur radio

Vol. 39, No. 1
JANUARY, 1971

Registered at G.P.O., Melbourne, for transmission by post as a periodical
Price 30 Cents
**CHRISTMAS SPECIAL!**

1 WATT TRANSCEIVER

13 TRANSISTORS, 3-CANAL, AND CALL SYSTEM

- Frequency range: 10 to 100 miles (depending on terrain, etc.).
- Frequency: 27.240 MHz. (F.M.G. approved). Freq. stability: plus or minus 0.005%. Transmitter: Crystal controlled, 1 watt. Receiver: Superhet.
- Size: 2" x 3" x 1 1/4". Weight: 25 ozs.

Other features: Leather carrying case, battery level meter, squelch control, earphone jack, AC adapter jack, etc.

**Price $75 a Pair.**

Single units available $38.50 each

BE EARLY, limited stock available

---

**CRYSOTRYS**

CITIZENS BAND and MODEL RADIO CONTROL

FREQUENCY CRYSTALS

- **HC18** Miniature, 1/4 inch spacing.
- **HC8** Holders, 1/2 inch spacing.

**Channel A**

- Transmitter: 10,275 kHz.
- Receiver: 10,275 kHz.

**Channel B**

- Transmitter: 10,275 kHz.
- Receiver: 10,275 kHz.

**Special Price $39.00**

**Packaging 75c. F.O.R.**

---

**GENERAL COVERAGE COMMUNICATION RECEIVERS**

IN STOCK

- TRIO B00E5/15, type 550 kHz to 30 MHz, in bands, bandspace tuning, SSB-AM-CW, $175 net.
- TRIO MATCHING SPEAKER, 8 ohm, V.C., $13.50.
- REALISTIC DX-153, solid state, 550 kHz to 30 MHz, lightweight bandspace tuning, SSB-AM-CW, $239 net.
- LOUDSPEAKER in matching cabinet, 8 ohm V.C., $13.50.
- LAFAYETTE HA-630, five-band, bandspace tuning, solid state, SSB-AM-CW, $199 net.

**LAFAYETTE HA-600**

Solid state, as above but Ham Band Only, SSB-AM-CW, $199 net.

**BRAND NEW SPEAKERS**

- **3DX** 8 ohms
- **3DX** 15 ohms
- **6A7** 8 ohms
- **6A7** 15 ohms
- **12CMX** 8 ohms
- **12CMX** 15 ohms

**Next Price $3.95**

**Postage 20c**

---

**DUAL METER S.W.R. BRIDGE**

For V.S.W.R. measurement, this unit uses the dual bridge method of comparing simultaneously the power supplied and reflected from the antenna system. Spok: impedance, 50 ohms: accuracy, plus or minus 1%; power loss, negligible; freq. range, 3 to 150 MHz. Price $28.

---

**TE-16A TRANSMISORISED TEST OSCILLATOR**

- Frequency range: 400 KHz to 3 MHz. In five bands.
- Modulated 800 Hz. sine wave. Modulation 20% approx. 5% x 5% x 5%.
- Weight 1.5 lbs.
- Price $24 tax paid, Postage 75c.

---

**HAM RADIO SUPPLIERS**

323 ELIZABETH STREET, MELBOURNE, VIC., 3000

Phones: 67-7329, 67-4286 All Mail to be addressed to above address

Our Disposals Store at 104 HIGGERT ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 10.30 a.m. to 5.0 p.m., and on Saturdays to midday.

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.
CONTENTS

Technical Articles:

Harmonics, Lecture No. 10B ........................................... 8
How Many Mikes? .......................................................... 7
Results of 1970 Victorian 432 MHz Antenna Gain Contest ..... 10

General:

AMSAT 1970 Annual Report .................................................. 15
Australian D.X.C.C. Countries List ....................................... 12
Australian DX Century Club Award ...................................... 11
Australian VHF Century Club Award ..................................... 11
Awards for Technical Articles ............................................... 20
B.A.R.T.G. Spring RTTY Contest ......................................... 20
Book Review: Amateur Radio Techniques ............................... 21
Canberra Easter Convention .................................................. 17
Central Coast Award .......................................................... 20
Change In Intruder Watch Co-ordinator in N.S.W. .................... 15
Cook Bi-Centenary Award .................................................... 17
Correspondence ................................................................... 22
Federal Comment .................................................................. 3
Higginbotham Award ............................................................ 18
La Balsa—A Triumph for Amateur Radio ................................. 4
Licensed Amateurs in VK at August 1970 ................................. 16
New Call Signs .................................................................... 17
N.Z.C.—New Zealand Counties Award .................................... 9
Obituary .............................................................................. 20
Operation from Two N.Z. Counties ........................................... 20
Overseas Magazine Review ..................................................... 21
Prediction Charts for January 1971 .......................................... 18
Silent Key ............................................................................. 22
So You Have Changed Your QTH ............................................ 18
Telecommunications and Electronics (S.A.A. Report) ......... 20
The Call Book ..................................................................... 16
VHF .................................................................................... 19
W.I.A. D.X.C.C. ................................................................. 16

COVER STORY

Arrows point to the insulators at the top and bottom of the 14 MHz quarter wave vertical aerial on the starboard leg of La Balsa’s mast. See story on page 4.
**HAND-CARVED CALL LETTER PLAQUES**

In solid Philippine Monkey Pod Wood. A unique gift for yourself—or others!

Price, parcel post paid, A$9.75 plus local tax of approx. A$4

Allow 3 months for delivery. You pay local tax. Send postal money order or bank draft for A$9.75 to:

**REPUBLIC CRYSTAL LABS**

Exporter of Philippine Handicrafts

P.O. Box 46, Makati Comm. Center, D-708, RIZAL, PHILIPPINES

If you need special Plaques with business names or family names, send us a sketch of your needs and we will quote post paid. Cut-out letters of wood for wall painting also available.

Plaque lengths: 5 letters 20", 6 letters 22"; letters about 5" high; width 6"; thickness 1".

Only $2.35 for a subscription to—

**"BREAK-IN"**

OFFICIAL JOURNAL OF N.Z.A.R.T.

Send a cheque to the—

Federal Subscription Manager, W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

---

**BEST SEASON'S GREETINGS TO ALL**

**ROUTERS—CDR Ham-M heavy duty rotator with indicator-control unit, for up to 2 inch masts, the proven rotator since 1655 ... A$165**

8-conductor control cable for same, ........ per yard A$0.60

Note the special package offer with Hy-Gain THE6XX.

**ANTENNA NOISE BRIDGE—OMEGA TE-7-01 Bridge, for the serious experimenter, gives resonance and impedance in one operation A$25**

**CRYSTALS—FT-241 channels 0-79, full box of 80 xtals A$37.50**

Individual channel crystals, A$0.20 to A$2.00, depending on frequency required. 455 KHz. the dearest.

**BALUNS— Exact electrical duplicate of the Hy-Gain BN-86 ... A$12.50**

**MIDLAND PRODUCTS—Type 13-710 One Watt Transceiver, P.M.G. approved model for 27,240 KHz., operation under special licence, will accept 27 and 28 MHz. Amateur band crystals, 3 channels, with batteries, earphone, carrying case, microphone, battery voltage meter, complete, only ... A$37.50**

Type 23-1358 Field Strength Meter, with five ranges tunable from 1 to 300 MHz, with telescoping whip ... A$10

Type 23-126 SWR-POWER Meter, dual meters 100 micro-amp., very sensitive for low powers but good for 1 kw. max., up to 175 MHz., reads forward and reflected power simultaneously, 52 ohm impedance ... A$20

Type 23-126 SWR Meter, standard 52-ohm type, good for up to 1 kw., with telescoping whip to be used for field strength meter A$12

**DURALUMIN ALUMINIUM ALLOY TUBING**

IDEAL FOR BEAM AERIALS AND T.V.

**★ LIGHT ★ STRONG ★ NON-CORROSION**

Price List on Request

STOCKISTS OF SHEETS—ALL SIZES AND GAUGES

**GUNNERSEN ALLEN METALS**

PTY. LTD.

SALMON STREET,

PORT MELB'NE, VIC.

Phone 64-3531 [10 lines] T'grams: "Metal's" Melb.

HANSON ROAD,

WINGFIELD, S.A.

It was my original intention to devote this Federal Comment to a review of the year just past. I would have preferred to have paid tribute to all those who made the 60th year of the Institute such a special year, particularly all those who supported the Cook Bi-Centenary Award so magnificently, and who turned it into one of the high points in the history of Amateur Radio in Australia.

Unfortunately I cannot do this. At a time when I know that so many of you are on a holiday, I must turn, not to the past, but to the present and to the future. In this holiday season, as I convey to you all the Season’s Greetings of the Federal Council and the Federal Executive, I have also to tell you of the serious crisis that we face, and seek your support for the solution we propose.

That we faced a very real crisis in our Federal Administration and with this magazine has been apparent for some time. Both have, since their inception, relied on the labour of honorary officers. But as the years have passed, so our organisation has grown. What was once basically a social group with a common interest has grown into an organisation that is fundamental to our very existence.

The amount of work done by officers such as the Federal Secretary, the members of the Federal Executive generally and those responsible for this magazine has grown to the extent that it is no longer possible to maintain the present level of activity by reliance on volunteers alone. How many of us realise the hours of work each week, each day, that the Editor of “A.R.” or the Federal Secretary is called upon to do? I joined the Federal Executive after the Easter 1968 Federal Convention. Before that, as Victorian Federal Councillor, at each Convention, I had been able to sit back and offer the Federal Executive the benefit of my advice as to how they should undertake the many tasks they faced. Now I realise only too well how much work must be done.

Certainly we express our gratitude to those doing the work. But to those people neither gratitude nor the satisfaction of doing something worthwhile is enough. The job itself is too big. They want to be able to earn their living without having to steal time for the Institute. They want to be able to spend a reasonable time with their families. They even want to enjoy their hobby. In a word, they want “out”.

The use of volunteers has slowly drifted into the exploitation of volunteers. These are hard words indeed, but I can assure you, they are justified.

There are only two. To be effective, and I do believe that at present the Institute is effective, and that the magazine is effective, we cannot do less than we are doing now. Indeed, we are not doing all we should; I am particularly unhappy that we are not giving the Federal Councillors, or the members, nearly as much information as we should. No, we cannot cut back and remain effective.

Can we use even more volunteers? Already, in the metropolitan area of Melbourne there is one job going for each 5½ full members. Quite apart from the fact that we have reached a level of saturation, administration cannot be channelled through an indefinite number of people. In the end, the coordination of that kind of administration takes just as much effort as the job itself.

Our choice is simple. We can either have a paid, high level permanent administration, both for the Federal body and the magazine, or we can go back to a vastly lower level of activity and effectiveness, where things might be done when someone has the time, with the magazine perhaps duplicated and produced five or six times a year.

The Councils of the New South Wales Division and the Victorian Division have, together with Federal Executive, exhaustively examined the problem. They realise that we cannot go back, and the only solution is the first one.

This means that each member will have to pay more in subscriptions each year. Despite this, both the Victorian and New South Wales Divisions have pledged to a programme involving the employment of a Secretary/Manager. Events have moved quickly. Executive has been able to inform some Divisions, but not all, as fully as we would have wished.

To our surprise, we have found nothing but support. Our members seem to have been more aware of the problem than perhaps we thought. In this issue we advertise for a person to fill this post. Remember, when you read this advertisement, that how our organisation grows will depend very much on the man we get. Accordingly, we are looking for a man with top ability and experience, mainly administrative.

The cost to each member rather depends on the financial structure of the member’s Division. Some Divisions will be able to effect some economies by the utilisation of the proposed centralisation of certain records, feasible with a permanent administration. Generally speaking, the direct increase to members in the smaller Divisions (which have lower fees than the larger Divisions) will be greater. It will not be more than $3 per annum.

I earnestly seek your support. Each member can do two things. First, give your Division your support in these moves. Let your Division know they have your support; when faced with a need to increase subscriptions we are always hesitant. It’s not that we do not wish to pay the increase ourselves, it’s just that we are worried about the other fellow. We are all “other fellows” — let your Division know that they do not have to fear a general exodus if they increase the fees.

Secondly, each of you can do something to get new members. Only 54% of all licensees are members of the W.I.A. Please, take the time to have a look at the table set out on page 16 of the April 1970 issue. The 46% who are not members take the benefit of the privileges obtained and the protection given by the W.I.A. No membership drives can be as successful as the efforts of each individual member to get new members. The more members we have to share the burden, the lighter the burden is on each individual.

Yes, I would rather have written a Federal Comment dealing with the achievements of the Institute, but this matter cannot wait until February. In my report to the Federal Council last year I said that I believed that the Institute can justify the support it needs.

May we count on your support?

—MICHAEL OWEN, VK3KI.
Federal President, W.I.A.
The search could be likened to looking for a needle in a haystack. In fact, it was for little more than a switch click somewhere in the Pacific Ocean south of the Equator.

The fact that through the perseverance of Amateur Radio operators in at least four countries, and perhaps only because of their discovery, has the incredible story of La Balsa been told.

It is now history that Vital Alsar, a Spaniard, Marc Modena, a Frenchman, Normand Tetreault, a Canadian, and Gabriel Salas, a Chilean, left Ecuador, South America, on a balsawood log raft last May 29.

On November 4 at 11.50 p.m., they arrived under tow in the Mooloolaba River, 65 miles north of Brisbane, after a voyage of 8,500 miles.

The report of their Amateur Radio activities during that time, as compiled from the men and operators, will have a special place in the minds of all who took part or who at least heard the raft signals.

Although Vital Alsar was primarily an adventurer seeking to prove that an ancient type raft could be sailed with some direction, he also realised some modern radio gear, together with a petrol generator and a fuel supply, would be a necessity on his raft.

On the advice of his friend, Vice-Admiral Samuel Fernandes, a Mexico City Ham, XE1EB, and radio co-ordinator Raphael L. Corcuera, XE1EEI, a business man, of Guadalajara, Mexico, Vital installed a Hallicrafters SR-150 transceiver.

Installation was under the eye of electronics engineer Joe HC2OM, of Guayaquil, Ecuador, where the raft was built.

Vital was given the call sign of HC9E/EP/MM.

The transceiver was largely pre-set to operate on about 14,105 KHz. to limit operating time and thus exposure to the sea air.

The radio was stored in the plaited cane cabin and protected by eight plastic bags.

The aerial was a quarter wave loaded vertical mounted on two insulators taped to the starboard leg of the mast with a lead into the cabin.

Transmissions after the raft started its cross-Pacific drift were good with regular s.s.b. contacts to Fernandes and Corcuera and later with Liliana HC2IS.

Vital joined in La Rueda, the wheel in Spanish but radio net in English, every four days with hardly any interference.

Besides the Mexican and Ecuador stations, there were calls from Nicaragua, San Diego (California) and Montreal (Luc VE2BBS).

Raphael was even able to arrange a rendezvous with a U.S. Navy ship when the La Balsa was down to half a gallon of petrol from an original 17 gallons—enough only for an hour and a half's operating.

MICROPHONE USELESS

In mid-September came a storm in which waves reached 30 feet and the transceiver in its plastic bags was put under the ceiling for safety as water swept through the cabin. Some shack!

It was little wonder then that on October 3 with the raft east of New Caledonia and approaching the most dangerous part of the voyage, the microphone became faulty.

The next day it failed.

Vital tinkered with it while Raphael and the Admiral, so far away, wondered what to do.

But Vital shorted out the insert so that by pressing the microphone switch he could trigger a signal.

The Admiral devised the system where Vital could give an affirmative answer by pressing the microphone switch and remaining silent for a negative answer.

Then by transmitting digits one-two-three and so on, and listening in between, he could get a signal from Vital giving the raft's longitude, latitude, air and sea temperatures, wind direction and strength, sea conditions and the condition of those on board.

ZL THEN VK HELP

Enter into this strange communication, Mr. A. T. “Gus” Knox, ZL1RO, of Auckland, an Air New Zealand operations man.

The Mexicans explained all and said that although the raft seemed to hear...
them without difficulty, they were having growing difficulty in hearing the reply clicks as the raft drifted west.
At this time, the signals were traveling more than 6,900 miles.
Gus offered to help since with his rotating beam he could hear the clicks easily and his signal on the raft was strong.
This was October 10 and the raft was in danger from the D'Entrecasteaux Reefs ahead, a danger apparently not realized by the men back in Mexico.
A suggestion that a new microphone be dropped from the air was not taken up.
Luckily, the raft passed the northern end of New Caledonia and headed west in the current towards Australia.
On October 12, the raft's position was 162 deg. 43 min. E., 17 deg. 38 min. S., and from that day an alternate day schedule was kept.
For three weeks, Gus hurried home from his job to relay the Mexicans' questions and to relay the clicked replies.
Meanwhile in Sydney, Syd Molen, VK2SG, a senior t.v. technician, had heard about the proposed drift from Raphael, one of his regular contacts.
He had listened on the set frequency but had never talked to La Balsa, so as not to waste the raft's power.
Raphael asked Syd if he would have a go at taking over contact with the raft and Syd made his first contact on his home-brew gear from his 12 ft. x 12 ft. shack at Pendle Hill on Oct. 24.
Then it was his turn to take over from Gus and transmit the questions and then the replies. Gus stood by.
By October 28, the sea temperature had risen 3°C. in two days, which tended to confirm that they were encountering a warm current from the Coral Sea.
Australia was near at hand, but then there were the treacherous Great Barrier Reefs ahead.
By October 29, Les Bell, VK4LZ, a farmer, of Airlie Beach, near Proserpine, North Queensland, and Keith Schleicher, VK4KS, of Aspley, Brisbane, had joined in the relays.
NEWS BREAKS
The first news reports appeared.
It was important that Les and Keith joined in, along with several others known to be listening on the side, since the raft was approaching the Swain Reefs, east of Rockhampton, the southern end of the main Barrier Reef.
By 1.45 p.m. E.A.S.T. on Saturday, October 31, there can be little doubt that scores of beams, including that of Raphael in Guadalajara, and a Solo-

 Amateur Radio, January, 1971
As they felt they were within Australian waters and near landfall, they thought it advisable to request assistance to stand by.

Following the report, two newspapers put separate aircraft up to search for the raft, but in poor visibility and failing light, it was not sighted.

At Airlie Beach, Les offered to stay up all night keeping a listening watch on the frequency. At Syd's suggestion, the raft was back on the air at 8 p.m. It was then only 16 miles east-north-east of Double Island Point with a 30-knot south-easter still blowing.

At Mooloolaba, 50 miles to the south, a pilot launch with a doctor on board put to sea to search unsuccessfully and returned to port soon after midnight.

At 2 a.m. on Thursday, November 5, the fishing launch Capri, chartered by the local Nambour newspaper, left Mooloolaba to search.

By 5 a.m., the Mexicans were back on the air asking Vital his position, which was two miles off Double Island Point. However, lighthouse men there could not see the raft.

At this time, skip distance prevented Brisbane Amateurs from hearing the raft. It was Syd who asked the questions and Les confirmed the raft's replies.

The untold scores of Amateurs who must also have been listening did not break in.

**SEEN FROM THE AIR**

As air-sea rescue authorities were still maintaining the whole matter was a hoax, the raft was spotted from the air.

After Syd was unable to reach Brisbane authorities by telephone, he asked Keith VK4KS, standing by in Brisbane, to contact them to see if Syd's services were still required. The authorities released Syd and took control.

The raft was later taken in tow by the Capri and it reached Mooloolaba at 11:50 p.m. E.A.S.T.

---

**W.I.A. OFFICIALS AT WELCOME**

There to welcome them on behalf of Amateurs were the W.I.A. Queensland Div. President Norm Wilson (VK4NP), Vice-President Theo Marks (VK4MU), Keith VK4KS and Ken Chiverton (VK4VC).

About 2.30 a.m., Vital was at Norm's station wagon to contact the Admiral (XE1EB) to confirm the end of a fantastic voyage.

But all was not ended there so far as Amateurs were concerned.

The next day Vital paid a visit to the shack of Kev in Nambour and while there was able to communicate with Mexico and Ecuador.

On Friday, November 13, the four crewmen were in Brisbane and visited the shack of Keith for a late lunch and again were able to have a few words with XE1EEI, XE1EB and HC2OM.

Then on Sunday, November 15, they returned to Keith's for a dinner in their honour, given by the Brisbane DX Radio Club and attended by 50 members and their wives.

At this, Vital was presented with a club certificate and made an honorary member. Here, too, the men received back their transceiver, repaired to first class condition.

Salt water spray had got inside and the microphone had been damaged by electrolysis action. Also, the transmitter was putting out only 30 watts, two tubes were "soft" and tuning was poor. Luck had prevailed!

The debt to all Amateur operators involved with La Balsa from Ecuador to Australia has been acknowledged many times since by Vital.

But who would take anything from the magnificence of the feat by four brave men?
**HOW MANY MIKES?**

**COL HARVEY,* VK1AU**

Not for the audiophile—but a simple approach to the problem of testing capacitors in the tens of microfarads range

The long standing practice of bridging a replacement capacitor across a suspect electrolytic has much to commend it, particularly in filter and decoupling applications. However, in solid state equipment where even interstage coupling capacitors are likely to be many microfarads, it is generally a nuisance to remove suspect capacitors for test, and more a problem to prove capacitor value and serviceability. As very few Amateurs seem to have access to a polarised capacity bridge, a simple self contained capacity and leakage tester can be a useful substitute. The method used does not give absolute readings, but compares the suspect component with a calibration obtained from newish similar items.

Experience to date shows that capacitor values measured for electrolytics are higher than the equivalent values given by paper capacitors. Apart from the effect of differing leakage, no explanation for this has been attempted. The problem is easily overcome, however, by using a supplementary calibration for paper capacitors in the microfarad range.

![Fig. 1. The Capacity Meter.](image)

Values are not critical. C is needed to keep d.c. off the meter rectifier. Set meter to full scale by adjustment of the multiplier before connecting condenser under test. Choose a value for the multiplier which will allow f.s.d. with the voltages and meter available.

The concept of the tester is that it should be simple and cheap, should cover the range 5 to 200 µF, and provide a leakage test and allow measurements to be made without having to disconnect the suspect item.

Take any half wave a.c. to d.c. rectifier and apply the output to a load resistor. If there is no filter, there will be a substantial a.c. component across the load. A low range a.c. voltmeter can be coupled across the load and the multiplier set to give a full scale reading of the ripple. The more substantial the capacity subsequently placed across the load, the lower the meter reading of ripple. Calibration is then achieved by the simple expedient of recording meter readings against the labelled value of newish capacitors in series-parallel combinations to cover the preferred values in the range 0-200 µF.

Since testing is incomplete unless we have an assurance that leakage is within reasonable limits, we also need to provide an adjustable source of reasonably pure d.c., and a means of indicating within broad limits the amount of leakage. With low value mica/ceramic capacitors a conventional neon lamp is well proven, but with the higher leakage of electrolytics a less sensitive indication is needed. The meter used to display capacity can therefore be switched (and shunted as required) to read leakage.

There is considerable freedom in the way in which an appropriate test voltage can be obtained, ranging from a simple half wave supply with no choice of voltage; through a voltage doubler arrangement with switched voltage divider networks to provide precise ranges for test. However, with a 250 volt supply, providing a push to test switch is provided, a 2 watt 50K potentiometer can be calibrated to show the approximate voltage available for test. The ultimate choice depends mainly on the transformer and the size of the instrument cabinet which is to be used.

In practice only one important refinement is needed to the simple capacity test circuit described above. If the capacitor under test, or the test leads are shorted, the output of the transformer rectifier will also be shorted. To avoid the smell of burning insulation, a series resistor of about 50-100 ohms must be used in series with the load resistor. Since both resistors will dissipate about 1.5 watts (depending on transformer voltage), it is necessary to use wire wound bias resistors together with a diode that will handle 60 mA. plus the peak charging current.

So far as the transformer secondary voltage is concerned, any voltage between 4 and 40 can be used, providing the series resistor is altered to maintain about 5 watts dissipation in the load, and that the meter multiplier is varied to permit full scale deflection with whatever end-voltage results. It is a slight advantage to have some portion of the meter multiplier adjustable from the front panel, so that the scale can be set before each set of readings of capacity.

The meter full scale deflection is not significant either, but the combination of a 6-12 volt transformer secondary and an 0-1 mA. meter has proved very satisfactory. Almost any available junk transformer can be found to make a satisfactory device. However, don't forget the low value blocking capacitor to keep d.c. off the meter rectifier.

After the instrument is completed, it is wise to measure the d.c. voltage across the load resistor, so that tests on small electrolytics of lesser working voltage can be avoided.

Calibration is not linear, but the difference between 5 and 8 µF, can be seen easily. If the readings of newish electrolytics are graphed, it is a simple matter to extract scale readings corresponding with preferred values, such as 8, 16, 25, 40, 50, 64, 100, 160 µF. By using a parallel rheostat across the test capacitor, the value of in-circuit shunt resistance which will affect the accuracy of readings can be found. Generally, a 1,500 ohm bias resistor across 25 µF, will not affect the reading.

As with most test procedures, a few clues as to interpretation of results are sometimes needed. With this gadget—

- A shorted capacitor reads 200 µF.
- A leaky capacitor shunts the ripple and consequently gives an erroneously high capacity reading. If the capacity reading is more than about 20% high on the labelled value, suspect a leaky capacitor and test further.
- Readings less than the labelled value are likely to be valid.
- A low voltage electro run at higher than rated d.c. voltage will initially show excessive capacitance, soon followed by a progressive drop to a low reading of capacity, probably accompanied by overheating.
- Paper capacitors although labelled the same value as electros, do not produce the same scale reading.

**FIG. 2a.** Simple Leakage Tester.

For use with paper and mica capacitors. If electrolytics are to be tested frequently, it would be better to make provision for a meter indication of leakage as well.

**Addition of a potentiometer calibrated for voltages allows low voltage electrolytics to be checked. The safety switch is needed as a precaution against high charging currents. A "normally closed" push button switch (such as is used for refrigeration lights) would be ideal. For clarity, switching has been omitted.
LECTURE No. 108

HARMONICS

C. A. CULLINAN, VK3AXU

Now it is rather unfortunate that if we operate a valve in its most linear condition its efficiency is low, but luckily it is possible to operate under certain conditions with a considerable increase in efficiency whilst retaining low distortion characteristics.

Let us make some comparisons, taking data from an A.W.V. valve data book after detailing some definitions.

CLASS OF SERVICE

Class A Amplifier

This is a valve amplifier in which the grid bias and the alternating grid voltages are such that plate current in a specific valve flows at all times.

The ideal class A amplifier is one in which the alternating component of the plate current is an exact reproduction of the form of the alternating voltage applied to the grid and plate current flows during three 360 degrees of the electrical cycle.

The characteristics of a class A amplifier are low output and low efficiency.

The efficiency of a class A amplifier may lie between 25% and 30%. One main characteristic is that grid current never flows during any part of the exciting voltage cycle.

In most valve type receivers the r.f. stages operate in class A. Also in the early days of radio telephony, using valves, the modulator valves were operated in class A.

Class AB Amplifier

An amplifier in which the grid bias and the applied alternating grid voltages are such that plate current in a specific valve flows for appreciably more than half but less than the entire electrical cycle.

The characteristics of a class AB amplifier are greater output and greater efficiency than a class A amplifier. However, the plate current will not remain steady. The bias is such that without an exciting voltage at the grid, the plate current will be lower than in class A operation and will rise considerably as the exciting voltage increases.

Class AB amplifiers are divided into two types known as AB1 and AB2.

In class AB1 grid current never flows during any portion of the grid excitation, but the efficiency is greater than in a class A amplifier.

But in class AB2 operation grid current does flow during part of the exciting voltage cycle and greater power can be obtained because the efficiency is still greater.

Class B Amplifier

An amplifier in which the grid bias is approximately equal to the plate current cut-off value so that plate current is approximately zero when no grid exciting voltage is applied, so that plate

* a. Adrian Street, Colac, Vic., 2250.

...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.

The output of each valve will combine to produce a complete electrical cycle in the transformer, for each component in cycle of grid exciting voltage, also even-order harmonics (2nd, 4th, 6th, etc.) will cancel and in practice the even-order harmonics, particularly the 2nd, will be sufficiently small to be negligible. Therefore it becomes possible to obtain good quality audio frequency power from class AB or class B operation. Also, push-pull operation may be applied to two valves in class A.

Class C Amplifier

This is an amplifier in which the grid bias is appreciably greater than the cut-off value so that the plate valve current is zero when no alternating grid voltage is applied, and so that the plate current in a specific valve flows for appreciably less than one half of each cycle when an alternating grid voltage is applied.

The characteristics of a class C amplifier are high plate circuit efficiency and high power output. However, as plate current flows only over portion of the grid voltage cycle there will be a considerable departure from linearity between the grid and plate wave-forms.

Class C amplifiers find their main use in radio frequency applications. For such purposes the valve operates into a tuned circuit, usually known as a "tank circuit", and this has the property of appearing as a "fly-wheel" converting the plate current pulses into a sine-wave usually with considerable harmonic content. Two valves used in class C operation in push-pull will have little even-order harmonic distortion due to the reduction of the even order harmonics because of the push-pull connection.

A similar state of affairs exists if a class B amplifier is operated at radio frequencies and it is possible to obtain excellent linearity if the valve and its associated circuits are correctly adjusted. Such an amplifier is often referred to as a linear amplifier.

Unfortunately a valve used as a class B radio frequency amplifier has low efficiency, about 33.3% and attempts to make it more efficient frequently cause considerable harmonic and intermodulation distortion.

Valve type 6L6 was developed before World War II and has been a very popular valve. Although designed for audio frequency work, Radio Amateurs soon found that it was excellent at radio frequencies for transmitters, and later a variant called 807 was developed expressly for high power audio and radio frequency work.

To illustrate the operation of valves as amplifiers under the various classes of operation, we are listing some of those for 6L6 and 807s from the A.W.V. valve data books, 6L6G is a glass envelope equivalent of the 6L6.

The characteristics of a class C amplifier are high plate circuit efficiency and high power output. However, as plate current flows only over portion of the grid voltage cycle there will be a considerable departure from linearity between the grid and plate wave-forms. In this connection one valve amplifies over one half of the exciting voltage cycle and the other valve amplifies over the other half cycle. (In an ideal amplifier.)

The plates of the two valves are connected to a load having the h.t. applied to the centre tap. Usually the load will take the form of a transformer having a centre-tapped primary, into which the actual load has been reflected.

If the two halves of the primary are well balanced as regards inductance, self-capacitance and resistance, then
### Type 6L6

**Single Valve—Class A**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate voltage</td>
<td>250 v.</td>
</tr>
<tr>
<td>Screen voltage</td>
<td>250 v.</td>
</tr>
<tr>
<td>Grid voltage</td>
<td>14 v.</td>
</tr>
<tr>
<td>Peak a.f. grid voltage</td>
<td>14 v.</td>
</tr>
<tr>
<td>Zero signal plate current</td>
<td>72 mA.</td>
</tr>
<tr>
<td>Max. signal plate current</td>
<td>78 mA.</td>
</tr>
<tr>
<td>Zero signal screen current</td>
<td>5 mA.</td>
</tr>
<tr>
<td>Max. signal screen current</td>
<td>7.3 mA.</td>
</tr>
<tr>
<td>Load resistance (plate to plate)</td>
<td>2500 ohms</td>
</tr>
<tr>
<td>Max. signal power output</td>
<td>6.5 watts</td>
</tr>
<tr>
<td><strong>Total harmonic distortion</strong></td>
<td>10%</td>
</tr>
</tbody>
</table>

This valve is a tetrode and under class A operation there is a slight change in plate current. Grid current changes; however, plate current flows at all times.

Note that there is a very high total harmonic distortion.

Let us compare what happens if two 6L6 valves are operated in class A push-pull for the same plate and screen voltages (for two valves).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate voltage</td>
<td>250 v.</td>
</tr>
<tr>
<td>Screen voltage</td>
<td>250 v.</td>
</tr>
<tr>
<td>Grid voltage</td>
<td>16 v.</td>
</tr>
<tr>
<td>Peak grid to grid voltage</td>
<td>32 v.</td>
</tr>
<tr>
<td>Zero signal plate current</td>
<td>120 mA.</td>
</tr>
<tr>
<td>Max. signal plate current</td>
<td>140 mA.</td>
</tr>
<tr>
<td>Zero signal screen current</td>
<td>10 mA.</td>
</tr>
<tr>
<td>Max. signal screen current</td>
<td>16 mA.</td>
</tr>
<tr>
<td>Load resistance (pl. to pl.)</td>
<td>5000 ohms</td>
</tr>
<tr>
<td>Max. signal power output</td>
<td>14.5 watts</td>
</tr>
<tr>
<td><strong>Total harmonic distortion</strong></td>
<td>2%</td>
</tr>
</tbody>
</table>

Comparison of these two sets of data shows that the push-pull connection gives more than twice the output of a single valve, also that the total distortion has dropped to 2%.

By increasing both the plate and screen voltages as well as the grid bias, it is possible to operate two 6L6s in class AB1 push-pull and keep within the maximum ratings for the valves.

Here is one set of data for two valves.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate voltage</td>
<td>360 v.</td>
</tr>
<tr>
<td>Screen voltage</td>
<td>270 v.</td>
</tr>
<tr>
<td>Grid bias voltage</td>
<td>-22.5 v.</td>
</tr>
<tr>
<td>Peak a.f. grid to grid</td>
<td>45 v.</td>
</tr>
<tr>
<td>Zero signal plate current</td>
<td>88 mA.</td>
</tr>
<tr>
<td>Max. signal plate current</td>
<td>132 mA.</td>
</tr>
<tr>
<td>Zero signal screen current</td>
<td>5 mA.</td>
</tr>
<tr>
<td>Max. signal screen current</td>
<td>15 mA.</td>
</tr>
<tr>
<td>Load resistance (pl. to pl.)</td>
<td>6600 ohms</td>
</tr>
<tr>
<td>Max. signal power output</td>
<td>26.5 watts</td>
</tr>
<tr>
<td><strong>Total harmonic distortion</strong></td>
<td>2%</td>
</tr>
</tbody>
</table>

For this mode of operation there has been almost twice the power output as obtained from the same valves in class A push-pull, and the total harmonic distortion has remained the same. However, it must be pointed out that there is considerable variation in plate current and the screen voltage should be stabilised to keep it at 270 volts. Also, the regulation of the power supply must be very good to keep the h.t. voltage constant as the plate current swings from 88 mA. to 132 mA.

Grid current. Note that in all the examples given so far the peak grid current is greater than the plate current. At this point it is necessary to consider the bias voltage on either positive or negative peaks, hence grid current does not flow, nor is the valve driven beyond plate current cut-off.

### Class AB2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate voltage</td>
<td>360 v.</td>
</tr>
<tr>
<td>Screen voltage</td>
<td>270 v.</td>
</tr>
<tr>
<td>Grid bias voltage</td>
<td>-22.5 v.</td>
</tr>
<tr>
<td>Peak a.f. g.-g. voltage</td>
<td>72 v.</td>
</tr>
<tr>
<td>Zero sig. plate current</td>
<td>88 mA.</td>
</tr>
<tr>
<td>Max. sig. plate current</td>
<td>205 mA.</td>
</tr>
<tr>
<td>Zero sig. screen current</td>
<td>5 mA.</td>
</tr>
<tr>
<td>Max. signal screen current</td>
<td>20 mA.</td>
</tr>
<tr>
<td>Load resistance (plate to plate)</td>
<td>3800 3800 ohms</td>
</tr>
<tr>
<td>Max. sig. power output</td>
<td>47 60 watts</td>
</tr>
<tr>
<td><strong>Total harm. distortion</strong></td>
<td>2%</td>
</tr>
</tbody>
</table>

Two sets of operating conditions have been given. In the first set of data (A.W.V.) the major change from class AB1 operation is in the plate to plate load resistance. However, the grids are now driven into grid current on the positive peaks of the exciting grid voltage and as a result considerably more plate current flows.

However, there are penalties to be made good. The grids require 270 milliwatts of driving power, which means that the driver stage must have good regulation as it supplies this power. Also, the regulation of the plate and screen supplies must be very good.

The second set of data (R.C.A.) shows that with an increase in plate, screen and grid bias voltages and an increase in grid driving power up to 80 watts output can be obtained. However, no distortion figures are quoted.

It would appear that 47 watts output is the maximum that two 6L6 valves can deliver in class AB2 push-pull operation. Above this there is a great danger of internal breakdown in the valves.

However, the 807 is essentially a 6L6 valve with different external appearance. The plate is brought out to a metal cap on the top of its glass envelope and the base uses a "low loss" UY configuration.

For Continuous Commercial Service (C.C.S.) the 807 may be operated with the same ratings as for the 6L6, but for Intermittent Commercial and Amateur Service (I.C.A.S.) it is possible to get as much as 120 watts from two 807s in class AB2 push-pull operation.

No data is available for 6L6 or 807 valves for operation as class B audio frequency amplifiers.

All the data presented so far shows that class A operation is the least efficient, although the simplest, and that to obtain greater power per valve it is necessary to use more than one valve in one of the other classes or several valves in parallel.

It is possible to operate in class A, AB1, AB2 and B so that the distortion in the output wave is very low, but the power output, too, will be low, also there is an enormous difference in the linearity between input and output wave forms for different types of valves.

Important—it must be thoroughly understood that data in valve handbooks refers to an ideal amplifier and such things as power output and distortion are those to be obtained at the valve of a single valve. To get as much as 120 watts from two output coupling device is not considered so in designing amplifiers the losses and any distortion in the coupling system must be taken into account.

It is possible to build valve amplifiers with nominally 1% total harmonic distortion and this can be reduced further if negative feedback is employed.

(to be continued)

---

**N.Z.C.—NEW ZEALAND COUNTIES AWARD**

Initial award requires confirmations from 20 different New Zealand counties. Stickers for 40, 60, 80, 100 with a special award for the full 112 counties. Charges: initial certificate with endorsements 10 cents or two IRCs. Checking sheets with all county information available for 10 cents or two IRCs. This sheet remains a complete record of the counties worked and endorsements obtained—it is returned after each application. Applications and information from ZL2GX, 152 Lytton Rd., Gisborne, N.Z.

---

**K.W. ELECTRONICS**

**KW ATLANTA TRANSCEIVER**

- Built-in Noise Limiter
- Built-in 100 kHz Crystal Calibrator
- Full P.T.T. Operation
- Automatic Linearity Control
- Upper and Lower Sideband Selection by Panel Switch
- Steep Slope Crystal Filter, 5.2 MHz.
- Matching A.C. Power Supply Unit with Built-in Speaker
- Full Coverage All Bands, 3.5 to 30 MHz.

<table>
<thead>
<tr>
<th>Output</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>500 W.</td>
</tr>
<tr>
<td>High</td>
<td>1020 W.</td>
</tr>
<tr>
<td>Full</td>
<td>1500 W.</td>
</tr>
</tbody>
</table>

Write for Technical Leaflet

**SIDEBAND RADIO**

73 COLE STREET, ELWOOD, VIC., 3184

Phone 96-1877
Results of the 1970 Victorian 432 MHz. Antenna Gain Contest

By J. JENNINGS,* VK3AVJ

Incorporated in the 1970 Victorian V.h.f. Convention held in Melbourne over the week-end of October 10 and 11 was a contest in which the gains of 432 MHz. antennas were measured.

The results are as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Submitted Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 element extended-expanded colinear</td>
<td>VK3ZYO 16</td>
</tr>
<tr>
<td>32 element extended-expanded colinear</td>
<td>VK3AOT 15</td>
</tr>
<tr>
<td>VK3ABP 15 element yagi</td>
<td>VK3AOT 11</td>
</tr>
<tr>
<td>12 over 12 skeleton slot</td>
<td>VK3ZTE 9</td>
</tr>
<tr>
<td>90° corner reflector</td>
<td>VK3AUI 8</td>
</tr>
<tr>
<td>VK3AGV 9 element yagi</td>
<td>VK3ZMU 7</td>
</tr>
<tr>
<td>Commercial 450 MHz.</td>
<td></td>
</tr>
<tr>
<td>7 over 7 skeleton slot</td>
<td>VK3AOT 5</td>
</tr>
<tr>
<td>11 element yagi</td>
<td>VK3ZDY 4</td>
</tr>
<tr>
<td>9 over 9 yagi</td>
<td>VK3ZCK 4</td>
</tr>
<tr>
<td>9 element yagi</td>
<td>VK3ZKB 2</td>
</tr>
<tr>
<td>7 over 7 skeleton slot</td>
<td>VK3AOT 2</td>
</tr>
<tr>
<td>Yagi</td>
<td>VK3AKC 1</td>
</tr>
<tr>
<td>Yagi</td>
<td>VK3ASV 1</td>
</tr>
</tbody>
</table>

The antenna with the lowest measured gain was a halo brought by VK3ZBJ.

MEASURING TECHNIQUE

The measuring technique used is illustrated in Fig. 1. At the beginning of each measurement a reference dipole was connected so as to receive the signal from a low power transmitter 300 ft. away. Receiver gain was adjusted for a convenient "S" meter reading with the variable attenuator in the 0 dB position. The antenna under test was then connected in place of the reference dipole and the variable attenuator adjusted until the "S" meter reading corresponded with that for the dipole. Hence the antenna gain was read directly from the scale of the variable attenuator.

The variable attenuator used was calibrated for a 50 ohm source and load. To ensure that these conditions were met, 6 dB. pads were connected as shown in Fig. 1. Hence attenuator reading was made accurate almost regardless of antenna impedance and receiver input impedance.

Antenna gain measurements can also be affected by ground reflections. In theory results can be affected by between +6 dB. and —90 dB., depending on the amplitude and phase difference between direct and reflected waves. It is believed that measures taken to reduce this source of error were effective since consistent results were obtained in several positions.

EVALUATION OF RESULTS

It is believed that the technique used allowed gains to be compared to within ±2 dB. The absolute error cannot be determined except by estimation.

Theoretical antenna gains can be most easily determined for the colinears and corner reflector. Measured results are about 2 dB. below theoretical, which indicates that the figures for all antennas measured may be 2 dB. low. This could be attributed to the mismatch existing between the 70 ohm reference dipole and the 50 ohm transmission line and to other deficiencies of the reference dipole. Some antennas which exhibited reasonable directivity measured very low in gain. This probably can be attributed to (1) poor surface conductivity of elements and other resistive losses, and (2) incorrect matching between antenna and 50 ohm transmission line. Mismatch is less of a problem in normal use since the tuning and loading controls of a final amplifier will usually cater for a wide range of load impedances. Such is not the case for a mismatched antenna delivering power into a line terminated in a 50 ohm pad.

(continued on page 161)
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 amateur operator who satisfies the following conditions.

1.3 A certificate of the Award will be issued to the applicant to 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 published annually in "Amateur Radio" and will be amended from time to time as required. Should a country be deleted from the List at any time, members and intending members will be credited with such country if the date of contact was before such deletion.

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 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 In the case of the authorised Amateur Bands in Band 7, contacts must be made within one hundred different stations using only one type of emission.

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

2.5 The commencing date for the Award is 1st January, 1946. All contacts made on or before 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 authorized 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 one station licensee, but may not include both contacts for the same type of endorsement.

3.5 A contact 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.

3.6 All contacts must be made when operating in accordance with the Regulations laid down in if the new location for 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 exact location of the applicant 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 contact, and the check list must correspond 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 63, East Melbourne, Vic. 3002, accompanied by the verifications and 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 be charged 25c per total to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager, and all 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 amateur operator who satisfies the following conditions.

1.3 A certificate of the Award will be issued to the applicant to 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 7) which extends from 30 to 300 MHz., but such contacts must only be made in the authorized Amateur Bands in Band 7.

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 30 and 100 MHz., verifications are required for each of the authorised Amateur Bands nominated in Rules 2.2 and 2.3.

2.3 In the case of the authorized Amateur Band between 100 to 200 MHz., verifications are required for each of the authorised Amateur Bands nominated in Rules 2.2 and 2.3.

2.4 It is possible under these rules for one applicant to claim contacts made in one of the following cases for one of the each of the authorized Amateur Bands nominated in Rules 2.2 and 2.3:

(a) At least one hundred contacts in Band 7.

(b) At least one hundred contacts in Band 8.

(c) At least one hundred contacts in Band 9.

(d) At least one hundred contacts in Band 10.

2.5 The commencing date for the Award is 1st January, 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 authorized type of emission for the band concerned.

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

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

3.5 A contact may be claimed with ship or aircraft stations if the ship or aircraft is operating in the same band, and cross-band contacts will not be allowed.

3.6 All stations must be contacted from the same call area, and cross-band contacts are not allowed.

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 exact location of the applicant, 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 contact, and the check list must correspond 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 63, East Melbourne, Vic. 3002, accompanied by the verifications and 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 be charged 25c per total to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager, and all 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 D.X.C.C. COUNTRIES LIST

<table>
<thead>
<tr>
<th>Phone</th>
<th>C.W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2C, ZS9—Botswana</td>
<td></td>
</tr>
<tr>
<td>AC3—Sikkim</td>
<td></td>
</tr>
<tr>
<td>AC4—Tibet</td>
<td></td>
</tr>
<tr>
<td>AC5—Bhutan</td>
<td></td>
</tr>
<tr>
<td>AP—East Pakistan</td>
<td></td>
</tr>
<tr>
<td>AP—West Pakistan</td>
<td></td>
</tr>
<tr>
<td>BV—Taiwan</td>
<td></td>
</tr>
<tr>
<td>BY—China</td>
<td></td>
</tr>
<tr>
<td>C21, VK9—Nauru</td>
<td></td>
</tr>
<tr>
<td>C31, PX—Andorra</td>
<td></td>
</tr>
<tr>
<td>CE—Chile</td>
<td></td>
</tr>
<tr>
<td>CE0AA-AM, FB8Y, KC4AA-US, LA, LU-Z, OR, UA1, VK0, VP8, ZL5</td>
<td></td>
</tr>
<tr>
<td>CJ—Antarctica</td>
<td></td>
</tr>
<tr>
<td>CE0A—Easter Is.</td>
<td></td>
</tr>
<tr>
<td>CE0X—San Felix</td>
<td></td>
</tr>
<tr>
<td>CE0Z—Juan Fernandez</td>
<td></td>
</tr>
<tr>
<td>CM, CO—Cuba</td>
<td></td>
</tr>
<tr>
<td>CN—Morocco</td>
<td></td>
</tr>
<tr>
<td>CP—Bolivia</td>
<td></td>
</tr>
<tr>
<td>CR3—Portuguese Guinea</td>
<td></td>
</tr>
<tr>
<td>CR4—Cape Verde Is.</td>
<td></td>
</tr>
<tr>
<td>CR5—Principe, Sao Thome</td>
<td></td>
</tr>
<tr>
<td>CR6—Angola</td>
<td></td>
</tr>
<tr>
<td>CR7—Mozambique</td>
<td></td>
</tr>
<tr>
<td>CR8—Portuguese Timor</td>
<td></td>
</tr>
<tr>
<td>CR9—Macao</td>
<td></td>
</tr>
<tr>
<td>CT1—Portugal</td>
<td></td>
</tr>
<tr>
<td>CT2—Azores</td>
<td></td>
</tr>
<tr>
<td>CT3—Madeira</td>
<td></td>
</tr>
<tr>
<td>CX—Uruguay</td>
<td></td>
</tr>
<tr>
<td>DJ, DK, DL, DM—Germany</td>
<td></td>
</tr>
<tr>
<td>DU—Philippine Is.</td>
<td></td>
</tr>
<tr>
<td>EA—Spain</td>
<td></td>
</tr>
<tr>
<td>EA6—Balearic Is.</td>
<td></td>
</tr>
<tr>
<td>EA8—Canary Is.</td>
<td></td>
</tr>
<tr>
<td>EA9—Rio de Oro</td>
<td></td>
</tr>
<tr>
<td>EA9—Spanish Morocco</td>
<td></td>
</tr>
<tr>
<td>EI—Republic of Ireland</td>
<td></td>
</tr>
<tr>
<td>EL—Liberia</td>
<td></td>
</tr>
<tr>
<td>EP—Iran</td>
<td></td>
</tr>
<tr>
<td>ET3—Ethiopia</td>
<td></td>
</tr>
<tr>
<td>F—France</td>
<td></td>
</tr>
<tr>
<td>FB8W—Crozet Is.</td>
<td></td>
</tr>
<tr>
<td>FB8X—Kerguelen Is.</td>
<td></td>
</tr>
<tr>
<td>FB8Z—Amsterdam and St. Paul Is.</td>
<td></td>
</tr>
<tr>
<td>FC—Corsica</td>
<td></td>
</tr>
<tr>
<td>FG7—Guadeloupe</td>
<td></td>
</tr>
<tr>
<td>FH8—Comoro Is.</td>
<td></td>
</tr>
<tr>
<td>FK8—New Caledonia</td>
<td></td>
</tr>
<tr>
<td>FL8—French Somaliland</td>
<td></td>
</tr>
<tr>
<td>FM7—Martinique</td>
<td></td>
</tr>
<tr>
<td>FO8—Clipperton Is.</td>
<td></td>
</tr>
<tr>
<td>FO8—French Oceania</td>
<td></td>
</tr>
<tr>
<td>FO8M—Maria Theresa</td>
<td></td>
</tr>
<tr>
<td>FP8—St. Pierre and Miquelon</td>
<td></td>
</tr>
<tr>
<td>FR7—Glorioso Is.</td>
<td></td>
</tr>
<tr>
<td>FR7—Juan de Nova</td>
<td></td>
</tr>
<tr>
<td>FR7—Reunion Is.</td>
<td></td>
</tr>
<tr>
<td>FR7—Tromelin</td>
<td></td>
</tr>
<tr>
<td>FS7—Saint Martin</td>
<td></td>
</tr>
<tr>
<td>FW8—Wallis and Futuna Is.</td>
<td></td>
</tr>
<tr>
<td>FY7—French Guiana and Inini</td>
<td></td>
</tr>
<tr>
<td>G, GB—England</td>
<td></td>
</tr>
<tr>
<td>GC—Guernsey and Dependencies</td>
<td></td>
</tr>
<tr>
<td>GC—Jersey Is.</td>
<td></td>
</tr>
<tr>
<td>GD—Isle of Man</td>
<td></td>
</tr>
<tr>
<td>GI—Northern Ireland</td>
<td></td>
</tr>
<tr>
<td>GM—Scotland</td>
<td></td>
</tr>
<tr>
<td>GW—Wales</td>
<td></td>
</tr>
<tr>
<td>HA, HG—Hungary</td>
<td></td>
</tr>
<tr>
<td>HB9—Switzerland</td>
<td></td>
</tr>
<tr>
<td>HB0—Liechtenstein</td>
<td></td>
</tr>
<tr>
<td>HC—Ecuador</td>
<td></td>
</tr>
<tr>
<td>HC8—Galapagos Is.</td>
<td></td>
</tr>
<tr>
<td>HH—Haiti</td>
<td></td>
</tr>
<tr>
<td>HI—Dominican Republic</td>
<td></td>
</tr>
<tr>
<td>HK—Columbia</td>
<td></td>
</tr>
<tr>
<td>HK0—Bajo Nuevo</td>
<td></td>
</tr>
<tr>
<td>HK0—Malpelo Is.</td>
<td></td>
</tr>
<tr>
<td>HK0—Sr Scn Andres and Providencia</td>
<td></td>
</tr>
<tr>
<td>HL, HM—Korea</td>
<td></td>
</tr>
<tr>
<td>HP—Panama</td>
<td></td>
</tr>
<tr>
<td>HR—Honduras</td>
<td></td>
</tr>
<tr>
<td>HS—Thailand</td>
<td></td>
</tr>
<tr>
<td>HV—Vatican</td>
<td></td>
</tr>
<tr>
<td>HZ, 7Z—Saudi Arabia</td>
<td></td>
</tr>
<tr>
<td>I, IT—Italy</td>
<td></td>
</tr>
<tr>
<td>IS1—Sardinia</td>
<td></td>
</tr>
<tr>
<td>JA, JH, JR, KA—Japan</td>
<td></td>
</tr>
<tr>
<td>JD1, KA1, KG6I—Bonin and Volcano Is.</td>
<td></td>
</tr>
<tr>
<td>JD1, KA1, KG6I—Marcus Is.</td>
<td></td>
</tr>
<tr>
<td>JT—Mongolia</td>
<td></td>
</tr>
<tr>
<td>JW—Svalbard</td>
<td></td>
</tr>
<tr>
<td>JX—Jan Mayen</td>
<td></td>
</tr>
<tr>
<td>JY—Jordan</td>
<td></td>
</tr>
<tr>
<td>K, KN, W, WA, WB, WN—United States of America</td>
<td></td>
</tr>
<tr>
<td>KB6—Baker, Howland and American Phoenix Is.</td>
<td></td>
</tr>
<tr>
<td>KC4—Navassa Is.</td>
<td></td>
</tr>
<tr>
<td>KC6—Eastern Caroline Is.</td>
<td></td>
</tr>
<tr>
<td>KC6—Western Caroline Is.</td>
<td></td>
</tr>
<tr>
<td>KG4—Guantanamo Bay</td>
<td></td>
</tr>
<tr>
<td>KG6—Guam</td>
<td></td>
</tr>
<tr>
<td>KG6—Mariana Is.</td>
<td></td>
</tr>
<tr>
<td>KH6, WH6—Hawaiian Is.</td>
<td></td>
</tr>
<tr>
<td>KH6—Kure Is.</td>
<td></td>
</tr>
<tr>
<td>KJ6—Johnston Is.</td>
<td></td>
</tr>
<tr>
<td>KL7, WL7—Alaska</td>
<td></td>
</tr>
<tr>
<td>KM6—Midway Is.</td>
<td></td>
</tr>
<tr>
<td>KP4, WP4—Puerto Rico</td>
<td></td>
</tr>
<tr>
<td>KP6—Palmyra Group, Jarvis Is.</td>
<td></td>
</tr>
<tr>
<td>KR6, 8—Ryuku Is.</td>
<td></td>
</tr>
<tr>
<td>KS4—Swan Is.</td>
<td></td>
</tr>
<tr>
<td>KS4B, HK0—Serrana Bank and Roncador Cay</td>
<td></td>
</tr>
<tr>
<td>KS6—American Samoa</td>
<td></td>
</tr>
<tr>
<td>Phone</td>
<td>C.W.</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>KV4, WV4—Virgin Is.</td>
<td>UJ8—Tadzhik</td>
</tr>
<tr>
<td>KW6—Wake Is.</td>
<td>UL7—Kazakh</td>
</tr>
<tr>
<td>KX6—Marshall Is.</td>
<td>UM8—Kirghiz</td>
</tr>
<tr>
<td>KZ5—Canal Zone</td>
<td>UO5—Moldavia</td>
</tr>
<tr>
<td>LA, LJ—Norway</td>
<td>UP2—Lithuania</td>
</tr>
<tr>
<td>LU—Argentina</td>
<td>UQ2—Latvia</td>
</tr>
<tr>
<td>LX—Luxembourg</td>
<td>UR2—Estonia</td>
</tr>
<tr>
<td>LZ—Bulgaria</td>
<td>VE, VO—Canada</td>
</tr>
<tr>
<td>MP4B—Bahrein</td>
<td>VK—Australia</td>
</tr>
<tr>
<td>MP4D, T—Trucial Oman</td>
<td>VK2—Lord Howe Is.</td>
</tr>
<tr>
<td>MP4M—Sultinate of Muscat and Oman</td>
<td>VK4—Willis Is.</td>
</tr>
<tr>
<td>MP4Q—Qatar</td>
<td>VK9—Christmas Is.</td>
</tr>
<tr>
<td>OA—Peru</td>
<td>VK9—Cocos Is.</td>
</tr>
<tr>
<td>OD5—Lebanon</td>
<td>VK9—Norfolk Is.</td>
</tr>
<tr>
<td>OE—Austria</td>
<td>VK9—Papua Territory</td>
</tr>
<tr>
<td>OH—Finland</td>
<td>VK9—Territory of New Guinea</td>
</tr>
<tr>
<td>OH0—Aland Is.</td>
<td>VK0—Heard Is.</td>
</tr>
<tr>
<td>OJO—Market Reef</td>
<td>VK3—Macquarie Is.</td>
</tr>
<tr>
<td>OK, OL—Czechoslovakia</td>
<td>VP1—British Honduras</td>
</tr>
<tr>
<td>ON—Belgium</td>
<td>VP2A—Antigua, Barbuda</td>
</tr>
<tr>
<td>OX, KG1, XP—Greenland</td>
<td>VP2D—Dominica</td>
</tr>
<tr>
<td>OY—Faroe Is.</td>
<td>VP2E—Anguilla</td>
</tr>
<tr>
<td>OZ—Denmark</td>
<td>VP2G—Grenada and Dependencies</td>
</tr>
<tr>
<td>PA, PE, PI—Netherlands</td>
<td>VP2K—St. Kitts, Nevis</td>
</tr>
<tr>
<td>PJ—Netherlands Antilles</td>
<td>VP2L—St. Lucia</td>
</tr>
<tr>
<td>PJ—Sint Maarten</td>
<td>VP2M—Montserrat</td>
</tr>
<tr>
<td>PY—Brazil</td>
<td>VP2S—St. Vincent and Dependencies</td>
</tr>
<tr>
<td>PY0—Fernando de Noronha</td>
<td>VP2V—British Virgin Is.</td>
</tr>
<tr>
<td>PY0—St. Peter and St. Paul’s Rocks</td>
<td>VP5—Turks and Caicos Is.</td>
</tr>
<tr>
<td>PY0—Trinidad and Martim Vaz Is.</td>
<td>VP7—Bahama Is.</td>
</tr>
<tr>
<td>PZ1—Surinam</td>
<td>VP8—Falkland Is.</td>
</tr>
<tr>
<td>SK, SL, SM—Sweden</td>
<td>VP8, LU-Z—South Georgia Is.</td>
</tr>
<tr>
<td>SP—Poland</td>
<td>VP8, LU-Z—South Orkney Is.</td>
</tr>
<tr>
<td>ST—Sudan</td>
<td>VP8, LU-Z—South Sandwich Is.</td>
</tr>
<tr>
<td>SU—Egypt</td>
<td>VP8, LU-Z, CE9AN-AZ—South Shetland Is.</td>
</tr>
<tr>
<td>SV—Crete</td>
<td>VP9—Bermuda Is.</td>
</tr>
<tr>
<td>SV—Dodecanese</td>
<td>VQ1—Zanzibar</td>
</tr>
<tr>
<td>SV—Greece</td>
<td>VQ9—Aldabra Is.</td>
</tr>
<tr>
<td>TA, TC—Turkey</td>
<td>VQ9—Chagos Is.</td>
</tr>
<tr>
<td>TF—Iceland</td>
<td>VQ9—Desroches</td>
</tr>
<tr>
<td>TG—Guatemala</td>
<td>VQ9—Farquhar</td>
</tr>
<tr>
<td>TI—Costa Rica</td>
<td>VQ9—Seychelles</td>
</tr>
<tr>
<td>TB—Cocos Is.</td>
<td>VR1—British Phoenix Is.</td>
</tr>
<tr>
<td>TJ—Cameroon</td>
<td>VR1—Gilbert, Ellice and Ocean Is.</td>
</tr>
<tr>
<td>TL—Central African Republic</td>
<td>VR2—Fiji Is.</td>
</tr>
<tr>
<td>TN—Congo Republic</td>
<td>VR3—Fanning and Christmas Is.</td>
</tr>
<tr>
<td>TR—Gabon Republic</td>
<td>VR4—Solomon Is.</td>
</tr>
<tr>
<td>TT—Chad Republic</td>
<td>VR5—Tonga Is.</td>
</tr>
<tr>
<td>TU—Ivory Coast</td>
<td>VR6—Pitcairn Is.</td>
</tr>
<tr>
<td>TY—Dahomey Republic</td>
<td>VS5—Brunei</td>
</tr>
<tr>
<td>TZ—Mali Republic</td>
<td>VS6—Hong Kong</td>
</tr>
<tr>
<td>UA, UV, UW1-6, UNI—European Russian S.F.S.R.</td>
<td>VS9K—Kamarian Is.</td>
</tr>
<tr>
<td>UA, UV, UW9, 0—Asiatic R.S.F.S.R.</td>
<td>VU—India</td>
</tr>
<tr>
<td>UA1—Franz Josef Land</td>
<td>VU—Laccadive Is.</td>
</tr>
<tr>
<td>UA2—Kaliningradsk</td>
<td>VU—Andaman and Nicobar Is.</td>
</tr>
<tr>
<td>UB5, UT5, UY5—Ukraine</td>
<td>XE, XF—Mexico</td>
</tr>
<tr>
<td>UC2—White Russian S.S.R.</td>
<td>XE4—Revilla Gigedo</td>
</tr>
<tr>
<td>UD6—Azerbaijan</td>
<td>XT2—Voltaic Republic</td>
</tr>
<tr>
<td>UF6—Georgia</td>
<td>XU—Cambodia</td>
</tr>
<tr>
<td>UG6—Armenia</td>
<td>XV8—Laos</td>
</tr>
<tr>
<td>UH8—Turkoman</td>
<td>XZ2—Burma</td>
</tr>
<tr>
<td>UI8—Uzbek</td>
<td>YA—Afghanistan</td>
</tr>
<tr>
<td>Country</td>
<td>Phone</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>YB, YC, YD, 8F—Indonesia</td>
<td>Phone</td>
</tr>
<tr>
<td>YI—Iraq</td>
<td>7X, FA—Algeria</td>
</tr>
<tr>
<td>YJ—New Hebrides</td>
<td>8P—Barbados</td>
</tr>
<tr>
<td>YK—Tyrol</td>
<td>8QA, VS9M—Maldives</td>
</tr>
<tr>
<td>YL—New Guinea</td>
<td>8R—Guyana</td>
</tr>
<tr>
<td>YN—Nicaragua</td>
<td>8Z4—Saudi Arabia/Iraq Neutral Zone</td>
</tr>
<tr>
<td>YO—Rumania</td>
<td>9A1, M1—San Marino</td>
</tr>
<tr>
<td>YS—El Salvador</td>
<td>9B1—Ghana</td>
</tr>
<tr>
<td>YV—Venezuela</td>
<td>9F—Malta</td>
</tr>
<tr>
<td>YV0—Aves Is.</td>
<td>9J—Zambia</td>
</tr>
<tr>
<td>ZA—Albania</td>
<td>9K2—Kuwait</td>
</tr>
<tr>
<td>ZB2—Gibraltar</td>
<td>9K3, 8Z5—Kuwait/Saudi Arabia Neutral Zone</td>
</tr>
<tr>
<td>ZD3—The Gambia</td>
<td>9L1—Sierra Leone</td>
</tr>
<tr>
<td>ZD5—Swaziland</td>
<td>9M2, 4—Western Malaysia (fr. 16/9/63)</td>
</tr>
<tr>
<td>ZD7—St. Helena</td>
<td>9M6, 8—Eastern Malaysia (fr. 16/9/63)</td>
</tr>
<tr>
<td>ZD8—Ascension Is.</td>
<td>9N1—Nepal</td>
</tr>
<tr>
<td>ZD9—Tristan da Cunha &amp; Gough Is.</td>
<td>9Q5—Republic of the Congo</td>
</tr>
<tr>
<td>ZE—Rhodesia</td>
<td>9U5—Burundi</td>
</tr>
<tr>
<td>ZF1—Cayman Is.</td>
<td>9V1, VS1, 9M4—Singapore (prior to 16/9/63 or after 8/8/65 only. From 16/9/63 to 8/8/65 Singapore counts as 9M2—West Malaysia)</td>
</tr>
<tr>
<td>ZK1—Cook Is.</td>
<td>9X5—Rwanda</td>
</tr>
<tr>
<td>ZK1—Manahiki Is.</td>
<td>9Y4—Trinidad and Tobago</td>
</tr>
<tr>
<td>ZK2—Niue</td>
<td>*—Blenheim Reef</td>
</tr>
<tr>
<td>ZL—New Zealand</td>
<td>*—Geyser Reef</td>
</tr>
<tr>
<td>ZL/A—Auckland and Campbell Is.</td>
<td>* Since there is no apparent claim by any country to these reefs, no prefix will be shown. Confirmations for contact only after 4/5/67 will be accepted for D.X.C.C. credit.</td>
</tr>
<tr>
<td>ZL/C—Chatham Is.</td>
<td><strong>DELETED COUNTRIES LIST</strong></td>
</tr>
<tr>
<td>ZL/K—Kermadec Is.</td>
<td>CN2—Tangier (prior 1/7/60)</td>
</tr>
<tr>
<td>ZM7—Tokelau</td>
<td>CR8—Damao, Diu (prior 1/1/62)</td>
</tr>
<tr>
<td>ZP—Paraguay</td>
<td>CR8—Goa (prior 1/1/62)</td>
</tr>
<tr>
<td>ZS1—South Africa</td>
<td>EA9—Ifni (prior 13/5/69)</td>
</tr>
<tr>
<td>ZS2—Prince Edward and Marion Is.</td>
<td>ET2—Eritrea (prior 15/11/62)</td>
</tr>
<tr>
<td>ZS3—South-West Africa</td>
<td>FF8—French West Africa (pr. 7/8/60)</td>
</tr>
<tr>
<td>ZS—South Africa</td>
<td>FI8—French Indo China (pr. 21/12/50)</td>
</tr>
<tr>
<td>ZT—Mauritania</td>
<td>FN—French India (prior 1/1/54)</td>
</tr>
<tr>
<td>ZU7—Niger Republic</td>
<td>FQ8—French Equ. Africa (pr. 17/8/60)</td>
</tr>
<tr>
<td>ZV—Togo Republic</td>
<td>I1—Trieste (prior 1/4/57)</td>
</tr>
<tr>
<td>ZW3—Tanzania</td>
<td>I5—Italian Somaliland (prior 1/7/60)</td>
</tr>
<tr>
<td>ZW4—Malagasy Republic</td>
<td>JZ0—Nether. New Guinea (pr. 1/5/63)</td>
</tr>
<tr>
<td>ZW5—Nigeria</td>
<td>PK1, 2, 3—Java (prior 1/5/63)</td>
</tr>
<tr>
<td>ZW8—Senegal Republic</td>
<td>PK4—Sumatra (prior 1/5/63)</td>
</tr>
<tr>
<td>ZW9—Togo Republic</td>
<td>PK5—Netherlands Borneo (pr. 1/5/63)</td>
</tr>
<tr>
<td>ZX1—Samoa</td>
<td>PK6—Celebes &amp; Moluc. Is. (pr. 1/5/63)</td>
</tr>
<tr>
<td>ZX5—Uganda</td>
<td>UN1—Karelo-Finnish Rep. (pr. 1/7/60)</td>
</tr>
<tr>
<td>ZX4—Kenya</td>
<td>VO—Newfoundland (prior 1/4/49)</td>
</tr>
<tr>
<td>ZX—North Africa</td>
<td>VQ6—Brit. Somaliland (prior 1/7/60)</td>
</tr>
<tr>
<td>6O1, 6, 6—Somali Republic</td>
<td>VS4—Sarawak (prior 16/9/63)</td>
</tr>
<tr>
<td>6W8—Senegal Republic</td>
<td>VS9H—Kuria Muria Is. (pr. 29/11/67)</td>
</tr>
<tr>
<td>6Y5—Jamaica</td>
<td>ZC5—Brit. North Borneo (pr. 16/9/63)</td>
</tr>
<tr>
<td>7G1—Republic of Guinea</td>
<td>ZC6—Palestine (prior 2/7/68)</td>
</tr>
<tr>
<td>7Q7—Malawi</td>
<td>ZD4—Gold Coast, Togol'd (pr. 6/3/57)</td>
</tr>
<tr>
<td>7Q8—Lesotho</td>
<td>9M2—Malaya (prior 16/9/63)</td>
</tr>
<tr>
<td>9O—Rumania</td>
<td>9S4—Saar (prior 1/4/57)</td>
</tr>
<tr>
<td>9S5—Ruanda-Urundi (between 1/7/60 and 1/7/62 only)</td>
<td></td>
</tr>
</tbody>
</table>
AMSAT 1970 ANNUAL REPORT

By DR. PERRY I. KLEIN,* K3JTE, President

On March 3, AMSAT reached its first anniversary. The AMSAT Corporation and entered its second year of activity. Membership grew from 354 at the end of 1969 to over 376 members and 26 member clubs in 25 countries. The following comprises the second annual report presented at the AMSAT annual meeting, held on November 21, 1970.

ACCOMPLISHMENTS TO DATE

AUSTRALIS OSCAR 5

This first full year of AMSAT's operation witnessed the launch of the fifth Radio amateur communications satellite, AUSTRALIS OSCAR 5, built by the WIA Project Australis group in Australia, was launched from the Western Test Range, Calif., on Jan. 23, 1970. The spacecraft's two metre beacon transmitter and the ten metre beacon transmitter reached end of life after 46 days.

The AO-5 mission was technologically significant in several respects. Of particular note, the spacecraft was the first to use the 10-centimetre band. Both experiments would take advantage of the 30-foot parabolic antenna on the satellite. The passive magnetic attitude stabilisation system employed in AO-5 was also very successful in that one axis of the spacecraft was maintained within 1 degree field width with a time constant of one hour. The rapid stabilisation was indicative of the effectiveness of the passive stabilisation system which has been demonstrated in a satellite in the Amateur Satellite Corporation.

The passive magnetic attitude stabilisation system employed in AO-5 was also very successful in that one axis of the spacecraft was maintained within 1 degree field width with a time constant of one hour. The rapid stabilisation was indicative of the effectiveness of the passive stabilisation system which has been demonstrated in a satellite in the Amateur Satellite Corporation.

当前活动 – AMSAT-Oscar B

Work is proceeding on AMSAT-Oscar B (AO-B), the first of a series of long lifetime AO-B Projects, in support of the first amateur satellite launching on June 9 to the FCC and NASA, and re-launched in the two metre band. Reports of skip propagation and non-damper brought one axis of the spacecraft within a time constant of one degree field width with a time constant of one hour. The rapid stabilisation was indicative of the effectiveness of the passive stabilisation system which has been demonstrated in a satellite in the Amateur Satellite Corporation.

ATS-G EXPERIMENTAL PROPOSAL

In November 1970, AMSAT submitted a proposal to NASA for AO-B, which would involve the development of a transmitter to provide a 200-watt transmit power output of two watts. This transmitter is designed to provide a reliable and secure means of controlling the emissions of satellite power loads. The solar cells and rechargeable batteries are expected to make possible satellite operating lifetimes in excess of one year.

ADMILLATION OF THE PROPOSAL

On March 3, AMSAT submitted a proposal to NASA for the launch of AMSAT-Oscar B. On June 9, the first amateur satellite was launched with the proposal in hand. Its purpose was to provide a reliable and secure means of controlling the emissions of satellite power loads. The solar cells and rechargeable batteries are expected to make possible satellite operating lifetimes in excess of one year.

In connection with the AO-B project, a third-party agreement has been arranged between Australia and the United States to provide additional communication traffic concerning the satellite. This agreement extends the three-party agreement arranged last year until several months after the end of life of Oscar 5.

FUTURE ACTIVITY

AMSAT is giving highest priority to the development of long-lifetime, solar-powered OSCAR satellites designed for reliable and augments Amateur communications, particularly on the VHF Amateur bands. Thus it is planned that the satellites to come, beginning with AO-B, will open the door to the introduction of additional mode of communications for Amateur Radio.

CHANGE IN INTRUDER WATCH CO-ORDINATOR

Bill Jenvey, VK2ZIO, has been appointed Intruder Watch Co-ordinator for New South Wales. He is former Intruder Watch Co-ordinator for New South Wales. His interest in this activity is the assurance of proper control and safe operation of all electronic and electrical equipment, and consumer electronic products.

A & R SOANAR 25th ANNIVERSARY

Now one of Australia's leading components and equipment manufacturers and suppliers, the A & R Group of Companies is celebrating its 25th anniversary this year. During the last five years, A & R diversified its manufacturing activities by developing a range of electronic and electrical equipment, specialising in power supplies for communications, educational, and laboratory apparatus, and consumer electronic products.

A variety of air-cooled transformers from sub-miniature to 10kva, have been developed as stock items. The scope of activity by the Group runs into many millions of dollars a year, with offices in three States, employing approximately 200 people in the manufacturing and merchandising of equipment, transformers and components with the consolidation of offices and a large plant at Box Hill, Melbourne, which has now occupied over 35,000 square feet.

A & R's research and development programme involving two groups, transformers and components with the consolidation of offices and a large plant at Box Hill, Melbourne, which has now occupied over 35,000 square feet.

A & R's research and development programme involving two groups, transformers and components with the consolidation of offices and a large plant at Box Hill, Melbourne, which has now occupied over 35,000 square feet.

During the last five years, A & R diversified its manufacturing activities by developing a range of electronic and electrical equipment, specialising in power supplies for communications, educational, and laboratory apparatus, and consumer electronic products.

Amateur Radio, January, 1971 Page 15
THE CALL BOOK

The 1971 issue of the Call Book is now in the course of preparation. The schedule we are working to means that the book will be available some time during April, and will include all alterations and additions as notified to us by the P.M.G.'s Department up to and including the December 1970 lists.

In previous years, we have received some severe criticism over errors that have appeared in the Call Book, but our experience has shown that the errors which have occurred have been due to the fact that many licensees have failed to notify the Department when there has been a change of address, despite the fact that any such change of station location can (according to the regulations) only be made with the permission of the Department. The fact that this regulation is not strictly enforced in no way relieves the licensee of his responsibility of making sure that his address is correctly advised to the proper authorities.

In an endeavour to produce the most up-to-date Call Book possible, we will notify the Department of any changes of address of which we are aware, but have not appeared in any official Departmental lists up to December 1970.

---

LICENSED AMATEURS IN VK AT AUGUST 1970

<table>
<thead>
<tr>
<th>VK</th>
<th>Full</th>
<th>Limited</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK0</td>
<td>7</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>VK1</td>
<td>83</td>
<td>28</td>
<td>111</td>
</tr>
<tr>
<td>VK2</td>
<td>1401</td>
<td>457</td>
<td>1858</td>
</tr>
<tr>
<td>VK3</td>
<td>1284</td>
<td>635</td>
<td>1929</td>
</tr>
<tr>
<td>VK4</td>
<td>527</td>
<td>194</td>
<td>721</td>
</tr>
<tr>
<td>VK5</td>
<td>516</td>
<td>233</td>
<td>749</td>
</tr>
<tr>
<td>VK6</td>
<td>356</td>
<td>140</td>
<td>496</td>
</tr>
<tr>
<td>VK7</td>
<td>160</td>
<td>72</td>
<td>232</td>
</tr>
<tr>
<td>VK8</td>
<td>31</td>
<td>10</td>
<td>41</td>
</tr>
<tr>
<td>VK9</td>
<td>84</td>
<td>8</td>
<td>92</td>
</tr>
</tbody>
</table>

Total: 4459 1777 6236 Grand Total

---

Results of 432 MHz. Aerial Gain Contest

(continued from page 10)

COLINEAR DESIGN

The two antennas exhibiting highest gain (15 and 16 dB., respectively) were 32 element extended-expanded colinears. These antennas originated in the San Francisco Bay area of California and have become increasingly popular in the United States. The lengths of the driven elements are extended to 5/8 of a wavelength and the spacing between parallel elements expanded to 3/4 of a wavelength. In conventional colinears these dimensions are both 1/2 wavelength. The detailed dimensions are given in Fig. 2.

YAGI DESIGN

The most successful yagi (11 dB.) was based on the highly reputed VK3ABP design, the dimensions of which are given in Fig. 3.

CONCLUSION

It is expected that the antenna gain measurement will become an annual event, thus providing Amateurs in the Eastern States with a means of evaluating their antennas and determining trends in antenna design.

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

Amendments:

VK5MS 319/343 VK5AB 297/314
VK8RU 317/342 VK4FJ 287/307
VK4HR 319/342 VK4HTY 284/309
VK3AHQ 311/346 VK2APK 281/307
VK6MK 300/346 VK2ARK 272/327
VK4KS 300/315 VK5FL 271/317

Amendments:

VK4PF 251/328 VK3JW 224/253
VK3AKM 227/307 VK9RF 182/192

Correction:

VK5AMU shown in the Nov. 1970 list as Cert No. 113, should read Cert. No. 114.

OPEN

Amendments:

VK8RU 316/350 VK6MK 304/324
VK4HR 316/341 VK5EO 302/325
VK2AGH 314/334 VK4KS 301/325
VK5AS 316/341 VK2APK 289/308
VK4SD 300/321 VK4FJ 288/323
VK4TY 300/287 VK3ARX 281/296
VK2AGH 314/327 VK2APK 297/306

Amendments:

VK4FP 263/268 VK5FL 107/111

NEW MEMBER:

Cert. No. Call Total
130 VK6JK 129/136 265
107/111

For Reliable Connections

OTL RESIN CORE SOLDERs

O. T. LEMPRIERE & CO. LIMITED

Head Office: 31-41 Bowden St., Alexandria, N.S.W., 2015
and at Melbourne, Brisbane, Adelaide, Perth, Newcassle

Amateur Radio, January, 1971
NEW CALL SIGNS

AUGUST 1970
VK1DA—A. Davis, 45 Dalgon St., Seulinn, 2614.
VK1KY—G. E. Smith, 22 Glyius St., Parrar, 2607.
VK1OX—L. Daniell, 4 Bandjalang Cres., Aranda, 2600.
VK1WL—L. M. Stone, Lot 10, Trafalgar Rd., Turdos Heads, 2327.
VK2GK—E. W. Bastow, 43 Esatta St., Collaroy Plateau, 1948.
VK1D—S. A. Mann, 9 Birubi Ave., Pymble, 2073.
VK2ZI—V. A. Salisbury, 68 T etwa, Wahroonga, 2158.
VK3YCV—D. J. Bainbridge. Incorrectly advised VK3BBA.

NEW CALL SIGNS

AUGUST 1970
VK1DA—A. Davis, 45 Dalgon St., Seulinn, 2614.
VK1KY—G. E. Smith, 22 Glyius St., Parrar, 2607.
VK1OX—L. Daniell, 4 Bandjalang Cres., Aranda, 2600.
VK1WL—L. M. Stone, Lot 10, Trafalgar Rd., Turdos Heads, 2327.
VK2GK—E. W. Bastow, 43 Esatta St., Collaroy Plateau, 1948.
VK1D—S. A. Mann, 9 Birubi Ave., Pymble, 2073.
VK2ZI—V. A. Salisbury, 68 T etwa, Wahroonga, 2158.
VK3YCV—D. J. Bainbridge. Incorrectly advised VK3BBA.

NEW CALL SIGNS

AUGUST 1970
VK1DA—A. Davis, 45 Dalgon St., Seulinn, 2614.
VK1KY—G. E. Smith, 22 Glyius St., Parrar, 2607.
VK1OX—L. Daniell, 4 Bandjalang Cres., Aranda, 2600.
VK1WL—L. M. Stone, Lot 10, Trafalgar Rd., Turdos Heads, 2327.
VK2GK—E. W. Bastow, 43 Esatta St., Collaroy Plateau, 1948.
VK1D—S. A. Mann, 9 Birubi Ave., Pymble, 2073.
VK2ZI—V. A. Salisbury, 68 T etwa, Wahroonga, 2158.
VK3YCV—D. J. Bainbridge. Incorrectly advised VK3BBA.

NEW CALL SIGNS

AUGUST 1970
VK1DA—A. Davis, 45 Dalgon St., Seulinn, 2614.
VK1KY—G. E. Smith, 22 Glyius St., Parrar, 2607.
VK1OX—L. Daniell, 4 Bandjalang Cres., Aranda, 2600.
VK1WL—L. M. Stone, Lot 10, Trafalgar Rd., Turdos Heads, 2327.
VK2GK—E. W. Bastow, 43 Esatta St., Collaroy Plateau, 1948.
VK1D—S. A. Mann, 9 Birubi Ave., Pymble, 2073.
VK2ZI—V. A. Salisbury, 68 T etwa, Wahroonga, 2158.
VK3YCV—D. J. Bainbridge. Incorrectly advised VK3BBA.

NEW CALL SIGNS

AUGUST 1970
VK1DA—A. Davis, 45 Dalgon St., Seulinn, 2614.
VK1KY—G. E. Smith, 22 Glyius St., Parrar, 2607.
VK1OX—L. Daniell, 4 Bandjalang Cres., Aranda, 2600.
VK1WL—L. M. Stone, Lot 10, Trafalgar Rd., Turdos Heads, 2327.
VK2GK—E. W. Bastow, 43 Esatta St., Collaroy Plateau, 1948.
VK1D—S. A. Mann, 9 Birubi Ave., Pymble, 2073.
VK2ZI—V. A. Salisbury, 68 T etwa, Wahroonga, 2158.
VK3YCV—D. J. Bainbridge. Incorrectly advised VK3BBA.

NEW CALL SIGNS

AUGUST 1970
VK1DA—A. Davis, 45 Dalgon St., Seulinn, 2614.
VK1KY—G. E. Smith, 22 Glyius St., Parrar, 2607.
VK1OX—L. Daniell, 4 Bandjalang Cres., Aranda, 2600.
VK1WL—L. M. Stone, Lot 10, Trafalgar Rd., Turdos Heads, 2327.
VK2GK—E. W. Bastow, 43 Esatta St., Collaroy Plateau, 1948.
VK1D—S. A. Mann, 9 Birubi Ave., Pymble, 2073.
VK2ZI—V. A. Salisbury, 68 T etwa, Wahroonga, 2158.
VK3YCV—D. J. Bainbridge. Incorrectly advised VK3BBA.

NEW CALL SIGNS

AUGUST 1970
VK1DA—A. Davis, 45 Dalgon St., Seulinn, 2614.
VK1KY—G. E. Smith, 22 Glyius St., Parrar, 2607.
VK1OX—L. Daniell, 4 Bandjalang Cres., Aranda, 2600.
VK1WL—L. M. Stone, Lot 10, Trafalgar Rd., Turdos Heads, 2327.
VK2GK—E. W. Bastow, 43 Esatta St., Collaroy Plateau, 1948.
VK1D—S. A. Mann, 9 Birubi Ave., Pymble, 2073.
VK2ZI—V. A. Salisbury, 68 T etwa, Wahroonga, 2158.
VK3YCV—D. J. Bainbridge. Incorrectly advised VK3BBA.

NEW CALL SIGNS

AUGUST 1970
VK1DA—A. Davis, 45 Dalgon St., Seulinn, 2614.
VK1KY—G. E. Smith, 22 Glyius St., Parrar, 2607.
VK1OX—L. Daniell, 4 Bandjalang Cres., Aranda, 2600.
VK1WL—L. M. Stone, Lot 10, Trafalgar Rd., Turdos Heads, 2327.
VK2GK—E. W. Bastow, 43 Esatta St., Collaroy Plateau, 1948.
VK1D—S. A. Mann, 9 Birubi Ave., Pymble, 2073.
VK2ZI—V. A. Salisbury, 68 T etwa, Wahroonga, 2158.
VK3YCV—D. J. Bainbridge. Incorrectly advised VK3BBA.
SO YOU HAVE CHANGED YOUR QTH

For as long back as we can remember, the first page of this magazine has shown details for the procedure to be adopted to correctly ensure that your copy of "AJR." will reach you after a change of address. However, it is becoming more and more apparent that the procedure is not being followed as it should be, many members trying to short-circuit the system by notifying us direct.

Instead of helping, this procedure only delays the change in our records, as we have to refer these changes back to the Division concerned. We now make a plea that the procedure that has been laid down be followed, namely when you have a change of address, notify your Divisional Secretary—NOT US. Your Secretary will include the change in his monthly list to us. He knows when and where to send it.

You can help yourself by making sure to advise your Secretary in plenty of time, and not two or three months later. The number of copies of "A.R." which are returned to us each month with the endorsement "not known at this address," or similar, is reaching quite a large figure. This is involving us in much extra work and expense, as we have to locate the member concerned and re-post the magazine. We have no way of knowing how many "A.R.'s" are delivered although wrongly addressed. May we suggest you check the wrapper from this issue, and if there is any error, notify your Secretary immediately.

AWARDS FOR TECHNICAL ARTICLES

The Publications Committee considered the allocation of these awards at the December meeting, and as a result, awards have been made to Mr. R. H. Black, VK2QZ, Mr. R. F. Dannecker, VK4ZND. The various articles covering "Australis" were also voted into an award, but in view of the number of people involved it was considered impractical to try to make a worthwhile award to each and every individual worker on the project. It was, therefore, decided to make the award to the Project Australis Fund.

Our congratulations to the recipients. To the other contributors who just failed to make the grade this year, our thanks, and we hope you will try again.

HIGGINBOTHAM AWARD

This year a somewhat unusual result came from the voting for this award. Two previous winners were well up in the voting, and one man almost made it for the third time. The final outcome was to make the award to the VK3 V.h.f. Group in recognition of the large amount of work they have devoted to their projects over the last two years. Once again, the number of individuals concerned was too many to allow awards to each and everyone, hence the award has been made to the Group as a whole, for them to apply as they wish.

PREDICTION CHARTS FOR JANUARY 1971

(Prediction Charts by courtesy of Ionospheric Prediction Service)
AMATEUR BAND BEACONS

VK4 144,390 VK4VV, 107W. of Brisbane.

VK5 52,000 VK5VF, Mt. Lofty.

VK6 50,980 VK6BF, Carnarvon.

VK7 144,000 VK7VF, Tuart Hill.

VK8 144,080 VK8VF, Mount Lofty.

ZA2 145,000 ZA2ZEM, Mount Eliza.

ZA3 145,000 ZA3ZLHF, Christchurch.

JA 51,900 JA1JG, Japan.

HL 50,100 HL5WI, South Korea.

As of this writing, 6 metres is beginning to warm up in readiness for the DX season. Probably the most important news this month was contained in a message from Bill VK2ZBU who advised hearing the W6MID beacon WB6KAP, U.S.A.

We would also like to let you know that 10 metres has been causing quite a stir, particularly as Channel B is now available to VKs. Many VKs have been experimenting on the band and have been having a lot of fun with spins and other experimentations.

ABSTRACT OF DX ACTIVITY

1. VK9WVI, South Korea.

2. VK9WVI, South Korea.

3. VK9WVI, South Korea.

4. VK9WVI, South Korea.

5. VK9WVI, South Korea.

6. VK9WVI, South Korea.

7. VK9WVI, South Korea.

8. VK9WVI, South Korea.

9. VK9WVI, South Korea.

10. VK9WVI, South Korea.

11. VK9WVI, South Korea.

12. VK9WVI, South Korea.

13. VK9WVI, South Korea.

14. VK9WVI, South Korea.

15. VK9WVI, South Korea.

16. VK9WVI, South Korea.

17. VK9WVI, South Korea.

18. VK9WVI, South Korea.

19. VK9WVI, South Korea.

20. VK9WVI, South Korea.

21. VK9WVI, South Korea.

22. VK9WVI, South Korea.

23. VK9WVI, South Korea.

24. VK9WVI, South Korea.

25. VK9WVI, South Korea.

26. VK9WVI, South Korea.

27. VK9WVI, South Korea.

28. VK9WVI, South Korea.

29. VK9WVI, South Korea.

30. VK9WVI, South Korea.

31. VK9WVI, South Korea.

32. VK9WVI, South Korea.

33. VK9WVI, South Korea.

34. VK9WVI, South Korea.

35. VK9WVI, South Korea.

36. VK9WVI, South Korea.

37. VK9WVI, South Korea.

38. VK9WVI, South Korea.

39. VK9WVI, South Korea.

40. VK9WVI, South Korea.

41. VK9WVI, South Korea.

42. VK9WVI, South Korea.

43. VK9WVI, South Korea.

44. VK9WVI, South Korea.

45. VK9WVI, South Korea.

46. VK9WVI, South Korea.

47. VK9WVI, South Korea.

48. VK9WVI, South Korea.

49. VK9WVI, South Korea.

50. VK9WVI, South Korea.

51. VK9WVI, South Korea.

52. VK9WVI, South Korea.

53. VK9WVI, South Korea.

54. VK9WVI, South Korea.

55. VK9WVI, South Korea.

56. VK9WVI, South Korea.

57. VK9WVI, South Korea.

58. VK9WVI, South Korea.

59. VK9WVI, South Korea.

60. VK9WVI, South Korea.

61. VK9WVI, South Korea.

62. VK9WVI, South Korea.

63. VK9WVI, South Korea.

64. VK9WVI, South Korea.

65. VK9WVI, South Korea.

66. VK9WVI, South Korea.

67. VK9WVI, South Korea.

68. VK9WVI, South Korea.

69. VK9WVI, South Korea.

70. VK9WVI, South Korea.

71. VK9WVI, South Korea.

72. VK9WVI, South Korea.

73. VK9WVI, South Korea.

74. VK9WVI, South Korea.

75. VK9WVI, South Korea.

76. VK9WVI, South Korea.

77. VK9WVI, South Korea.

78. VK9WVI, South Korea.

79. VK9WVI, South Korea.

80. VK9WVI, South Korea.

81. VK9WVI, South Korea.

82. VK9WVI, South Korea.

83. VK9WVI, South Korea.

84. VK9WVI, South Korea.

85. VK9WVI, South Korea.

86. VK9WVI, South Korea.

87. VK9WVI, South Korea.

88. VK9WVI, South Korea.

89. VK9WVI, South Korea.

90. VK9WVI, South Korea.

91. VK9WVI, South Korea.

92. VK9WVI, South Korea.

93. VK9WVI, South Korea.

94. VK9WVI, South Korea.

95. VK9WVI, South Korea.

96. VK9WVI, South Korea.

97. VK9WVI, South Korea.

98. VK9WVI, South Korea.

99. VK9WVI, South Korea.

100. VK9WVI, South Korea.
B.A.R.T.G. SPRING RTTY CONTEST

The committee of B.A.R.T.G. wish to thank your readers for their past support of these annual events which are organised in order to promote interest in the RTTY mode as used by Radio Amateurs and they hope that the Group may continue to receive their support for future RTTY Contests. The contest will continue to enjoy the continued participation of readers for their past support of these bands.

RULES

When: 0000 GMT, Saturday, March 13, until 0000 GMT, Monday, March 15, 1971. The total contest period is 48 hours, but not more than 36 hours operation is permitted. Time spent in listening periods counts as operating time. The 12-hour non-operating period must be observed by all stations. The Contest, but off-periods may not be less than two hours at a time. Times on and off the air must be summarised on the log and score sheets. The Contest is also open to SWL RTTY operators. Bands: 3.5, 7, 14, 21 and 28 MHz. Amateur bands.

Stations may not be contacted more than once on any one band, but additional contacts may be made with the same station if a different band is used.

Country stations: A.R.L. Countries List, except XYL, KH6 and VQ to be considered as separate countries.

Messages exchanged will consist of:

(a) Time GMT.
(b) Message number and RST.

Points:

(a) All two-way RTTY contacts with stations within one's own country will earn two points.
(b) All two-way RTTY contacts with stations outside one's own country will earn ten points.
(c) All stations will receive a bonus of 200 points per country worked including their own. Note: Any one country may be counted again on another band, but continents are counted once only.

Scoring:

(a) Total country points times total continents worked.
(b) Total country points times number of continents worked.

Add (a) and (b) together to obtain your final score.

Sample score:

Exchange points (200) x countries (3) x continents (5) = 3000

Total 9000

Logs and Score Sheets: Use one log for each band and indicate any rest periods. Logs to contain: Band, Time GMT, Message and RST. Numbers sent and received exchanged Points Claimed. All logs must be received by 1900 GMT, Monday, March 15, 1971.

Awards: Certificates will be awarded to the leading RTTY stations and SWL's. These positions will be determined by the Contest Table and will be valid for entry in the "World Champion RTTY Championship". The Judges' decision will be final and no correspondence can be entered into in respect of the judging of logs or entries.

Send your Contest logs to:


CENTRAL COAST AWARD

Commemorating from 1st December, 1970, a new award, the Central Coast Award, will be available to Radio Amateurs throughout Australia and the world. The award will be sponsored by the Central Coast Tourist Authority through the Central Coast Branch. Details are as follows:

1. Operators will gain an award by making radio contact with any two stations in the Central Coast area and submitting log, together with 10 cents in stamps.

2. VK operators (excluding Central Coast operators) can gain an award by contacting four stations in the Central Coast area plus the club station VK5AFY and submitting a log, together with 10 cents in stamps.

3. Central Coast operators can also gain an award by contacting four stations in the Central Coast area plus the club station VK5AFY and submitting a log, together with 10 cents in stamps.

4. This award is made available as a h.f. or v.h.f. award. Operators must qualify on either h.f. or v.h.f. bands.

5. Logs to be sent to Awards Manager, Central Coast Branch W.I.A., P.O. Box 230, Gosford, N.S.W., 2250.

TELECOMMUNICATIONS AND ELECTRONICS (TE/-)

The second meeting of this Industry Standards Committee was in October following a meeting of the executive of the committee. The chairman, Mr. P. R. Brett (I.P.M.G. Department), reported that all the technical committees recommended at the first meeting had been constituted and that the seven active technical committees had aggregated a total of 40 meetings. Several sub-committees had been formed covering such subjects as microcircuits, radio-reception, radio transmission and aerials, while a special panel had been formed to deal with polyethylene insulation of telecommunication cables. The committee organises the production of standards reaching the stage of publication, seven drafts being circulated for public review, and many other documents currently under consideration.

Other matters discussed were the metrification programme and the operation of future workshops, and the formation of new technical committees concerning capacitors, resistors and printed circuits.

The executive of the Telecommunications and Electronics Industry Standards Committee has met to discuss what may be required in their sector. They considered general principles and their general comment was that the major problems would be associated with the supply of materials and components and other mechanical engineering aspects of the industry rather than with electrical requirements which are already effectively in terms of SI units.

The executive went on to analyse the types of problems which would be faced by the telecommunication and electronics industry, and noted that standardisation would be one factor which might be a matter for the Metric Conversion Board and its Advisory Committees, e.g. in relation to economic availability of basic materials like rationalised metric sizes, the time programme for conversion, education and training, and some aspects of instrumentation and test equipment. It was observed also that there would be some matters for reference to the S.A.A. Metric Standards Advisory Committee, such as conversion data and procedures, and rationalisation and preferred numbers.

Finally, the executive recognised that the technical committee's supervision would need to consider both existing and future requirements and encouraged metrification by way of conversion of such standards into fully metric terms.

R. H. CUNNINGHAM

Dow Key Relays to Clear

- We offer three Model DK72 high powered relays. Three-position R.L.S switch commonly used for switching antennas, etc. up to 12V. D.C., and one at 24V. D.C. Also available in waterproof sealed cans for mast mounting. Coil voltages: One at 12V D.C., one at 12V A.C., and one at 24V. D.C. Price $11.50 each.

- One only Model DK2-60B 52 ohm 12V. D.C. relay. 1 kw. capacity, designed for use with Pi Couplers. Rated at 150 watts (50 MHz). Price $9.90.

- Relays with Electrically Isolated Co-axial Connectors. Each relay is provided with special terminals and wire connections to allow quick and easy fitting. Price $11.50 each.

- One only Model DK77 Miniature Co-axial Relay (BNC connectors), 28V. D.C., rated at 150 watts (50 MHz.). Price $9.20.

- One only Model DK2-60B 52 ohm 12V. D.C. relay. 1 kw. capacity, designed for use with Pi Couplers. Rated at 150 watts (50 MHz). Price $9.90.

R. H. CUNNINGHAM

SUBSCRIPTIONS DUE

All members of the W.I.A. are reminded that annual subscriptions are now due and should be paid promptly to their Divisional Secretary. Non financial members will not receive a copy of "A.R.," and back copies may not be available upon request. To preserve continuity of your files of "A.R.," please pay your annual subscription now.
"Overseas Magazine Review"
Compiled by Syd Clark, VK3ASC

"BREAK-IN"

September 1970—
More Circuits and Diodes, ZL1AI. For the solid state experimenter, T.V. line Output Tubes as R.F. Amplifiers, and a new stage of the paper "I experienced hands these tubes have a life measured in minutes. Once the techniques are mastered they can produce a gain of 100,000 and an output of 1,000 hours."

The Market, Some Thoughts and Ideas, ZL2AHY. How to build and fit a device which will let the outsiders know the insiders are in.

October 1970—
Diode Signal Isolators, ZL2AI. Solid state switches.
Circuits for All, VK3GG. Describes a simple method of drafting. Up the Pole, ZL2AHY describes a tilt-over mast.

"CQ"

October 1970—
A Solid State Permeability Tuned V.F.O. with Digital Readout, PVY2PSC. Two BF115 triodes are used. The Editor reviews the Collins 30L-1 Linear Amplifier, W2AEF. Four 811A triodes and some cute tricks enable Collins to run 1 kw. to 3 kw. as a linear amplifier. A built-in power supply which provides filament, bias, relay and 1800v. plate supplies. An Efficient Multiband Loop Antenna, by G3NNG and W2GSK. TAKE one quad type element, e.g. a muntzian or horn, turn horizontally, feed at the midpoint of one side with co-ax, and you have a simple antenna with an effective gain over a dipole. Evolution of the Decibel, K2BZ. It even helped me to brush up my theory.

A Frequency Counter for the Amateur Station, W1EO. Designed to suit the Collins line of gear and provide digital readout of frequency. The Junker Amplier, W1CCP. 3.35 to 30 or 21 MHz, depending upon what you use.

"QST"

October 1970—
There is an interesting line-up of articles in "QST" for October. My vote for the "article of the month" goes to Doug de Maw, W1CER, for his article "The Ham Builder's Nightmare." Solid state components have so altered the industry that many of the "receiving components" which could be used in transmitting applications are no longer available.

A Simple Audio Test Oscillator, W6JTT. Three transistors in a phase shift circuit. The Case of the Kinlave T.V.I., W2WBB. An investigation of both the CB operator and an Amateur who were blamed for causing T.V.I. tracked the source down to a colour t.v. receiver. Bushmanship was terrible.

August 1970—
80 Metre Transceiver, ZS6AAM. Small s.s.b. transceiver using valves and based on a "QST" article of several months back. Helical Whip Antenna Plus, Z66JP. "The Rhodesian Mobile Antenna" is described as a very useful addition to Hand band, 10 to 40 metres, using a normal p.n. receiver. Winders and construction details are given. Some Linear Considerations, ZS6SHF. Part 2, Power supplies.

Some Linear Amplifiers, W2AEF. How, why and the gadget to do it.

Low Cost Function Generator for the Experiment, W2AKI. 0.01 Hz. to 4 Khz. Transformer is a special job, but a filter, a circuit and the gadget to do it. ICs for A.mateur Use, KlCLL. Discusses the various types on the market and what they can do for you. Practical IC Regulator Circuits for Home, WB2E2G. Makes a simple regulated supply possible.

"RADIO COMMUNICATION"

September 1970—

September 1970—
FET Front End and Pre-Smixer with Electronic Tuning, ZL6IO. Using M.P.F.8 tubes, some Linear Considerations, ZS6SHF. A form of cathode coupled circuit which does not use filament chokes and power measurements are discussed. RF Amplifier, ZS6SHF. The discine is a vertically polarised, broad-band antenna with v.v.w.r. over a frequency range of about 10/1.

Professor Nutzenbam and the Speed Key, G3VA. Third edition, published September 1970—
Circuit using the gadget to do it.

"RADIO COMMUNICATION"

September 1970—
The Milliwatt Six, G3WLT. Describes an all-transistor tx for top band QRP operation. More on Clapper F.V.O. Design, G3BGJ presents another mathematical approach. R.F. Automatic Gain Control described as a useful practical design which will cater for serial feeder currents varying from about 25 mA. to 3 I.

September 1970—
Integrated Circuit C.W. I.D. Generator, by W7FPG. Automatic identification for your station.

"SHORT WAVE MAGAZINE"

September 1970—
Six Vela from Twelve Volts, KG3SY. Six beautiful voltage drops! The Indicating Oscillator, KH6AF. Another dipper circuit, 1-400 Mhz. That's Life, K6MVH. Clever infinite attenuator and oscillator unit.

"Short Wave Magazine Review"

Compiled by Syd Clark, VK3ASC


This third edition of "Amateur Radio Techniques" is a somewhat enlarged version of the second edition published five years ago. Approximately 33 per cent of the contents are additions. The book has been substantially revised and updated. G3VA has successfully combined the best of two items presented by him as a monthly feature in the R.S.G.B. journal, "RADIO COMMUNICATION." "Amateur Radio Techniques" is written in a straightforward manner. It is well written and well illustrated. The book is a must.

The review copy came direct from R.S.G.B. and copies should be available shortly through the usual sources. British price is twenty shillings sterling.

Amateur Radio, January, 1971
Correspondence

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

CAN YOU HELP?

Editor “A.R.,” Dear Sir,

I have obtained an ancient radio receiver which I would like to put in working order. It is a 1924 American King's "Newtrodyne" receiver. It is a d.c. five valver on 6, 4-5, 90 volts, and was complete but for valves. I sought advice here and obtained four A608a and a UX226 for it. However, it performs not much better than a good crystal set. As it is in good order, I think it should be better despite its age. Possibly the tubes are incorrect. The UX226 has burnt out its filament. If the above performance is usual, it wouldn't need the volume control fitted!

I would welcome any information you may send, possibly from a collector of obsolete equipment you may know of. Congratulations on "A.R." It is a good magazine, I enjoy it.

Thank you for any information you may be able to obtain.

—John Alcorn.

"ASTRONET"

Editor “A.R.,” Dear Sir,

Ever heard of such a net? It is my privilege to make an effort to explain all about this new "Net". Beginning with Apollo the astronauts were instructed from ground control to dump waste water from the spacecraft at specific times. This "water dumping" was done for the benefit of Professional and Amateur Astronomical Societies alike, around the world. The dumped water consists mainly of a by-product of their electrical system. Some of the water was recycled and the remainder was jettisoned from the spacecraft. This water dumped around the earth made the earth appear like a "halo". The Astronomical Societies are asked to observe the three magnitudes of brightness of the "Vapour cloud" and furnish their findings back to Houston.

What has all this to do with Astronet?

Houston confirms the exact times of "dumping" to Belton, who in turn conveys the messages to Amateur Radio stations in the U.S.A. which consist of six call signs, "Astro-146a Cotham Rd., Kew, Vic. Ph. 80-3777". Successful reception is confirmed by a net." Very little publicity has been given to this net. The "Astro-net" is working as far as I know. If anyone should get Astronet working in this area, I would welcome any information you may be able to obtain.

—John Alcorn.

SILENT KEY

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

VK2SV—C. W. Peters
VK3PI—L. F. Pearson

All we had to know was the times of the actual water dumpings, and the stations which yours truly can receive. The exact times were transmitted from 0100-0200 hours GMT on 14.255 MHz. and from 0100-0200 hours GMT on 14.255 MHz.

The point I would like to make is that we can use this net to our advantage in publicising and asking Amateur Radio operators to keep the mentioned frequencies clear at those particular times. I can assure you that it was quite hopeful in the past, to note any stations on the mentioned QRM frequencies which are not 100 per cent clear, with this net. Thus we are able to see the network which is self-propagating.

So how about some co-operation from this side of the globe to give this project its fullest support; it darn well deserves it.

Footnote—At present, negotiations with Mt. Wilson Observatory, California, are well advanced for the flight of Apollo 14, scheduled for take-off in the end of January 1971.

—Clem Steggink, VK4FD.

TO AND FROM THE MOON

Editor "A.R.,” Dear Sir,

May I submit the following information for possible future inclusion in "A.R."

On 12th June, 1965, from a transmitting site approximately 20 miles north of Brisbane, at 14.255 MHz. on 14.255 MHz. solar moons, signals on 144 MHz. were successfully reflected and received from the moon.

The data from this experiment were... (info continues on page 23).

—John Alcorn.

KITS


COMMECO INDUSTRIES

P.O. Box 1, Kew, Vic., 3101

REPAIRS TO RECEIVERS, TRANSMITTERS

Constructing and testing: xtal conv., any frequency; Q5-ers, R9-ers, and transistors.

ECCLESTON ELECTRONICS

146a Coatham Rd., Kew, Vic. Ph. 80-3777

V.K. ELECTRONICS

63 HAROLD ST., DIANELLA, W.A., 6062

Service to Transceivers, Receivers, Transmitters, Antennae, etc.

Phone 76-2319

HAMS

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

HAMS WILL NOT BE PUBLISHED UNLESS ACCOMPANYED BY REMITTANCE.

Advertisements 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 5th of month and remittance must accompany the advertisement.

FOR SALE: All-band 80 through 10 metres. A.M./F.M. transceiver, 60 watts PEP, Model 200s, General Radiant, Melb., Victoria. $100.00. Phone 347-4247.

FOR SALE: A.W.A. F.M. 3-unit Base Station, rx & tx, power supply, channel A crystal, P.2625s. 45 watts A.C., powered, handsets, complete, $250.00. Contact Mr. W. A. MR10 single channel, F.M., mobile unit, complete with crystals, handset, etc., $225. VK3KKE, Phone 97-2373 (Melb.).

FOR SALE: Call Books; United States listings, Fall 1967, Winter 1968, $1.50 each. Contact J. M. B. G, 2881, Miami, Florida; Fax DX listings; Summer 1968, Winter 1967/68 $4.00. Collect only not post. 48 Orchard St., Glen Waverley, Vic., 3128.


FOR SALE: Hy-Gain TH6 antenna and belin together with spare set of nuts and bolts. Electromagnetic, fully assembled, $120. VK3AF, 8 Abelia St., North Balwyn, Vic., 3104. Phone 857-3401.


SWAN 500 plus AC PU/Speaker; transceiver VOX/BK adwptor; CW side tone; U/L SSB; stx calibrating values for it. Contact A. O. T. 60, 30 Orchard St., Glen Waverley, Vic., 3128. Phone 97-2373 (bus. hrs. only).

FOR SALE: V.H.F. F.M. Base Station (2) A.W.A. 8550, one on 146 MHz, band H, $3 A.W.A. MR3 (needs power transfr.), $150. 2BXF, 547 Blaxland Road, Eastwood, N.S.W., 2122. Phone 85-2043.


WANTED: A.W.A. 8546, one on 146 MHz, band H, $3 A.W.A. MR3 (needs power transfr.), $150. 2BXF, 547 Blaxland Road, Eastwood, N.S.W., 2122. Phone 85-2043.


WANTED: Yessie Muse FL-1000 Linear Amplifier in good order. Contact A. O. T. 60, 30 Orchard St., Glen Waverley, Vic., 3128. Phone 97-2373 (bus. hrs. only).

WANTED: Extra words, 3 cents each.

WANTED: Federal Awards Manager, W.I.A.

[Amateurs are reminded that the AX prefix ceased on 31st December, 1970.—Ed.]
BRIGHT STAR CRYSTALS
FOR ACCURACY, STABILITY, ACTIVITY
AND OUTPUT

SPECIAL OFFER—
STANDARD AMATEUR CRYSTALS
STYLE HC6U HOLDER, FREQUENCY RANGE 6 TO 15 MHz.
0.01% $4.25
0.005% $5.50
Prices include Sales Tax and Postage

COMMERCIAL CRYSTALS
IN HC6U HOLDER, 0.005% TOLERANCE, FREQUENCY RANGE 6 TO 15 MHz.
$6.00 plus Sales Tax and Postage

Write for list of other tolerances and frequencies available.
COMPREHENSIVE PRICE LIST NOW AVAILABLE—WRITE FOR YOUR COPY

New Zealand Representatives: Messrs. Carrell & Carrell, Box 2102, Auckland
Contractors to Federal and State Government Departments

BRIGHT STAR CRYSTALS PTY. LTD.
LOT 6, EILEEN ROAD, CLAYTON, VIC., 3168 Phone 546-5076

With the co-operation of our overseas associates our crystal manufacturing methods are the latest

GOOD QUALITY ANTENNA EQUIPMENT ENSURES THE BEST SIGNAL STRENGTH

- First Grade Brown Glazed Porcelain Egg Insulators, large size, type G53 .... 46c
- First Grade Brown Glazed Porcelain 5" Low Loss End or Centre Insulator, type 211/5 .... 46c
- Baluns—Impedance Ratio 1:1; 75/50 unbalanced to 75/50 ohm balanced. Type 353B with standard UHF Connector, Frequency range: 3-30 MHz ... $6.25
- Baluns—Impedance Ratio 1:4; 75 ohm unbalanced to 300 ohm balanced. Type 354B with standard UHF Connector, Frequency range: 3-30 MHz ... $6.25
- PT11M 50 ohm Co-axial Cable: conductor, diam. .405", pwr. rating 1.95 kw. at 10 MHz, velocity ratio .66 ... 60c yd.
- RG58AU 50 ohm Co-axial Cable: conductor 19/.0068, diam. .195", pwr. rating approx. .75 kw. at 10 MHz, velocity ratio .67 ... 46c yd.
- PT11M Co-axial Cable: conductor 14/.0078, diam. .31", pwr. rating 92 kw. at 10 MHz, velocity ratio .56 ... 52c yd.
- PT77M 70 ohm Co-axial Cable: conductor 77/0078, diam. .23", pwr. rating .53 kw. at 10 MHz, velocity ratio .65 ... 46c yd.
- K20 72 ohm Twin Flat Transmission Line: conductors 1/.036, diam. .16" x .10", pwr. rating .92 kw. at 10 MHz, velocity ratio .66...

See us for other types of Cables, Microphones, P.v.c. Hook-up, Audio, Power, Multi-Core, Hard Drawn Copper, etc.

WILLIAM WILLIS
& CO. PTY. LTD.
77 CANTERBURY RD., CANTERBURY
VIC., 3126 Phone 836-0707

BAIL ELECTRONIC SERVICES
for your amateur station requirements

YAESU SSB Transmitters, Receivers, Transceivers, and Linears
HY-GAIN HF and VHF Antennas, Beams, and Mobile Whips

BEAM ROTATORS — CO-AX. SWITCHES — ELECTRONIC KEYERS
24-HOUR DIGITAL CLOCKS — CO-AX. CABLE — SWR METERS — LOW-PASS FILTERS
HEATHKIT AMATEUR EQUIPMENT (Vic. only) — CO-AX. PLUGS — YAESU VALVES & SPARES, etc.

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 67-1650 (AH 37-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

Amateur Radio, January, 1971
Today's sophisticated communications equipment calls for crystals that meet the most exacting standards of the art. Standards that were acceptable a few years ago cannot meet the requirements of design engineers today. Today's tight tolerances demand quartz blanks with precision selected angles of cut, and Hy-Q use X-ray diffraction equipment to determine this most important factor.

Long term stability is assured by close engineering control of all processing in an air-conditioned environment. The blanks are then checked to determine the frequency change over the temperature range. The crystal is then precision calibrated to frequency using a crystal impedance meter which simulates the manufacturer's oscillator specifications. Hy-Q crystals are custom manufactured to meet all these exacting requirements.

It is for these reasons that Hy-Q crystals have been readily accepted as a standard by the Communications Industry and why we can guarantee them against defective material and workmanship or any deterioration in performance when they are used in equipment for which they were specifically made.

Australia's largest independent crystal manufacturers.
Write for details.

Hy-Q Electronics Pty. Ltd.
10-12 Rosella Street,
P.O. BOX 256,
Frankston, Victoria, 3199.
Telephone 783 9611. * Area Code 03.
Cables: Hyque Melbourne.
Telex 31630.

LOW DRIFT CRYSTALS

* 1.6 Mc. to 10 Mc.,
0.005% Tolerance, $5

* 10 Mc. to 18 Mc.,
0.005% Tolerance, $6

* Regrinds $3

THESE PRICES ARE SUBJECT TO SALES TAX

SPECIAL CRYSTALS: PRICES ON APPLICATION

MAXWELL HOWDEN
15 CLAREMONT CRESC.,
CANTERBURY,
VIC., 3126
Phone 83-5090

LOG BOOK
AVAILABLE IN TWO TYPES—
VERTICAL OR HORIZONTAL
Larger, spiral-bound pages
with more writing space.
Price 75c each
plus 22 Cents Post and Wrapping
Obtainable from your Divisional Secretary,
or W.I.A., P.O. Box 36, East Melbourne,
Vic., 3002.
Do away with the heavy, "closed-in" feel of conventional headphones. The sensational new OPEN-AIRE HD-414 headphones by Sennheiser offer an entirely new approach to high-fidelity listening. They deliver their sound not only directly through the earpieces, but also through the air around you...immersing you in sound that is breathtakingly real.

Experience the "natural" sound of Sennheiser! Surround yourself with beautifully life-like timbre and lustre, without losing touch with the world. Who said you have to be isolated from family and friends while listening? Frequency range 20-20,000 Hz.

**the OPEN-AIRE HD-414 HEADPHONE by SENNHEISER**

- Unique "open-acoustics" design lets you hear through...and beyond...the earphones.
- Light-as-a-feather foam ear cushions replace heavy, air-tight seals for unprecedented user comfort.
- True-fidelity reproduction from 20 to 20,000 Hz.
- Connects directly to either high or low impedance outputs.
- Professional quality for only $16.65 plus sales tax $4.58, post free.

ex stock from

K. H. Cunningham

Amateur Radio, January, 1971
Announcing Our Latest Production for 1971

425-page Catalogue showing trade-retail prices — fully illustrated

YOU GET MONTHLY FOR 2 YEARS
(the life of the Catalogue)

★ REGULAR PRICE CHANGE ADVICE
★ NEW LINE ADVICE
★ MONTHLY CIRCULARS
★ NEW CLIP-IN PAGES
★ ONE DE-LUXE CATALOGUE

$12.50
including postage for two years
(only $6.25 per annum)

Please send your cheque with order to ensure early delivery. Your money back if not delighted.

CATALOGUE ONLY
Without Price Amendment Service, etc.
$3.00 including postage

FULL SUBSCRIPTION (2 years including monthly Price Amendment Service) .... .... .... $12.50
Additional copies: $3.00 each

radio parts

GROUP

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!
PLUGS AND SOCKETS

- 2-pin 2.5 mm Plug or Socket ................... 40c
- 5-pin DIN Chassis Socket ....................... 65c
- 3.5 mm. Min. Phone Plug or Socket ......... 25c
- 2.5 mm. Plug or Socket ......................... 15c
- 2-pin American Power Plug or Socket ....... 50c
- 5-pin DIN Plug .................................. 56c
- 5-pin DIN Chassis Plug ......................... 36c
- Power Plug, National Type ..................... 55c
- Power Socket ................................ 10c
- Banana Plug or Socket .......................... 60c

SPECIAL!

1 WATT TRANSCEIVER

13 TRANSISTORS, 3-CHANNEL, AND CALL SYSTEM
Range: up to 10 miles (depending on terrain, etc.).
Frequency: 27.240 MHz. (F.M.G. approved). Frequency accuracy: plus or minus 100 KHz.
Transmitter: Crystal controlled, 1 watt. Receiver: Superhet.
Price $75 a Pair.

CRYSTALS

CITIZENS BAND and MODEL RADIO CONTROL

FREQUENCY CRYSTALS

- HC18 Miniature, 1/4 inch spacing.
  26.540 MHz. 26.995 MHz. 27.240 MHz.
  26.590 MHz. 27.945 MHz. 27.245 MHz.
  26.640 MHz. 27.995 MHz. 27.245 MHz.
  26.690 MHz. 27.145 MHz. 27.740 MHz.
  26.785 MHz. 27.195 MHz. 27.785 MHz.
  26.790 MHz. 27.800 MHz.

PRICE $3.50 EACH

AMATEUR CRYSTALS

VHF Band — 144 MHz. FM

- HC6 Holders, 1/2 inch spacing.
  Channel A Transmit 4,055.5 KHz.
  Channel A Receive 10,285.71 KHz.
  Channel B Transmit 4,055.5 KHz.
  Channel B Receive 10,285.71 KHz.
  Channel C Transmit 4,055.61 KHz.
  Channel C Receive 10,285.14 KHz.
  Channel D Transmit 4,056.66 KHz.
  Channel D Receive 10,276.57 KHz.
  Channel E Transmit 4,058.30 KHz.
  Channel E Receive 10,257.14 KHz.

PRICE $3.50 EACH

MARKER CRYSTALS

- 100 KHz Marker ................................. $12.00
- 1000 KHz Marker ............................... $12.00
- 3,500 KHz Marker ............................... $3.50
- 5,500 KHz Marker ............................... $3.50

COMMERCIAL FREQUENCY CRYSTALS

- HC5 Holders, 1/4 inch spacing.
  2,182 KHz. 2,234 KHz. 2,285 KHz.
  2,524 KHz. 2,739 KHz. 2,680 KHz.
  2,603 KHz. 2,797 KHz. 2,736 KHz.
  4,035 KHz. 4,025 KHz. 4,015 KHz.

PRICE $5.50 EACH

DUAL METER S.W.R. BRIDGE

For V.S.W.R. measurement, this unit uses the dual bridge method of comparing simultaneously the power supplied to and reflected from the antenna system. Specifications: Impedance, 50 ohms; accuracy, plus or minus 5%; power loss, negligible; freq. range, 3 to 150 MHz. Price $29.

TE-16A TRANSISTORISED TEST OSCILLATOR

Frequency range: 400 KHz. to 30 MHz. In five bands. Modulated 500 Hz. sine wave. Modulation 20%. Approx. 3/10 x 5/10 x 1/10 inches. Weight 1.5 lbs. Price $24 tax paid, Postage 75c.

CRYSTAL CALIBRATOR No. 10

Nominal range: 500 KHz. to 20 MHz. 500 KHz. and 200 KHz. 200 KHz. BFO. Provides heterodyne output in steps of 1 MHz. Dial driven by machine cut strip gears, calibrated in 2 KHz. div. Easily read to 250 cycles. Output "spiked" approx. 1 sec. intervals, identifies beat note. Power requirements: 12V. DC at 0.3 amp. 250 volts at 15 mA. This is a precision instrument. Complete with crystal. Brand new. Price $23.50

TAA300 INTEGRATED CIRCUIT

1 Watt Audio Amplifier

The TAA300 is a monolithic integrated circuit for use as a complete a.f. amplifier. With a supply voltage of 9v., outputs of up to 10w. are obtainable into a load impedance of 8 ohms. A voltage range of 4.5 to 9 watts coupled with very low crossover distortion and low current drain [8 ma.] makes this circuit ideal for battery operation. TAA300 Integrated Circuit. $3.50 Postage 10c

TRANSISTORS AND DIODES

- OC71 75c AF114 80c
- OC44 90c AF116 80c
- OC45 90c BC108 70c
- AC125 80c BC109 80c
- AC128 80c BF115 80c
- BA100 30c OA90 30c
- CA1 20c OA55 30c

A.C. ADAPTOR—BATTERY SAVER

Type PS64—240 volts to 6 or 9 volts. 300 mA. $12.50
Type PS62—240 volts to 6 or 9 volts. 100 mA. $8.50

SOLDERING IRONS

- ADCOLA M70 3/16 inch tip, 240 volt $8.00
- ADCOLA M64 1/32 inch tip, 240 volt $8.40
- SCOPE 4 volts AC/DC, 100 watts $6.40
- MINISCOPE $6.00
- SCOPE De Luxe $7.00

SOLDERING IRON TRANSFORMER

240 volts/120 volts, 100 VA $6.40

ERISIN SOLDER

Five-Core, 60/40 $2.50
Five-Core, 40/60 $2.20
Soldier Pack, 42 inches $18

RADIO SUPPLIERS

323 ELIZABETH STREET, MELBOURNE, VIC. 3000
Phones: 67-7329, 67-4286 All Mail to be addressed to above address
Our Disposals Store at 104 HIGHETT ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 10.30 a.m. to 5.00 p.m., and on Saturdays to midday.

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.
CONTENTS

Technical Articles:—

Counter Used for Frequency Measurement:
  Part One—Generation of Time Intervals .. .. 5

Harmonics, Lecture No. 10C .. .. .. .. .. .. .. 6

General:—

Amateur Equipment and the Customs Dept. .. .. 10
Cook Award .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. 11
Correspondence .. .. .. .. .. .. .. .. .. .. .. .. .. .. 15
"CO" W.W. DX Contest Aust. Results .. .. 11
DX .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. 14
Errata .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. 8
Federal Comment: On Project Australis .. .. 4
Federal Repeater Secretariat Report .. .. 8
F.M. Broadcasting .. .. .. .. .. .. .. .. .. .. .. .. .. .. 10
Heard All VK Call Areas (H.A.-VK-C.A.) Award .. 9
New Call Signs .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. 12
N.Z.A.R.T. Subscription .. .. .. .. .. .. .. .. .. .. .. .. 8
Obituary .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. 12
Prediction Charts for February 1971 .. .. 10
R.S.G.B. Certificates and Awards .. .. 11
Silent Keys .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. 15
VHF .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. 13
VK2 Area 5 Meeting .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. 12
VK2 Field Days and Activities for 1971 .. .. 13
W.I.A. Worked All States (Aust.) Award .. .. 9
Winning Divisions of R.D. Trophy—1948 to 1970 .. 8
**MOBILE POW. SUPPLY**

Universal type to suit most transceivers

12V DC TO DC CONVERTER

ACITRON Model 3003

Latest design, manufactured in Australia by ACI Electronics

Input Voltage:

12 to 15 volts DC, positive or negative earth, relay control.

Output Voltages

(at 13.5 volts DC input):

HT 1—Selectable 660 or 800 volts DC at an average current of 250 mA.
HT 2—Selectable 250, 275, 300 or 325 volts DC at 150 mA.
HT 3—150 volts DC at 150 mA.
HT 4—Bias voltage, minus 100 volts DC at 100 mA.
HT 5—Adjustable bias, minus 10 to minus 110 volts DC at 100 mA.

Output voltages are within 10% of nominal with all outputs fully loaded as above.

Size: 4½ x 6 x 6½ inches.

Weight: 7 lb., shipping wt. approx. 10 lb.

Unit is supplied with primary leads attached, together with a 5 ft. length of 12-core shielded output cable.

Price $115.00 incl. ST.

Add $5.00 if voltages to be set to suit a particular transceiver and output cable wired to the power supply connector. State type of set and voltages required. Freight is extra.

Bail Electronic Services

60 SHANNON ST., BOX HILL NTH., VIC., 3129.

Phone 89-2213

N.S.W. Rep.: STEPHEN KUHL, P.O. Box 36, Mascot, 2020. Telephone: Day 67-1650

(AH 37-5445)


DURALUMIN ALUMINIUM ALLOY TUBING

IDEAL FOR BEAM AERIALS AND T.V.

★ LIGHT ★ STRONG ★ NON-CORROSIVE

Stocks now available for Immediate Delivery

ALL DIAMETERS — ¼” TO 3”

Price List on Request

STOCKISTS OF SHEETS—

ALL SIZES AND GAUGES

GUNNERSEN ALLEN METALS PTY. LTD.

SALMON STREET, PORT MELB’NE, VIC.

Phone 64-3551 (10 lines) F: 133177 (4 lines) G: “Metals” Melb.

HANSON ROAD, WINGFIELD, S.A.


LOW DRIFT CRYSTALS

★

1.6 Mc. to 10 Mc., 0.005% Tolerance, $5

10 Mc. to 18 Mc., 0.005% Tolerance, $6

★

Regrinds $3

THESE PRICES ARE SUBJECT TO SALES TAX

SPECIAL CRYSTALS: PRICES ON APPLICATION

MAXWELL HOWDEN

15 CLAREMONT CRES., CANTERBURY, VIC., 3126

Phone 83-5090

LOG BOOK

AVAILABLE IN TWO TYPES—

VERTICAL OR HORIZONTAL

Larger, spiral-bound pages with more writing space.

Price 75c each

plus 22 Cents Post and Wrapping

Obtainable from your Divisional Secretary, or W.I.A., P.O. Box 36, East Melbourne, Vic., 3002
BAIL ELECTRONIC SERVICES
for your amateur station requirements

YAESU SSB Transmitters, Receivers, Transceivers, and Lines
HY-GAIN HF and VHF Antennas, Beams, and Mobile Whips

NOTE! NEW YAESU TRANSCEIVERS:
- FT-200, latest model has provision for use of an external VFO.
- FTDX-560, similar to FTDX-400, as produced for the U.S.A. market.
- FT-101, latest transistorised transceiver.

All sets pre-sale checked and covered by our 90-day warranty.

BEAM ROTATORS — CO-AX. SWITCHES — ELECTRONIC KEYERS — PTT MICROPHONES
24-HOUR DIGITAL CLOCKS — CO-AX. CABLE — SWR METERS — LOW-PASS FILTERS
HEATHKIT AMATEUR EQUIPMENT (Vic. only) — CO-AX. PLUGS — YAESU VALVES & SPARES, etc.

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 67-1650 (AH 37-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

WAYNE COMMUNICATION ELECTRONICS
Catering specially for the Amateur with Components, Receivers, Transmitters, Test Equipment. Everything from Resistors to 100 MHz. Frequency Counters

ALL AT UNBEATABLE PRICES

TRANSFORMERS: 14 volt 5 amp. .......... $5.00
22 volt 4 amp. .......... $5.00
17 volt 2 amp. .......... $3.20

CHOKES: 20H 250 mA. .......... $1.00
20H 150 mA. .......... $1.00
20H 100 mA. .......... $1.00
60H 80 mA. .......... $1.00

CO-AXIAL CABLE: RG217/U 50 ohm, 1.4 dB. loss per 100 ft. at 100 MHz., 5.5 dB. loss per 100 ft. at 1 GHz. Ideal for 432 MHz. 30c per yd.

A.W.A. AUDIO OSCILLATOR, Type A57321, 20 Hz. to 20 KHz. Output: 600 ohm bal. or unbal, also high impedance. Calibrated output meter. $50.00.

SWITCHES: 18-position, 1-pole, 3-bank rotary. New. $1.50 each.

SIEMENS RELAYS: Plug-in type with base. 1250 ohm coil. Four sets of change-over contacts. $2.50 each.

Come and inspect the full range of equipment and components at

WAYNE COMMUNICATION ELECTRONICS
757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122 Phone 81-2818
ON PROJECT AUSTRALIS, by John Battrick, VK3OR

I guess your first reaction to this Federal Comment is why is the W.I.A's I.A.R.U. Region 3 Association Director commenting on Project Australis? There are several reasons for my doing so.

Firstly, as you know this current satellite project—known as AO-B (AMSAT-OSCAR B) is a combined effort between Region 1, Region 2, and Region 3 Amateurs. Certainly not on an official regional basis, but the launch of the second of the AMSAT series of Amateur Radio spacecraft experiments (the sixth of the widely-known OSCAR series) and the specification of the general requirements necessary for the design, fabrication and test of the spacecraft is the responsibility of the U.S.A.-based Radio Amateur Satellite Corporation.

The design and fabrication of a translator with an uplink frequency in the 432 MHz band and a downlink frequency in the 144 MHz band is being undertaken in Germany, and is referred to as the DJ4ZC experiment. Conversely, the design and fabrication of a translator with an uplink frequency in the 144 MHz band and a downlink frequency in the 432 MHz band is being undertaken in Australia and is the activity being undertaken by the W.I.A. Project Australis Group. So the ultimate package envisaged at the moment will fly and operate as a result of a combined effort by Amateurs in all of the regions of the I.T.U.

However, that is not the real reason why I comment, although it is certainly an aspect of the activity which I believe to be most important; the next Amateur satellite will be a "talk-through" satellite and it will be operable as a result of this combined effort of Amateurs across the world! The real reason is, that at its last meeting the Federal Executive of the W.I.A. appointed me to the position of W.I.A. FEDERAL OSCAR CO-ORDINATOR.

This office was formerly held by Richard Tonkin in his capacity as the Chairman of the Project Australis Group. Richard and the members of his group (Les Jenkins, VK3ZBJ, who builds the translators; Peter Hammer, VK3ZPI, who builds the telemetry; Harold Hepburn, VK3AFQ, who handles procurement and builds sub-systems; Derek Brumley, VK3AVW, who is group treasurer; Edwin Shoell, VK5NZ, who assists with design), yes, that is about all the "group" comprises; these fellows asked the Institute for some assistance with co-ordination, publicity, administration, etc., and for some reason requested my assistance.

The Federal Executive discussed the matter with Richard and myself and all agreed that the two functions should be separated, that of the chairman of the Project Australis Group from that of the W.I.A. Federal Co-ordinator. So Richard and I now work together, and effect the liaison between the group responsible for the design and fabrication of the spacecraft, and the Amateurs of Australia and the world who we hope will use the ultimate system when it flies. So my first real job in my new position is to report briefly to you on the progress of the project.

At the time of reading this, a prototype translator will have been sent to AMSAT in U.S.A. for testing. It has been thoroughly tested in Melbourne, and meets the published specifications. Other prototype modules have been in operation as repeaters in Melbourne, and also will be flown to 100,000 feet on HIBAL balloon launches from Mildura during March. In addition to this prototype testing, the actual flight package will be completed and sent to the U.S.A. during March this year. This package will contain the translator, the command system and the telemetry systems.

The main problems of course in a combined experiment like this are the "interface" requirements—that is the physical and electrical specifications necessary so that the W.I.A. part, and the DJ4ZC part, and the launch vehicle all fit together so the final package flies and works. Many skeds between the Project Australis Group and AMSAT have been undertaken and much correspondence has been entered into in order to actually finalise the specifications, especially interface specifications.

I mention this to point out that this is not a simple experiment like the previous Oscar 5, but a complex affair needing intense and exact co-ordination across the world. The Federal Executive of the W.I.A. believes that the people engaged at the design and fabrication level had done an outstanding job, but they don't have much time left to report to you, the members of the W.I.A. Any hour spent in writing reports, preparing articles, etc., leaves less time to draw up printed circuit boards or fit large quantities of ICs in confined spaces. As the AMSAT boys require the space hardware about now, the group has concentrated its limited resources of private time on the actual building of the spacecraft package.

My function will be to assist them with what they do not have time to do. I hope to feed information to your State Co-ordinators regularly, to other Amateur Societies, and generally assist in the overall co-ordination.

Of course, I have another function. The W.I.A. is financing this Project. To date about $1,200 has been spent, about $24,000 worth of components has been donated and installed, and we require by the end of March a further $2,000 cash. May I make a personal plea for you as individual members to donate, and for you as members of a Division to direct your Councils to donate as your resources allow to a project which will, I believe, achieve more to raise the status of the W.I.A. and the Amateur Service generally than any other single activity undertaken during the long history of this Institute. I am pleased to have been asked to assist. Will you also please assist?
COUNTER USED FOR FREQUENCY MEASUREMENT

PART ONE—GENERATION OF TIME INTERVALS

ROBERT H. BLACK, M.D., VK2QZ

Frequency is the expression of the number of events occurring per unit of time. A previous article (Black, 1970) described a method of counting the events; the present article describes the generation of accurate time intervals using a 100 KHz crystal oscillator and a series of binary coded decimal frequency dividers. This method of frequency division has been found to be more reliable than one using multivibrators, particularly at pulse intervals of 0.1 sec. and longer.

The diodes and 300 pF capacitors come "free" on the boards, as may some of the resistors. Each decade is built on a particular type of board which had transistors mounted along the side—this saves a certain amount of drilling time. The whole timing unit will cost about $20, power being obtained from a second regulated supply.

Using 083 transistors this circuit will divide appropriate pulses arriving one million times per second and this property is used for frequency division of the input signal when its frequency is greater than, say, one or two hundred thousand (and up to 1 million) times per second. The pulse shaping amplifier and the dividing decade are shown beside the time unit in the photograph (the amplifier being the same as the one following the crystal oscillator except for 3.5 mH RFC in the collector circuits on the transistor side of the 3K resistors). If you want a significant last digit (±1) you can count for 10 seconds.

At the lower frequencies the speed-up capacitors (39 pF.) and recovery diodes (R.D.) should not be necessary.

The final article in this series will describe the method of timing bursts of pulses which are counted and displayed and then counted again and displayed and so on. The whole unit then being a frequency meter which measures frequencies accurately up to 1 MHz.

REFERENCES


There is nothing unusual about the crystal oscillator in which there are two variable capacitors in series with the crystal, one of 100 pF, for coarse and one of a few pF, for fine frequency adjustment using VNG on 4.5, 7.5 or 12 MHz., or WWV as reference.

The oscillator is followed by pulse shaping and amplifying stages. The output consists of negative pulses with a p.r.f. of 100,000/sec. The crystal was obtained by airmail order from U.S. for about $4.50 and was delivered eight days after the order was posted.

The frequency dividing unit consists of a series of six binary coded decimal frequency dividers (Kench, 1967). Outputs having intervals of 1/100, 1/10, 1 and 10 sec. are useful for frequency measurements with the counter described and these are obtained by switching to the appropriate decade. The cost of a decade is calculated as:

8 transistors at 7.5c each .... 60c
25 resistors at 3c each .... 75c
8 39 pF capacitors at 10c ea. 80c

$2.15

The crystal oscillator and amplifier is seen on the left; five frequency dividing decades are to the right of this, and on the right hand side the amplifier and two decades for signal frequency division.
HARMONICS

LECTURE No. 10C

So far we have shown how harmonic distortion will be produced, if an amplitude-modulated waveform is coplanarised whilst in the amplification or transmission of speech or music we aim for the lowest amount of harmonic distortion we can achieve, there are harmonics can be useful, and this lecture was started because of a problem which required use of harmonics.

Reference has already been made of the use of harmonics in a radio transmitter in order to obtain a high frequency from a much more stable lower frequency. Also it sometimes happens, particularly if a self-excited oscillator is used to generate a carrier frequency in a telephony transmitter using amplitude modulation, that there may be feedback through the transmitter and some of the amplitude modulation causes frequency modulation of the oscillator if the oscillator and the modulated stage are on the same frequency. Operating the oscillator at a lower frequency and using one of its harmonics to derive the final frequency is one way of getting over this problem.

Now the plate efficiency of a class C plate modulated amplifier will be considerably higher than 70%. However, in recent years some transmitters have been made having plate efficiencies around 90%.

One manufacturer told the writer that at times it had been found that a transmitter in a series of similar ones was giving appreciably more output, for the same plate input, as the others. Investigation showed, however, that this transmitter was producing more odd-harmonic distortion of its r.f. output than normal.

All designers of radio transmitters, no matter the size or purpose, are faced with the problem of preventing the generation of spurious frequencies, that is, frequencies which are not harmonically related to the fundamental frequency.

A method which assists considerably to prevent spurious or parasitic oscillation is to connect a small radio frequency choke as close as possible to the plate of the valve, electrically between the plate valve and the plate tuned circuit.

The investigation into transmitters having the very high plate efficiency showed that this choke, in the output r.f. amplifier plate circuit, was resonating at one of the odd-order harmonics due to the stray capacitance to ground of the choke, the choke and stray capacitance forming a parallel resonant circuit.

Later it was found that if a parallel resonant circuit was connected in the cathode circuit of the valve and tuned to the same harmonic then with both tuned circuits in operation the plate efficiency of the stage could be as much as 90%, i.e. 90% of the d.c. power fed to the plate of the valve, appeared as useful r.f. power.

Of course the output contained a considerable amount of the harmonic, but this could be reduced to negligible proportions by the use of filters.

Many broadcast transmitters, some with r.f. power outputs as great as 50 kW, are employing this method of the practical use of harmonics. (Usually either the 3rd or 5th.)

The method is not very practical with a series frequency transmitter because of the need to re-adjust the parallel tuned circuits for each frequency, as well as the harmonic filters.

CHECKING CALIBRATION OF MOD. OSCILLATOR

(Also applies for Calibration of Frequency Meter)

Now for the tape recorder. A fault had occurred in the erase-bias oscillator and a number of new components had replaced defective ones. It was most essential to be certain that the oscillator was operating on its nominal frequency, 58 KHz.

No equipment was available to check this directly so it was decided to use harmonics of the oscillator and check these with stations in the medium frequency broadcast band.

Since June 1968, the A.B.C.B. has required all Australian m.f. broadcasting stations to hold frequency within ±10 Hz. of the assigned frequency. Incidentally, the Standard of Reference must be the P.M.G. Standard of Frequency, and it was known that many stations do much better than the permitted tolerance.

For instance, the following are the measured deviations from the assigned frequencies of the four stations of Associated Broadcasting Services Limited, on 23/7/69:

- 3UL—Assigned freq. 530 KHz. deviation, +1.5 Hz.
- 3CS—Assigned freq. 1130 KHz. deviation, -1.2 Hz.
- 3YB—Assigned freq. 1210 KHz. deviation, +4.0 Hz.
- 3SR—Assigned freq. 1260 KHz. deviation, +1.35 Hz.

The manual which accompanied the recorder gave the nominal frequency of the oscillator as 58 KHz. and as 2WV operates on 580 KHz., it appeared to be worthwhile to try and find out if the 10th harmonic of the oscillator would zero-beat with 3WV. The 9th harmonic would fall outside the m.f. broadcast band whilst the 11th, 12th and 13th would not be exactly on the same frequency as any b.c. station. Consequently it was decided to check 3WV could be heard sufficiently strongly to make the trial feasible.

A Palec modulated oscillator type 1, possibly of World War II vintage, was available but its accuracy was unknown quantity so the first thing to do was to check its calibration against b.c. stations so that it could be substituted as a signal source in identifying the 11th, 12th and 13th harmonics of the recorder oscillator.

The overall accuracy of this procedure would be sufficient for our purpose.

A transistorised radio receiver with a ferrite rod aerial was obtained and tuned to 3UL, the modulated oscillator having been switched on for about two hours to warm up thoroughly, was then tuned to the same frequency, getting the best possible zero-beat with 3UL, and the dial reading noted. This was repeated with 3AR, 2CO, 3LO and 3GI.

Careful adjustments to the m.o. trimmer condenser brought the calibration right on the dot with 3GI, whilst adjustment of the iron-cored slug in the m.o. coil former brought the calibration right on 3UL. Actually there was quite a bit of re-adjusting to get both calibrations correct because of some interaction between the adjustments. This modulated oscillator covers the b.c. band in two sections and we were not interested, at this stage, in frequencies outside the band 830 to 530 KHz., our main purpose being to get as many calibration points in between as accurately as possible.

With the m.o. calibration well established, the next step was to search for harmonics of the recorder oscillator.

With the recorder in "Record" and the m.o. tuned well away from 580 KHz., the radio receiver was placed near the recorder oscillator, then carefully tuned around each side of 580 KHz. The receiver was turned around physically so that the directional effect of its ferrite rod aerial would reduce pick-up of 3WV.

The frequencies of all the stations mentioned in this lecture were as stated at the time the lecture was written. However, with the passage of time some station frequencies may change, therefore any Amateur wishing to calibrate equipment by using b.c. stations as frequency references should verify the frequency of each station. Beforehand lists of stations may be obtained from the Australian Broadcasting Control Board, 373 Elizabeth Street, Melbourne, Vic., 300.

* 6 Adrian Street, Colac, Vic., 3250.
Slightly on the low-frequency side of 3WV could be heard a whistle or beat of about 1,000 Hz. Switching the recorder on and off "zeroed" the beat, but did not eliminate it completely, thus identifying an harmonic from the recorder oscillator.

The oscillator coil of this particular recorder was fitted with an adjustable iron-core and slight adjustment of this core enabled the beat to be reduced to zero-beat.

Due to the presence of programme material on 3WV, it was necessary to make final adjustments during short pauses in the programme. Because of metal used in the construction of the building, and some distant pick-up in the receiver wiring, it was not possible to get a complete null in reception of 3WV. Also, it was not practicable to use the modulated oscillator at this stage.

When zero-beat had been accomplished at 580 KHz., we knew that one of the recorder harmonics was at 580 KHz. and although we assumed that it was the 10th harmonic of 58 KHz., the difference between 580 KHz. and although we assumed that it was the 10th harmonic of 58 KHz., we knew that one stage.

Out of curiosity, we located another harmonic. A weak "rushing" noise was identified as an harmonic of the receiver very carefully higher in frequency to try and find the next higher harmonic. A weak "rushing" noise was identified as an harmonic of the receiver very carefully higher in frequency to try and find the next higher harmonic.

The results we got were tabulated as follows:

<table>
<thead>
<tr>
<th>Tuning Frequency</th>
<th>10th Harmonic</th>
<th>11th Harmonic</th>
<th>12th Harmonic</th>
<th>13th Harmonic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>580 KHz.</td>
<td>58 KHz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>638 KHz.</td>
<td>58 KHz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>696 KHz.</td>
<td>58 KHz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>754 KHz.</td>
<td>58 KHz.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As the frequency between successive harmonics was 58 KHz., this meant that the fundamental frequency of the recorder oscillator was 58 KHz., which was what we set out to find.

Later the entire calibration of the modulated oscillator was checked. Its frequency ranges are:

- A: 150 - 335 KHz.
- B: 340 - 870 KHz.
- C: 870 - 2200 KHz.
- D: 1.9 - 5.1 MHz.
- E: 4.9 - 12.1 MHz.
- F: 12.1 - 30.0 MHz.

A receiver was not available which would cover Band A and all of Band B, but one was available which would cover from the lower broadcasting band through to 30 MHz., so some calculations were made to determine the feasibility of using some broadcasting stations as frequency references, then by harmonic techniques checking the calibration of the modulated oscillator.

Band A—Proposal.—Zero-beat harmonics of the m.o. against b.c. stations.

Band B—Proposal.—Zero-beat harmonics or direct against b.c. stations.

Band C—Proposal.—Zero-beat direct at low frequency and against b.c. stations.

However, there are no Australia broadcasting stations operating on 2.2 MHz. and as mentioned it would not be feasible to try and rely on harmonics or direct against b.c. stations, particularly at a distance.

For instance, in August 1969, field strength measurements were made of the harmonic radiation of station 3CS, at 0.9 mile from the centre of the aerial array and in the major lobe (3CS uses a directional aerial). The values were:

- 2nd harmonic:
  - 2260 KHz., 187 micro-volts.
- 3rd harmonic:
  - 3390 KHz., 20 micro-volts

The calculated values for one mile becomes 168.3 and 18 micro-volts respectively and as a result of these low values was 696 KHz. in actual fact.

Out of curiosity, we located another harmonic on approx. 755 KHz. (the 10th harmonic of 75 KHz.) and in the circumstances this was taken to be 696 KHz. in actual fact.

Further checks of the Palec m.o. calibration were made in m.f. broadcast and higher bands by using the signals of 3UL, 3CS, 3YB and 3SR as then-harmonics. As the numerical frequency of the harmonic, care being taken to determine that the Palec m.o. was switched to the correct band and that it was beating directly and not via one of its harmonics.

In all cases the multi-band receiver was used to locate the next harmonic either above or below the desired one to determine that it was the correct numerical one (as outlined earlier while discussing the tape recorder.

Fortunately sufficient harmonic output from the second m.o. was available to identify 30 MHz.

It must be appreciated that all zero-beating was done by ear as it was felt that the measurements were sufficiently accurate and, in any case, equipment to detect the exact zero-beat was not available, also it must be realised that any error in the fundamental is multiplied by the numerical frequency of the harmonic.

However in all cases given, the worst error would not exceed 200 Hz. at 30 MHz. and would more likely be not more than about 40 Hz. at this frequency.

Most of the work was done at night because some of the stations were interstate.

This method may be used for frequency calibration of equipment using other selected broadcast stations, also under some circumstances VNG can be used.

If precision measuring equipment is available VNG will probably be more accurate than either WWV or WWVH since signals from both of these stations are subject to atmospheric ionisation and, hops as well as Doppler effect caused by rotation of the earth).

Here is a tabulation of the frequencies and b.c. stations used in the above project:

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>150 KHz.</td>
<td>3AR</td>
</tr>
<tr>
<td>B</td>
<td>340 KHz.</td>
<td>3LO</td>
</tr>
<tr>
<td>C</td>
<td>754 KHz.</td>
<td>3SR</td>
</tr>
<tr>
<td>D</td>
<td>870 KHz.</td>
<td>3CS</td>
</tr>
<tr>
<td>E</td>
<td>2200 KHz.</td>
<td>3UL</td>
</tr>
<tr>
<td>F</td>
<td>3390 KHz.</td>
<td>3YB</td>
</tr>
</tbody>
</table>

This lecture has shown how harmonics are generated when an electrical signal is multiplied by the fundamental. At low frequency, the 1st harmonic is of little use, but one was available which would cover Band A and all of Band B, but one was available which would cover from the lower broadcasting band through to 30 MHz., so some calculations were made to determine the feasibility of using some broadcasting stations as frequency references, then by harmonic techniques checking the calibration of the modulated oscillator.

<table>
<thead>
<tr>
<th>Harmonic</th>
<th>Frequency</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>3390 KHz.</td>
<td>3UL</td>
</tr>
<tr>
<td>2nd</td>
<td>670 KHz.</td>
<td>3CO</td>
</tr>
<tr>
<td>3rd</td>
<td>1100 KHz.</td>
<td>3ZL</td>
</tr>
</tbody>
</table>

Further checks of the Palec m.o. calibrations were made in m.f. broadcast and higher bands by using the signals of 3UL, 3CS, 3YB and 3SR as their accuracy was known.

This lecture has shown how harmonics are generated when an electrical signal is multiplied by the fundamental. At low frequency, the 1st harmonic is of little use, but one was available which would cover Band A and all of Band B, but one was available which would cover from the lower broadcasting band through to 30 MHz., so some calculations were made to determine the feasibility of using some broadcasting stations as frequency references, then by harmonic techniques checking the calibration of the modulated oscillator.

<table>
<thead>
<tr>
<th>Harmonic</th>
<th>Frequency</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>3390 KHz.</td>
<td>3UL</td>
</tr>
<tr>
<td>2nd</td>
<td>670 KHz.</td>
<td>3CO</td>
</tr>
<tr>
<td>3rd</td>
<td>1100 KHz.</td>
<td>3ZL</td>
</tr>
</tbody>
</table>

AMATEUR FREQUENCIES:

- ONLY THE STRONG GO ON — SO SHOULD A LOT MORE AMATEURS!
Federal Repeater Secretariat Report

1970 has come to an end with several repeaters now on the air. The Secretariat will have a report available early in the new year. This will be sent to known active groups. Anybody else who would like a copy should send a large stamped, self-addressed envelope to the Federal Repeater Secretariat, P.O. Box 342, Crows Nest, N.S.W., 2065. We would also like to receive information from any group as to progress in your area.

ACTIVITIES

Here, briefly, is the activity as we know it:

VK4: Last reports indicated that systems were being tried for both Brisbane and the Gold Coast.

VK2: A channel 4 system is operating in Sydney with good coverage. A channel 4 application is pending for Newcastle. Interest is being shown in a channel 1 system for Gosford. Orange in the Central West is still running their network on 146.1 in and 145.85 MHz. It is expected that the output will be changed to 145.6 at some future time.

VK3: We understand that there is an operational channel 4 system at both Gippisland and Geelong, and a proposed system for Mildura. There appears to be no Melbourne activity and the original Z1 system is off the air.

VK7: No up-to-date report, but there may be some activity in the north of the island.

VK5: We understand that the channel 4 system destined for the slopes of Mt. Lofty is currently being checked out at an Amateur QTH.

VK6: Work is under way for a channel 4 system in Perth which will be installed, after tests on high ground near the t.v. sites. Albany in the south is showing interest in a repeater. It is likely that VK6 will develop a channel 4 network to serve the needs of the State.

The American scene has also been interesting during the past year with the F.C.C. directing a new policy for their repeater operation. Those who have read the American Amateur Radio publications will have seen what has happened. It is to be hoped that it does not occur in this country and we urge all users and developers of repeaters to co-operate with your local repeater co-ordinator and in turn with the Federal body.

If anybody can add to the above report would you please advise the F.R.S. care of the above address.

VK2 have been checking with the F.R.S. on 6 metre f.m. frequencies and have announced that they intend to introduce a local f.m. channel in addition to the national channels of 52.525 MHz. (prime) and 52.656 MHz. (secondary) already in use in that State. The reason is to have available a channel which will be reasonably free from Interstate traffic for emergency/broadcast use at times when either of the national channels are open Interstate. This frequency is 52.7 MHz.

With this allocation in mind, the F.R.S. suggests that similar State channels be introduced to all States. These channels are at 50 KHz. spacing:

VK5 52.6 MHz.
VK6 52.656 MHz. (existing)
VK2 52.7 MHz.
VK7 52.750 MHz.
VK3 52.8 MHz.
VK4 52.850 MHz.

As these are at this stage only suggestions, the F.R.S. would like to hear from users in all areas with their thoughts.

The F.R.S. is also seeking information on the use of 6 metre a.m. nets. To date we have the following information, which we wish to confirm and add to, so that the records may be up dated.

VK6 52.586 MHz.
VK5 53.100 MHz.
VK7 53.035 MHz.
VK3 53.652 MHz.
VK2 53.866 MHz. (Sydney)
VK2 53.982 MHz. (Wollongong)

We would like to know what areas these frequencies are being used and if there are any additional ones.

It is pleasing to note the list of beacons being maintained by Eric VK5LP in his "A.R." column. The Sydney repeater is usually automatically keyed every five minutes with its call sign—VK2BWI—in m.c.w. (145.9 MHz.) The choice of 145 MHz. by VK2XI on Christmas Island is interesting, we would like to hear if it is copied anywhere as the majority of stations on this frequency would be using simplex.

We would like to wish all Amateurs all the best for the New Year and a reminder that if you have any question or problem with the national side of v.h.f. repeater, beacon or net operation, please send your inquiry either direct or through your State’s Federal Councillor to the Federal Repeater Secretariat, who are a sub-committee of Federal Executive. The address of the F.R.S. is P.O. Box 342, Crows Nest, N.S.W., 2065.

HAND-CARVED CALL LETTER PLAQUES

In solid Philippine Monkey Pod Wood. A unique gift for yourself—or others!

Price, parcel post paid, AS9.75 plus local tax of approx. AS4

Allow 3 months for delivery. You pay local tax. Send postal money order or bank draft for AS9.75 to:—

REPUBLIC CRYSTAL LABS

Exporter of Philippine Handicrafts

P.O. Box 46, Makati Comm. Center, D-708, RIZAL, PHILIPPINES

If you need special Plaques with business names or family names, send us a sketch of your needs and we will quote post paid. Cut-out letters of wood for wall painting also available.

Plaque lengths: 5 letters 20"; 6 letters 22"; letters about 5" high; width 8"; thickness 1".

WINNING DIVISIONS OF R.D. TROPHY—1948 TO 1970

1948 1960 1970
VK2 VK7 VK7
1949 VK7 VK1 VK1
1951 VK7 VK1 VK1
1953 VK6 VK5 VK5
1955 VK5 VK5 VK8
1957 VK5 VK5 VK6
1958 VK6 VK6 VK6
1959 VK7 VK7 VK7

ERRATA

The author of the Lecture Series advises of the following errors:—

No. 5, July 1970, p. 15, col. 3, para. 2 and 4: Change word “average” to “effective” (lines 7 and 14).
No. 6, August 1970, p. 22, col. 1: Theorem of Pythagorus should be Hypotenuse² = side a² + side b². Also on page 23, last col.: Change 194.2 watts to 1194.2 watts.
No. 10A, December 1970, p. 13: Postcode for A.B.C.B. is 3000. Col. 3, para 7: “as can a valve rectifier which is wrongly biased . . .” should read “as can a valve amplifier which is wrongly biased . . .” ——

N.Z.A.R.T. SUBSCRIPTION

Please take note that as from this notice the subscription to N.Z.A.R.T. for “Break-In” is increased to $3.00 per annum. It is regretted that prior notice could not be given and any new renewals or new subscriptions will be accepted only at this increased rate.

——

WINNING DIVISIONS OF R.D. TROPHY—1948 TO 1970

1948 1960 1970
VK2 VK7 VK7
1949 VK7 VK1 VK1
1951 VK7 VK1 VK1
1953 VK6 VK5 VK5
1955 VK5 VK5 VK8
1957 VK5 VK5 VK6
1958 VK6 VK6 VK6
1959 VK7 VK7 VK7

Page 8

Amateur Radio, February, 1971
W.I.A. WORKED ALL STATES (AUST.) AWARD

At the last Federal Convention held in Adelaide at Easter it was agreed that the scope of the S.w.l. H.A.-VK-C.A. Award be extended to allow Australian S.w.l.'s to become eligible applicants. The amended rules are given below and any S.w.l. Awards Manager who considers Australian applicants for the award as from the date of publication of these new rules in "Amateur Radio".

In particular, the requirements of Rule 1.2 should be noted. This requires that the applicant S.w.l. must be a member of an affiliated I.A.R.U. International Amateur Radio Union Society for Australian Amateurs, or its successor organizations, and must normally be members of the W.I.A.; for applicants in the time of application the call letters of the R.G.B.S.; for Japanese S.w.l. to be members of J.A.R.L., and so on. This rule will be strictly enforced and Rule 4.4 requires the applicant to state the name of the society of which he is a member.

REQUIREMENTS

2.1 Verification of contacts is the responsibility of the applicant, who must prove having made two-way contact with all Australian call areas. Additional credit will be given for proof of contact with overseas countries, viz. New Zealand and Territories, and areas of the Commonwealth of Australia. Additional credit will be given for proof of contact with overseas countries, viz. New Zealand and Territories, and areas of the Commonwealth of Australia.

1.1 This Award has been created in order to stimulate interest in the v.h.f./u.h.f. bands and is of a high standard to fully acclaim the proficiency of the recipients on their operating activities.

2.2 Contacts must be made on the v.h.f./u.h.f. bands 50-52 MHz, prior to 1/4/46 will count towards the 52 MHz Certificate.

1.3 A certificate of the Award will be issued to those applicants who show proof of having made two-way contact with the specified areas of the Commonwealth of Australia.

2.3 It is possible under these rules for one applicant to receive one Award for each of the Authorised Bands between 30 and 3,600 MHz.

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

REQUIREMENTS

2.1 Contacts must be made on the v.h.f./u.h.f. bands 50-52 MHz, prior to 1/4/46 will count towards the 52 MHz Certificate.

2.2 The commencing date of the award is 1st January, 1946. All loggings made on or after this date may be included.

OPERATION

2.3 It is possible under these rules for one applicant to receive one Award for each of the Authorised Bands between 30 and 3,600 MHz.

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

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 the applicant has made contact with the various call areas as listed in the Appendix. No endorsement will be allowed.

4.2 Each verification submitted must be exactly as received from the station contacted, and may lead to the disqualification of the applicant.

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

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

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

HEARD ALL VK CALL AREAS (H.A.-VK-C.A.) AWARD

At the last Federal Convention held in Adelaide at Easter it was agreed that the scope of the S.w.l. H.A.-VK-C.A. Award be extended to allow Australian S.w.l.'s to become eligible applicants. The amended rules are given below and any S.w.l. Awards Manager who considers Australian applicants for the award as from the date of publication of these new rules in "Amateur Radio".

In particular, the requirements of Rule 1.2 should be noted. This requires that the applicant S.w.l. must be a member of an affiliated I.A.R.U. International Amateur Radio Union Society for Australian Amateurs, or its successor organizations, and must normally be members of the W.I.A.; for applicants in the time of application the call letters of the R.G.B.S.; for Japanese S.w.l. to be members of J.A.R.L., and so on. This rule will be strictly enforced and Rule 4.4 requires the applicant to state the name of the society of which he is a member.

REQUIREMENTS

2.1 Verification of contacts is the responsibility of the applicant, who must prove having made two-way contact with all Australian call areas. Additional credit will be given for proof of contact with overseas countries, viz. New Zealand and Territories, and areas of the Commonwealth of Australia. Additional credit will be given for proof of contact with overseas countries, viz. New Zealand and Territories, and areas of the Commonwealth of Australia.

1.1 This Award has been created in order to stimulate interest in the v.h.f./u.h.f. bands and is of a high standard to fully acclaim the proficiency of the recipients on their operating activities.

2.2 The commencing date of the award is 1st January, 1946. All loggings made on or after this date may be included.

OPERATION

2.3 It is possible under these rules for one applicant to receive one Award for each of the Authorised Bands between 30 and 3,600 MHz.

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

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 the applicant has made contact with the various call areas as listed in the Appendix. No endorsement will be allowed.

4.2 Each verification submitted must be exactly as received from the station contacted, and may lead to the disqualification of the applicant.

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

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

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

HEARD ALL VK CALL AREAS (H.A.-VK-C.A.) AWARD

At the last Federal Convention held in Adelaide at Easter it was agreed that the scope of the S.w.l. H.A.-VK-C.A. Award be extended to allow Australian S.w.l.'s to become eligible applicants. The amended rules are given below and any S.w.l. Awards Manager who considers Australian applicants for the award as from the date of publication of these new rules in "Amateur Radio".

In particular, the requirements of Rule 1.2 should be noted. This requires that the applicant S.w.l. must be a member of an affiliated I.A.R.U. International Amateur Radio Union Society for Australian Amateurs, or its successor organizations, and must normally be members of the W.I.A.; for applicants in the time of application the call letters of the R.G.B.S.; for Japanese S.w.l. to be members of J.A.R.L, and so on. This rule will be strictly enforced and Rule 4.4 requires the applicant to state the name of the society of which he is a member.

REQUIREMENTS

2.1 Verification of contacts is the responsibility of the applicant, who must prove having made two-way contact with all Australian call areas. Additional credit will be given for proof of contact with overseas countries, viz. New Zealand and Territories, and areas of the Commonwealth of Australia. Additional credit will be given for proof of contact with overseas countries, viz. New Zealand and Territories, and areas of the Commonwealth of Australia.

1.1 This Award has been created in order to stimulate interest in the v.h.f./u.h.f. bands and is of a high standard to fully acclaim the proficiency of the recipients on their operating activities.

2.2 The commencing date of the award is 1st January, 1946. All loggings made on or after this date may be included.

OPERATION

2.3 It is possible under these rules for one applicant to receive one Award for each of the Authorised Bands between 30 and 3,600 MHz.

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

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 the applicant has made contact with the various call areas as listed in the Appendix. No endorsement will be allowed.

4.2 Each verification submitted must be exactly as received from the station contacted, and may lead to the disqualification of the applicant.

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

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

4.5 Applications for membership shall be addressed to the W.I.A., P.O. Box 67, East Melbourne, Vic., 3002, accompanied by a check list and sufficient postage enclosed for their return to the applicant, registration being included if desired.
AMATEUR EQUIPMENT AND CUSTOMS DEPT.

We were recently asked to investigate a complaint that the Customs Department had confiscated some Amateur equipment from a migrant to this country. The complaint was made to us by the holder of an Australian licence. Either he was not given the full story or failed to pass it on.

Investigation showed that the migrant did not have a current licence from the country from which he migrated, nor did he have the qualifications to obtain a licence either there or in Australia. There is much more to the story, but we have no desire to embarrass anybody involved, sufficient to say the equipment will not be returned.

Should any of your overseas Amateur friends have thoughts of migrating you can assure them that provided they play by the rules, they will have no trouble.

Briefly, licensed Amateurs may bring commercial gear with them for their own use (and not for sale for a period of 12 months from arrival in Australia) provided the equipment was purchased at least 12 months prior to their departure for Australia, no duty is payable. A receipt must be produced to the Customs Department, showing clearly the date of purchase.

The same provisions apply to ancillary equipment. Home-built equipment is not subject to restrictions.

It must be remembered that an Australian licence must be obtained before the equipment can be used.

F.M. BROADCASTING

The inquiry by the Australian Broadcasting Control Board into the desirability or otherwise of introducing frequency modulation broadcasting into the Commonwealth will be held in Sydney, Melbourne and Adelaide as follows:


Adelaide: On 24th March, 1971, in the Board Room, Australian Broadcasting Control Board, 32 South Terrace, Adelaide, commencing at 10 a.m.

Announcing this, the chairman of the Board, Mr. Myles F. E. Wright, said that all persons who had submitted written statements to the Board in response to the Board's Notification dated 10th June, 1970, would be advised in writing of the time and place at which they would be required to attend the Board's inquiry for the purpose of giving evidence in relation to their written statements.

Mr. Wright added that in response to the Board's invitation for interested persons to give evidence at its inquiry, a total of 39 submissions had been received involving 56 witnesses.

AMATEUR FREQUENCIES:

ONLY THE STRONG GO ON—SO SHOULD A LOT MORE AMATEURS

PREDICTION CHARTS FOR FEBRUARY 1971

(Prediction Charts by courtesy of Ionospheric Prediction Service)
COOK AWARD

R.S.G.B. CERTIFICATES AND AWARDS

As a result of discussion between the British Amateur Radio Teleprinter Group and the Radio Society of Great Britain, the R.S.G.B. have agreed that any of the Certificates and Awards, for which they are responsible, can be endorsed for R.T.T.Y. operations provided that the normal submission of evidence such as QSL cards. A list of Awards follows.

RULES

The following general rules and conditions apply to all Certificates and Awards issued by the Radio Society of Great Britain and should be read in conjunction with the conditions which govern the award of the individual Certificates.

1. R.S.G.B. Certificates and Awards will be issued free of charge to members of the R.S.G.B. R.S.G.B. Certificates will also be issued on payment of a fee of 1/- (35np), or the equivalent in other currency, per Certificate, to non-members of the R.S.G.B. (1/- equals 10 International reply coupons).

2. In the case of transmitting Certificates and Awards, claims must certify in writing that their licensed power was not exceeded in effecting the contacts upon which their claim is based.

3. All claims must be sent to R.S.G.B. headquarters.

4. In the case of transmitting Awards each claimant may submit cards confirming contacts with stations holding R.S.G.B. Certificates, and/or contacts with Amateur Radio stations located in at least 50 of the 50 US states.

5. Contacts with mobile stations (other than ships) located in the British Commonwealth will be accepted, provided the exact location of each station at the time of contact is clearly stated on the evidence submitted.

6. Holders of an R.S.G.B. Certificate or Award are authorized to use the initials of the Call letters of the Certificate or Award.

7. Post-war cards only may be submitted as proof of contact.

8. In the case of transmitting Awards, endorsements for 100 per cent, telegraphy, 100 per cent, telegraphy and 100 per cent, single sideband contacts and/or single band, may be made on the submission of cards clearly confirming the mode or frequency of transmission.

9. Contacts may be made from any location in the same call area, or if no call area exists, and the licence holder being a licensed Radio Amateur who can produce evidence of having made two-way communication with Amateur Radio stations located in at least 50 of the call areas of the British Commonwealth of Nations, and in addition with at least 50 of the same call areas on other Amateur frequency bands. In the case of the 'other' Amateur frequency bands a particular call area may be claimed only once, irrespective of the band on which the call area was worked. The “other” call areas do not have to be the same as those contacted on 14 MHz.

Members of the R.S.G.B. only may claim the CDXC lapel badge at an additional cost of 1/-, 35np or 10 International reply coupons.

BRITISH COMMONWEALTH RADIO TRANSMISSION AWARD (BCRTA)

This Award may be claimed by any licensed Radio Amateur who can produce evidence of having effected two-way communication with Amateur Radio stations located in at least 50 of the call areas of the British Commonwealth of Nations.

WORKED BRITISH COMMONWEALTH CERTIFICATE (WBC)

This Certificate may be claimed by any person not holding an Amateur Radio transmitting licence who submits evidence that he has received signals from Amateur Radio stations located in at least 50 of the call areas of the British Commonwealth of Nations.

I.A.R.U. REGION 1 AWARD

This award may be claimed by any licensed Radio Amateur who can produce evidence of having made contact with communication with Amateur Radio stations located in countries whose national societies are members of the Region 1 Division of the International Amateur Radio Union. This Award shall be issued in two classes: Class 1, for contacting all member countries, and Class 2 for contacting 25 member countries.

DX LISTENERS' CENTURY AWARD (DXLA)

This Award may be claimed by any person not holding an Amateur Radio transmitting licence who submits evidence that he has received signals from stations located in at least 100 of the countries listed in the R.S.G.B. Countries List. Stickers will be available for every 25 additional countries confirmed.

FOUR METRES AND DOWN CERTIFICATES

These Certificates are available to both licensed Amateurs and Listeners, and cover operating achievements in the 20, 14 and 7 MHz bands. A complete set of rules and further information are obtainable from the Society headquarters. The rules listed here-with do not apply to these Awards.

Address all correspondence to R.S.G.B. Honorary Certificates Manager, Radio Society of Great Britain, 35 Doughty St., London, WC1N 2AE.

SUBSCRIPTIONS DUE

All members of the W.I.A. are reminded that annual subscriptions are now due and should be paid promptly to their Divisional Secretary. Non financial members will not receive a copy of "A.R." and back copies may not be available upon request. To preserve continuity of your files of "A.R." please pay your annual subscription now.

SUPPORT PROJECT AUSTRALIS!
LIMITED SUPPLY OF—

GREAT CIRCLE BEARING MAPS

60c Post Free

Printed on heavy paper 20” x 30”, Great Circle Map 16” diameter. Invaluable for all DXers and S.w.l’s. Bearings around circumference allow precise beam headings to be made.

ALL MONEY TO GO TO "W.I.A. PROJECT AUSTRALIS"

Cheques, etc., to W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

Many Maps have been sold and we would like to thank all those people who have made donations over and above the price of the Map.

COMMONWEALTH DX CERTIFICATE (CDXC)

This Award may be claimed by any licensed Radio Amateur who can produce evidence of having made contact with communication with Amateur Radio stations located in at least 50 of the call areas of the British Commonwealth of Nations, and in addition with at least 50 of the same call areas on other Amateur frequency bands. In the case of the 'other' Amateur frequency bands a particular call area may be claimed only once, irrespective of the band on which the call area was worked. The “other” call areas do not have to be the same as those contacted on 14 MHz.

Members of the R.S.G.B. only may claim the CDXC lapel badge at an additional cost of 1/-, 35np or 10 International reply coupons.

BRITISH COMMONWEALTH RADIO TRANSMISSION AWARD (BCRTA)

This Award may be claimed by any licensed Radio Amateur who can produce evidence of having affected two-way communication with Amateur Radio stations located in at least 50 of the call areas of the British Commonwealth of Nations.

WORKED BRITISH COMMONWEALTH CERTIFICATE (WBC)

This Certificate may be claimed by any person not holding an Amateur Radio transmitting licence who submits evidence that he has received signals from Amateur Radio stations located in at least 50 of the call areas of the British Commonwealth of Nations.

I.A.R.U. REGION 1 AWARD

This award may be claimed by any licensed Radio Amateur who can produce evidence of having made contact with communication with Amateur Radio stations located in countries whose national societies are members of the Region 1 Division of the International Amateur Radio Union. This Award shall be issued in two classes: Class 1, for contacting all member countries, and Class 2 for contacting 25 member countries.

DX LISTENERS' CENTURY AWARD (DXLA)

This Award may be claimed by any person not holding an Amateur Radio transmitting licence who submits evidence that he has received signals from stations located in at least 100 of the countries listed in the R.S.G.B. Countries List. Stickers will be available for every 25 additional countries confirmed.

FOUR METRES AND DOWN CERTIFICATES

These Certificates are available to both licensed Amateurs and Listeners, and cover operating achievements in the 20, 14 and 7 MHz bands. A complete set of rules and further information are obtainable from the Society headquarters. The rules listed here-with do not apply to these Awards.

Address all correspondence to R.S.G.B. Honorary Certificates Manager, Radio Society of Great Britain, 35 Doughty St., London, WC1N 2AE.

SUBSCRIPTIONS DUE

All members of the W.I.A. are reminded that annual subscriptions are now due and should be paid promptly to their Divisional Secretary. Non financial members will not receive a copy of "A.R.,” and back copies may not be available upon request. To preserve continuity of your files of “A.R.”, please pay your annual subscription now.
NEW CALL SIGNS

SEPTEMBER 1970

VK1ZAD—J. S. Bland, 15 Abeckett St., Watson, 2602.
VK1ZQR—R. C. Quick, 123 Theodore St., Currajong, 2601.
VK1ZWP—B. W. Pywell, 2 Birbal Place, Waramanga, 2606.
VK1BBZ—E. J. Mulholland, Kapooka Military Camp, Kapooka, 2661.
VK2ZAM—K. B. Trevena, 11 Grey St., Glenbrook, 2773.
VK3AEU—R. J. Flanagan, 51 Valetta St., Canberra, 2601.
VK2ZLF—M. A. Menchin, 21 Maxwell Ave., Waverley, 2602.
VK2ZKJ—G. H. Barnes, 30 Tweed St., Brunkaw, 2661.
VK2ZDL—R. G. Lukin, 4/2 Grosvenor St, Waverley, 2602.
VK2BCH—K. Y. H. Young, 138 Wolli St, Waverley, 2602.

NEW CALL SIGNS

• TWO MECHANICAL FILTERS ENSURE MAXIMUM SELECTIVITY.
• 2 MICROVOLTS SENSITIVITY FOR 10 DB S/N RATIO.
• "S" METER AND B.F.D.

Mains and specifications on Trio equipment

COMMUNICATIONS RECEIVER

PRICE: FOR/FOA SYDNEY: $178.50

TRIO 58DS

Western electronics

(A unit of Jemmy Mitchell Holdings Ltd)

376 EASTERN VALLEY WAY, ROSEVILLE, 2050.
Cables and Telegraphic Address: WESTELECT, Sydney. Phone: 49 1212

Please forward for illustrated literature and specifications on Trio equipment.

Name

Address

OBITUARY

ROY D. NICHOLLS, VK7RN

We regret to report the sudden passing of Roy D. Nicholls, VK7RN, in early November at Burnie.

Roy commenced his career as an apprentice radio fitter, then took up aerial contracts, frequently serving four years in Army Signals over the war years. He spent a short time with the P.M.G. before going to the A.F.F. paper mills at Burnie where he was engaged in electronics for 17 years. For the past few years Roy conducted his own business in t.v. and electrical servicing and p.a. service.

Roy was an active member of the local School, Ewasse, Ewass, and to his wife and family we extend our sincere sympathy.
 Probably the best day in VK3 was 28th Dec.,
towards the end of the season and one
I look forward to anyway. So many sig-

Jake from JA3XPO now only leaves a
several stations to work him. Charlie operates
VK32MZ, VK35L, V. M. of. B. You can
of several others for I got quite a kick out of listening to
VK35L and VK35KZ, and that the band was wide open to VK4. Despite
several calls to Colin, I could not latch on to his
activity and the band was not there when the beam was工作总结.

With quite a good lot of 6 metre DX around
for the last couple of weeks of 1970, many
should have had an excellent opportunity
for some interesting signals and good
signs for the Cook Award, v.h.f. section. As
there were a number of hams working over in
Australia trying to get this section added, it is hoped as
many members as possible will be submitting a log and
claiming the award. Although
you have until the end of 1971 to
work him, I don't think you do it
or you will certainly forget.

On the 2 metre scene, there has certainly
not been any sign of stagnation. Probably the
interesting finding for this month's best goes to
Garry VK3ZKZ, ever vigilant as usual, for his contact
with Bernie VK6KJ in Albany on 2 metres on
15th December. Garry goes about things
the hard way and the list of events runs something like
this: On 21st Dec., 2100 hours, VK6KJ worked over on
144.500 MHz, about 2300, strength rising to
9 S9 with 5 watts output. On 22nd Dec., VK6KJ
flaunted him to 2 metres, culminating in
a 20 over 9 contact with VK5ZJ, VK2AA, VK3AA,
rising to 5 X 7, lasting 15 minutes, after which
signals faded down. John VK5ZJ listened in on
this contact but by the time Garry had
finished his exciting DX, Garry had
feared it too soon.

Tony VK53DY, at Strirling in the Mt. Lofty
Ranges, in number 1 DX position on VK5,
has been having a ball with DX. On 21st Dec.,
he got quite a kick out of listening to Colin
VK5QZ at Mt. Cowley on 2m. On 22nd, Tony flew
an aircraft and got some excellent reports
to VK5ZWW from their portable site at Mt.
Olympus on Eyre Peninsula during Christmas
Day. Another good DX contact was with Bob VK3AOT
in Melbourne and other places. Tony's 2m.
and higher log entries must now be making
interesting reading. He's certainly exploiting
his choice locality.

Bob VK3AOT has sent in quite a lot of
information concerning his portable activity, and
luckily for VK5, the reports were
enough to produce the following 144 MHz signals
from Bob's log:

VK3AOT worked KO4 340 miles in the
morning of the 27th saw conditions
very much like this. First he heard VK6VE, the beacon
at Mt. Cowley was away from his location on
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.

The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
2200 hours on 52.150 MHz. Identification in the
form of voice announcement runs continu-
ously. The transmitter is a modified Pye Mk.
The gradual decline in conditions has been noted worldwide. The vast amount of solid DX which has been apparent on the 20 metre band has dropped, but as QRM has increased, many operators still provide much good DX and as a listener you must be aware of the presence of RFI, etc. during the day and at night, for I am sure that the air I would not be so anxious to compete with the QRM down there. The prospects for the current season on 160 metres, both modes, using GM prefixes, for administrative purposes, it has been approved for DX credit. LG5LG from Rockall Is. might have exactly Pacific, but close enough is HS0ISB, DX Old Timers’ Club (DXOTC) address as published in the Long Is. Bulletin. John Horsky, Krajlnska, 3029, Piestany. OK3HM, J. Horsky, Krajlnska, 3029, Piestany. OK3HM, J. Horsky, Krajlnska, 3029, Piestany.

[Continued from the previous page]
Correspondence

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

DO YOU PLAY CHESS?

Editor "A.R."

Dear Sir,

I was recently asked to form a team for a recent QSO with LU2EB. I received a letter from him, asking whether I would play chess with him by correspondence.

As I am not a chess player, I was not able to renounce the game. It is not in my power to oblige him. It has occurred to me, however, that there may be some radio amateurs in this country to whom this would be of considerable interest.

He is able to write in English, and his full address is:

Calle 19, No. 768, Mercedes (B.A.), Argentina.

His signal into Australia on 7 MHz. is a good one. Perhaps this letter will help to achieve what he desires.

-N. A. Loffman, VK2APL

NOVICE LICENSING

Editor "A.R." Dear Sir,

The N.S.W. Divisional Council has been requested to consider and to make recommendations on the subject of Novice Licensing. At the 1970 Federal Convention, a matter of this form of licensing was raised and discussed and it was then felt that a deadlock resulted, Tasmania, Queensland and Victoria voting against, and New South Wales and South Australia and Western Australia voting in favour of the introduction of Novice Licences. However, the matter has not been permitted to lapse entirely, and F.E. wishes to have a more definite statement with arguments FOR and AGAINST this licence. Further discussion may be discussed further at the 1971 Easter Convention.

As your readers are aware, the subject has been ventilated in the pages of "Amateur Radio" and elsewhere, so various arguments are available for the new committee's consideration. However, it is felt that the amateurs who have definite opinions pro or contra Novice Licensing should have the opportunity to express their opinions and to submit rational arguments to support them. Accordingly, I should be very grateful to any Institute members who would be willing to submit their ideas in writing—no matter how roughly presented. The committee would not be interested in anything but would be able to accept reasoned arguments, which would be used and quoted in the projected submission.

Especially we would be interested in information gained by amateur operators who make use of Novices in Japan, U.S.S.R., Israel, and other countries where low-level licensing exists. The opinions of DX operators in these areas are sought regarding the value of Novice Licensing, its contribution to the development of Amateur Radio in those countries, the difficulties which may have been experienced, and which novice operators, the proportion of Novices who progress to Full licence standard, the operating standards of such operators, the extent to which undue interference is caused to other Amateurs and other services, problems caused in t.w.i. and b.c.i. by Novice operators; in short, we can use any relevant information which will be useful in assessing the need for such a system in Australia.

Various Institute members have visited other countries and have obtained evidence of Novice activities. Any valid opinions would be useful if based upon observation and/or discussion with responsible members of the Amateur movements with constructive ideas and the capacity to make intelligent assessments.

It is felt that useful information could be gained from amateurs who are or are now engaged in instruction of A.O.C.P. students. Some Divisions conduct A.O.C.P. courses for evening students and by correspondence and/or discussion with responsible members of the Amateur movements with constructive ideas and the capacity to make intelligent assessments.

It has occurred to me, however, that there may be some radio amateurs in this country to whom this would be of considerable interest.

He is able to write in English, and his full address is:

Calle 19, No. 768, Mercedes (B.A.), Argentina.

He is able to write in English, and his full address is:

Calle 19, No. 768, Mercedes (B.A.), Argentina.

Please give this matter some thought and discussion and submit your suggestions and ideas as soon as possible.

-R. C. Black, VK2YA.

V.K. ELECTRONICS

63 HAROLD ST., DIANELLA, W.A., 6062

Service to Transceivers, Receivers, Transmitters, Antennae, etc.

Phone 76-2319

REPAIRS TO RECEIVERS, TRANSMITTERS

Constructing and testing: xtal conv., any frequency; Q5-ers, R9-ers, and transistorised equipment.

ECCLESTON ELECTRONICS

146a Gotham Rd., Kew, Vic. Ph. 80-3777

AMATEUR RADIO, FEBRUARY, 1971

SILENT KEYS

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

VK2ALX—Don Kirby.

VK2ANF—John Miller.

VK7RN—Roy D. Nicholas

FOR SALE:

F200 Transceiver complete with FT200 head, Kenwood A/C/mike, all cables, speakers and instructions. Purchased new 1970 and in mint condition. The unit is in top O.K. condition. Phone 45-2536, Business 49-1017.

FOR SALE:

Gated Compression Amplifier (model GC1) and Sideband Slicer with O Multiplier Units. Connect to any frequency, small size, complete with proprietary university. Phone 752245, P.O. Box 117, Nurriakula, Vic., 3636.

FOR SALE:

Heathkit OS-2, 3 inch oscilloscope, little used; SSB, CW, 500 kHz to 50 MHz. $225; 200 mA, and 12V; $15. New boxed Eddystone 888 dial; $10. Model 40 Acometer, carrying case, leads, probe, G. Box 751, Roseville, N.S.W. 2137, Phone 17-D. wired for A/C mains, 10; G2D2AF SSB TX, $165; Eddystone 888 dial, $20; Speaker, $5. SSB VOX/BU CKW, separate heavy duty A/C F.U., alt mic, professionally constructed but alignment not completed, some OSOS made, less than component value, $100 o.n.o.; re-built SV24 Rx, modern valves used throughout, completed, working except local osc., range 400 KHz to 80 MHz. $150. Harvey Wells Bandmaster, mechanical SS filter, also alignment, what offers? Eddystone 650, S meter built-in, what offer? B.F.M, 300. Contacts 28BF, S.7 Blaxland Rd., Eastwood, N.S.W., 2122. Tel: (A.H.) 852403.

FOR SALE:

Star SR50 Rx, Ham bands only, incl. 6m. double conv. all modes, as new, $120 or exchange for gen. cover Rd. Please write A. Reb, 101 Wilson St., North Carlton, Vic., 3054.

SSB Transmitter in 6 ft. enclosed rack. Antenna relay at top, underneath the final stage. 2 parallel KC250Bs at greater than 200 watts carrier output. 100 m. driver fed by SAG Amplifier using third mixer. All three balanced mixers are 1817L, fitted at 100 KHz uses 13 high Q tuned circuits. First mixer with crystal oscillator, switches sidesides within the range +50 kHz. Second mixer with VFO, covers 500 KHz. Third mixer BFO, 500 KHz. All mixers are high level LM 2208, available. Built in dummy load produces final frequency. Transmitter can operate on any band, plug-in coils are used. Coils included for 20 and 80 metres. Phone 82-3020 or 751-1281.

WANTED:


WANTED: Yaesu FL50 transmitter, also FL50 Receiver, complete with manual, clock, prices, etc. Contact C. Gibson, VK3FO, Main St., Maldon, Vic., 3463. Phone 752245.

WANTED: Yaesu Musen SSB Transmitter FL200B, FL2400 or FL100B, contact K. Jewell, W3KPH, 1 Armstrong St., Beaumaris, Vic., 3193. Write or phone evenings (03) 933 6487, day (03) 67441 43 ext 45.
BRIGHT STAR CRYSTALS
For Accuracy, Stability, Activity and Output

SPECIAL OFFER—
Standard Amateur Crystals
Style HC6U Holder, Frequency Range 6 to 15 MHz.
0.01% $4.25
0.005% $5.50
Prices Include Sales Tax and Postage

Commercial Crystals
In HC6U Holder, 0.005% Tolerance, Frequency Range 6 to 15 MHz.
$6.00 plus Sales Tax and Postage

Write for list of other tolerances and frequencies available.

BRIGHT STAR CRYSTALS PTY. LTD.
LOT 6, EILEEN ROAD, CLAYTON, VIC., 3168 Phone 546-5076

With the co-operation of our overseas associates our crystal manufacturing methods are the latest

"WILLIS" AIR-WOUND INDUCTANCES
Take the hard work out of Coil Winding, use — "WILLIS" AIR-WOUND INDUCTANCES

<table>
<thead>
<tr>
<th>Turns</th>
<th>Dia.</th>
<th>Per L'gth</th>
<th>B. &amp; W.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-08</td>
<td>½</td>
<td>8 3</td>
<td>No. 3002</td>
<td>75c</td>
</tr>
<tr>
<td>1-16</td>
<td>⅞</td>
<td>8 3</td>
<td>No. 3002</td>
<td>75c</td>
</tr>
<tr>
<td>2-08</td>
<td>⅝</td>
<td>8 3</td>
<td>No. 3006</td>
<td>88c</td>
</tr>
<tr>
<td>2-16</td>
<td>⅞</td>
<td>8 3</td>
<td>No. 3007</td>
<td>88c</td>
</tr>
<tr>
<td>3-08</td>
<td>¾</td>
<td>8 3</td>
<td>No. 3010</td>
<td>$1.06</td>
</tr>
<tr>
<td>3-16</td>
<td>¾</td>
<td>8 3</td>
<td>No. 3011</td>
<td>$1.06</td>
</tr>
<tr>
<td>4-08</td>
<td>1</td>
<td>8 3</td>
<td>No. 3014</td>
<td>$1.19</td>
</tr>
<tr>
<td>0-16</td>
<td>1</td>
<td>8 3</td>
<td>No. 3015</td>
<td>$1.19</td>
</tr>
<tr>
<td>5-08</td>
<td>1½</td>
<td>8 4</td>
<td>No. 3018</td>
<td>$1.32</td>
</tr>
<tr>
<td>5-16</td>
<td>3½</td>
<td>8 4</td>
<td>No. 3019</td>
<td>$1.32</td>
</tr>
<tr>
<td>8-10</td>
<td>2</td>
<td>10 4</td>
<td>No. 3907</td>
<td>$1.91</td>
</tr>
</tbody>
</table>

Special Antenna All-Band Tuner Inductance
(equivalent to B. & W. No. 3907 7 inch)
7" length, 2" diams., 10 turns/inch,
Price $3.30

"OST," March, 1959;

WILLIAM WILLIS & CO.
PTY. LTD.
Manufacturers and Importers
77 CANTERBURY RD., CANTERBURY
VIC., 3126 Phone 836-0707

ANNOUNCEMENT

The fabulous "FRONTIER ELECTRONICS" range of SSB-CW-AM Transceivers, Linear Amplifiers, and associated equipment

This Company is pleased to announce that we will be distributing this fine range of equipment throughout Australia commencing February.

These Transceivers are of modular construction using FETs and ICs throughout, with the exception of final amplifiers. They are fitted with every extra facility as standard, built-in VOX, noise blanker, power supplies, and in the "Digital 500" model even a nixie display tube digital frequency meter, giving an accurate freq. readout at all times. Power is 580 watts PEP input, and the transceivers are neat, attractive and well engineered. A full range of accessories will also be available.

★ MODEL "SUPER 1200GT" TRANSCEIVER, 580 Watts PEP .... .... .... $525
★ MODEL "SUPER DIGITAL 500" TRANSCEIVER, 580 Watts PEP .... .... .... $625
★ MODEL "SUPER 3500LA" LINEAR AMPLIFIER .... .... .... .... $325

Write us for fuller information. Prices quoted are tentative and include sales tax. Watch for further information in "A.R."

W.F.S. ELECTRONIC SUPPLY CO.
12 BOWDEN STREET, NORTH PARRAMATTA, N.S.W., 2151. Phone 630-1621
also SWAN SERVICE CO., 14 GLEBE STREET, EDGECLIFFE, N.S.W. Phone 32-5465

Page 16
Amateur Radio, February, 1971
Do away with the heavy, "closed-in" feel of conventional headphones. The sensational new OPEN-AIRE HD-414 headphones by Sennheiser offer an entirely new approach to high-fidelity listening. They deliver their sound not only directly through the earpieces, but also through the air around you...immersing you in sound that is breathtakingly real.

Experience the "natural" sound of Sennheiser! Surround yourself with beautifully life-like timbre and lustre, without losing touch with the world. Who said you have to be isolated from family and friends while listening? Frequency range 20-20,000 Hz.

- Unique "open-acoustics" design lets you hear through...and beyond...the earphones. • Light-as-a-feather foam ear cushions replace heavy, air-tight seals for unprecedented user comfort. • True-fidelity reproduction from 20 to 20,000 Hz. • Connects directly to either high or low impedance outputs. • Professional quality for only $16.65 plus sales tax $4.58, post free.

the OPEN-AIRE HD-414 HEADPHONE by SENNHEISER

ex stock from
WHOLESALE OR...
RAPAR ...

V.T. VOLTMETER

Model MV-21 is a general purpose Vacuum Tube Voltmeter which will measure AC and DC voltages, resistance and decibels.

Trade Price $53 plus 15% S.T.

SPECIFICATIONS

Measuring Ranges:

<table>
<thead>
<tr>
<th></th>
<th>DC Volts:</th>
<th>AC Volts:</th>
<th>Resistance:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 to 1.5, 5, 15, 50, 150 and 1,500V.</td>
<td>0 to 1.5, 5, 15, 50, 150, 500, 1,500V. r.m.s.</td>
<td>At Centre Scale—</td>
</tr>
<tr>
<td></td>
<td>0 to 14, 42, 140, 420, 1,400 and 4,200V. p-p.</td>
<td>0 to 1.5, 5, 15 and 30V. r.m.s. in R.F.</td>
<td>10, 100, 1K, 10K, 100K, 1M and 10M Ohms.</td>
</tr>
</tbody>
</table>

Power Level: —20 to 250 D.B.M. in two ranges.

Accuracy:

|        | DC Volts: Better than ±3% of rated value. | AC Volts: ±3% | Resistance: ±3% of centre scale value. |
|        | D.B.M.: ±4% d.b.m. at 0 d.b.m. |

Input Impedance:

DC Volt Ranges: 11 megohms + 3 pF. in parallel.
AC Volt Ranges: 5 megohms + 70 pF. in parallel.*
or 5 megohms + 25 pF. in parallel.†
or 1 megohm + 4 pF. in parallel.‡

Input Impedance:

R.M.S. and P.-P. Range and used with Multiprobe.
† On R.M.S. and P.-P. Range and direct coupling.
‡ On R.F. Range and used with Multiprobe.

Frequency Response:

R.M.S. .... 20 Hz. to 5 MHz. within ±1 db.
P.-P. .... 20 Hz. to 5 MHz. within ±1 db.
R.F. .... 5 KHz. to 200 MHz. within ±1 db.

Dimensions and Weight:

10¼" × 5½" × 4-5/16"
5.5 lbs. approx.
CRYS1ALS

CITIZENS BAND and MODEL RADIO CONTROL

FREQUENCY CRYSTALS

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC18 Miniature</td>
<td>26.95 MHz to 27.240 MHz</td>
<td>$3.30 each</td>
</tr>
</tbody>
</table>

SOLID STATE STEREO AMPLIFIER

8 watts r.m.s. per channel, input for magnetic, crystal and ceramic type microphone. P.V. cartridges, tape recordor input and output, tuner input, stereo headphone jack.

Reduced to $5.00. Postage $1.20.

FIVE-CORE CABLE

5 x 5/0076. Ideal for Intercoms. Telephones, etc.

New 100 yd. rolls, $17 (postage 75c), or 20 yd. rolls, $5.75. Postage 50c.

STEREO HEADPHONES

Professional quality (well known brand). Large earpads, standard stereo plug, 6 ft. lead.

Price $7.75. Postage 50c.

INSTRUMENT CASE

Sloping front panel. Plastic case, metal front panel, 7¼ x 4½ x 5 inches. Suitable for radio, test equipment, projects, etc.

Price $3.50 inc. tax. Postage 10c.

AUTO CAR AERIALS

Hirschmann, type 300N, side mounting, new. Price $4.50. Postage 50c.

DE LUXE 150 PROJECT KIT

Using integrated circuit, in hardwearing case, contains all parts for 150 different projects. Inc. IC, diode and transistor radios, electronic switches, relays, alarms, test equipment, etc. Good value.

Price $22.50. Postage 75c.

CRYSTAL CALIBRATOR No. 10

Nominal range: 500 KHz to 10 MHz. 500 KHz, 10-500 KHz, 1-10 MHz. 500 KHz. Provides heterodyne output in steps of 1 MHz. Dial driven by machine cut strip gears. Calibrated in 2 KHz. div. Easily read to 250 cycles. Output "spiked" approx. 1 sec. intervals, identifies beat note. Power requirements: 12v. DC at 0.3 amp., 250 volts at 15 mA. This is a precision instrument. Complete with crystal.

Price $23.50.

MICROPHONE CABLE

Type 15P1/24, E3746, 1/16 inch diameter.

Price 15c yard, or 100 yds. $14.00.

STEP-DOWN TRANSFORMERS

Type 5500—240 volts to 115 volts, 20 watts $12.00

Type 5750—240 volts to 115 volts, 40 watts $12.50

Type 2164—240 volts to 115 volts, 100 watts $16.30

Type 2160—240 volts to 115 volts, 250 watts $22.00

Postage $1.00.

TRANSISTORS AND DIODES

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC71</td>
<td>75c</td>
</tr>
<tr>
<td>OC94</td>
<td>90c</td>
</tr>
<tr>
<td>OC45</td>
<td>90c</td>
</tr>
<tr>
<td>AC125</td>
<td>80c</td>
</tr>
<tr>
<td>AC128</td>
<td>80c</td>
</tr>
<tr>
<td>BA100</td>
<td>30c</td>
</tr>
<tr>
<td>AO61</td>
<td>20c</td>
</tr>
</tbody>
</table>

SOLDERING IRONS

Long Nose—2 pin American type. Price $2.50.

Model 100—2 pin American type. Price $3.50.

Telescopic—2 pin American type. Price $4.50.

5506—240 volts to 115 volts, 20 watts $12.00.

Type 5166—240 volts to 115 volts, 100 watts $16.30.

Type 2160—240 volts to 115 volts, 250 watts $22.00.

Postage $1.00.

SOLDERING IRON TRANSFORMER

240 volts/33 Volts, 100 V.A. 

Price $6.40

Postage 40c.

A.C. ADAPTOR—BATTERY SAVER

Type PS54—240 volts to 6 or 9 volts, 300 mA $12.50

Type PS62—240 volts to 6 or 9 volts, 100 mA $8.50

Postage 30c.

WIRE WOUND POTENTIOMETERS

50 watts, 200 ohms. Price $3.00.

HAM RADIO SUPPLIERS

323 ELIZABETH STREET, MELBOURNE, VIC., 3000

Phones: 67-7329, 67-4286 All Mail to be addressed to above address

Our Disposals Store at 104 HIGHETT ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 10.30 a.m. to 5.0 p.m., and on Saturdays to midday.

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.
CONTENTS

Technical Articles:

A Transistorised Carphone, Part One—The Receiver ... 5
Australis-Oscar 5 Spacecraft Performance ... ... ... 9
Counter used for Frequency Measurement, Part Two—
Gating, Display Time, Reset ... ... ... ... ... ... ... 13
Modification to the Mute Circuit of the Pye Mk. 2 ... ... ... 8
Power in A.C. Circuits—Lecture No. 8A ... ... ... ... ... ... ... 16
Solid State Conversion of the G.D.O. ... ... ... ... ... ... ... 14

General:

Canberra Radio Society—Easter Convention ... ... ... ... ... ... 22
Cook Bi-Centenary Award ... ... ... ... ... ... ... ... ... ... ... ... 23
DX ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 21
Federal Comment—Members ... ... ... ... ... ... ... ... ... ... ... ... 4
Licensed Amateurs in VK ... ... ... ... ... ... ... ... ... ... ... ... ... 7
New Call Signs ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 7
Overseas Magazine Review ... ... ... ... ... ... ... ... ... ... ... ... ... 19
VHF ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 20
W.G.A. 21 Award ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 22
W.I.A. V.H.F.C.C. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 23
W.I.A. 52 MHz. W.A.S. Award ... ... ... ... ... ... ... ... ... ... ... ... ... 23
Worked All Britain Contests 1971 ... ... ... ... ... ... ... ... ... ... 22

Contests:

Contest Calendar ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 22
"CO" W.W. W.P.X. S.S.B. Contest, 1971 ... ... ... ... ... ... ... ... ... ... 12

COVER STORY

Pictured on our front cover this month is a 'Rapar' V.T.V.M., one of many pieces of test equipment designed for amateur and commercial use, that is available from Radio Parts, Melbourne.
A full range of high stability close tolerance crystals especially made for Amateur use is now available.

These crystals are made on the same equipment, with the same care, and subjected to the same exacting tests as those manufactured by us for Military and Industrial applications.

100 KHz., 0.02%
Style QC13/X holder .... $9.00

300 to 500 KHz., 0.02%
Style QC6/C (D) holder $6.50

1000 KHz., 0.01%
Style QC6/A (D) holder $8.00

2 to 20 MHz., 0.005%
Style QC6/A (D) holder $4.30

20 to 60 MHz., 0.005%
Style QC6/A3 (D) holder $4.85

60 to 100 MHz., 0.005%
Style QC6/A5 (D) holder $5.40

Other frequencies and tolerances can be quoted for on request—send for technical brochure.

Postage/Packing:
Victoria 20c, other States 30c

The above prices are Nett Amateur to which should be added Sales Tax if applicable at the rate of 27½% for Receiver use, or 15% for Transmitter or Transceiver use.

Hy-Q Electronics Pty. Ltd.
10-12 Rosella Street, Frankston, Vic., 3199
P.O. Box 256
Telephone 783-9611, Area Code 03.
BAIL ELECTRONIC SERVICES

for your amateur station requirements

YAESU SSB Transmitters, Receivers, Transceivers, and Linears
HY-GAIN HF and VHF Antennas, Beams, and Mobile Whips

NOTE! NEW YAESU TRANSCEIVERS:
• FT-200, latest model has provision for use of an external VFO.
• FTDX-560, similar to FTDX-400, as produced for the U.S.A. market.
• FT-101, latest transistorised transceiver.

All sets pre-sale checked and covered by our 90-day warranty.

BEAM ROTATORS — CO-AX. SWITCHES — ELECTRONIC KEYERS — PTT MICROPHONES
24-HOUR DIGITAL CLOCKS — CO-AX. CABLE — SWR METERS — LOW-PASS FILTERS
HEATHKIT AMATEUR EQUIPMENT (Vic. only) — CO-AX. PLUGS — YAESU VALVES & SPARES, etc.

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 67-1650 (AH 37-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

WAYNE COMMUNICATION ELECTRONICS
Catering specially for the Amateur with Components, Receivers, Transmitters, Test Equipment. Everything from Resistors to 100 MHz. Frequency Counters

ALL AT UNBEATABLE PRICES

TRANSFORMERS: 14 volt 5 amp. .. $5.00
22 volt 4 amp. .. $5.00
17 volt 2 amp. .. $3.20

CHOKES: 20H 250 mA. .. $1.00
20H 150 mA. .. $1.00
20H 100 mA. .. $1.00
60H 80 mA. .. $1.00

CO-AXIAL CABLE: RG217/U 50 ohm, 1.4 dB. loss per 100 ft. at 100 MHz., 5.5 dB. loss per 100 ft. at 1 GHz. Ideal for 432 MHz. 30c per yd.

A.W.A. AUDIO OSCILLATOR, Type A57321, 20 Hz. to 20 KHz. Output: 600 ohm bal. or unbal, also high impedance. Calibrated output meter. $50.00.

SWITCHES: 18-position, 1-pole, 3-bank rotary. New. $1.50 each.

SIEMENS RELAYS: Plug-in type with base. 1250 ohm coil. Four sets of change-over contacts. $2.50 each.

Come and inspect the full range of equipment and components at

WAYNE COMMUNICATION ELECTRONICS
757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122 Phone 81-2818
In recent months I have attended a number of meetings of Amateurs in various parts of Australia. I have usually been asked to speak on the present activities of our Federal body and in doing this I have referred to many of the difficulties that presently face us. One topic that has very often given rise to quite spirited discussion is whether or not we should be able to look to a significant increase in our membership and, if so, how this can be achieved.

You may recall that in the Federal Executive’s report submitted to the last Federal Convention, a table was published showing the number of members as against the number of licensees in each State. As we have not yet received the membership figures from all of the Divisions as at 30th December, 1970, we as yet have been unable to up-date that table. However, this will be included in the Federal Executive report to be submitted to the next Federal Convention which will be held in Brisbane at Easter this year.

Australia-wide, as at 30th December, 1969, 54% of all licensees were members of the Institute. It is this figure that generally gives rise to extensive discussion. Of course, this figure must be treated with some caution. There are a certain number of people who retain their licence for many years but are in no way active. These people may have developed other interests or may retain the call sign allocated to them for sentimental reasons. It is, I think, probably unreal to expect a 100% membership; the really difficult question is to determine what is a realistic percentage of licensees that the Institute can expect to be members. We know, for example, that the Radio Society of Great Britain has a membership of approximately 65%.

I would suggest that a 75% membership or even an 80% membership should be attainable. This figure would take into account all of those licensees who are really no longer interested, in a long term sense, in the hobby.

I do not think that we should disregard those who have temporarily other interests. If someone is contemplating coming back to the hobby, then he probably will have sufficient interest to remain or become a member.

The discussions I have heard on this topic have produced a number of suggested reasons as to why people are not members. It is worthwhile considering some of these suggestions as the reasons, if valid, may provide solutions.

There are, of course, some people who are “anti-Institute”, either because of some incident in the past or because they do not know enough about the Institute and are proceeding on the basis of their own assumptions as to what the Institute is all about. There are, it is suggested, many people who are not members because, whilst not being “anti-Institute”, they just did not know enough about what it is doing. Then, there are those people who are not members simply because they feel that the Institute cannot offer them anything worthwhile to justify their being members.

In a way, people falling into these various categories have something in common—a lack of knowledge of the fundamental role of the Institute to represent the Amateur Service. Perhaps even if the Institute offered nothing more than an effective medium to defend Amateur frequencies, many of these people would be prepared to become members.

But is it important that we seek more members? More and more of the Institute’s resources and, therefore, its funds, are being directed to the representation and the defence of the position of Radio Amateurs. Our involvement in the I.A.R.U. Region 3 Association—which takes 20c per annum from each member’s subscription—is because the Federal Council sees the importance of the attitudes of other administrations to the Amateur Service when questions of frequency allocation and regulation arise at an International level.

More and more, the Federal Executive is called upon to prepare detailed submissions in support of its position in its discussions with the Central Administration of the Postmaster-General’s Department.

What results can the Institute show for which it is doing? I can now state that the proposals of the Australian Administration to the World Administrative Radio Conference Relating to Space Communications, which will commence in Geneva in June this year, contain no proposal that affects either directly or consequently any Amateur frequency below 20 GHz.

In addition, the Australian Administration has adopted almost in toto the Wireless Institute’s submissions in relation to the use of space by the Amateur Service and these proposals now form part of the Australian proposal.

If the Wireless Institute of Australia is successful in retaining, against pressure, any new privilege, this is to the benefit of not only our members but for the benefit of all Amateurs. To put it even more succinctly, Amateurs who take the benefit of what the Institute does, but do not, by being non-members, share the cost, make the cost greater for those who are members.

These facts have been highlighted by many of the discussions I have heard on this topic.

Usually the discussion has then turned to membership drives and other means of attracting new members. There are various things that can be done at a Divisional level though I believe that the best salesmen for membership are, in fact, the existing members. If each member made it his business to seek one new member in the forthcoming year, I am sure that we could see a significant change in our membership pattern, particularly in the three States of Queensland (in terms of size), New South Wales and Victoria, where the percentage of licensees as members is smallest.

There are, of course, other areas of the Institute’s activities that can be improved and which will, if they are improved, make membership more attractive. For example, any improvement in this magazine should make the direct tangible benefits of membership more attractive. Have you any ideas? Let’s hear them—perhaps write a letter to the Editor.

In the last resort though, it is our own enthusiasm as members that will attract more members. This magazine only goes to members, therefore it is going only to those people who already support the organisation. Can you support it now by finding another member?

MICHAEL J. OWEN, VK3KI, Federal President, W.I.A.
A Transistorised Carphone

PART ONE—THE RECEIVER

By L. B. JENKINS,† VK3ZBJ, and H. L. HEPBURN,† VK3AFQ

To a greater or less extent most readers will be aware that the engineering team working on the Australis Oscar project must, of necessity, be examining, selecting and using fairly advanced techniques. This and subsequent articles will attempt to show how some of the Australis work has been utilised to produce a fully transistorised f.m. carphone for the two metre nets.

INTRODUCTION

This article will describe the receiver portion of the complete transceiver and will be followed by a second article on the transmitter.

Fig. 1 gives the block schematic of the unit, whilst Figs. 2 and 3 give the appropriate circuit diagrams.

In the electrical design two i.f.'s were used. The first i.f. is on 10.7 MHz. to allow use of freely available filters on this frequency and to be high enough to minimise image problems. The second i.f. is on 455 MHz., again to make use of freely available components.

Since the most likely end use for a transistorised f.m. receiver is in mobile systems, the h.t. supply was set at 12.5 volts and all design centred round this voltage. The unit will operate satisfactorily between 11.5 and 13.6 volts although, naturally, the transmitter output falls off at the lower figure.

Considerable attention has been paid to physical layout both from the constructional point of view and also with respect to ease of adjustment. Although the finished transceiver is small (the prototype is housed in a cabinet 4½" high x 10" wide x 10" deep) no attempt has been made to fully miniaturise it.

The complete receiver has been made on one p.c.b. 7½" x 4¾", while the transmitter is made in three parts. The exciter/audio modulator is on a p.c.b. 11½" x 7¼" and provides a 100 mW. f.m. modulated signal to the second p.c.b. which uses a Motorola 2N5589 to raise the power to some 1-2 watts. This stage in turn feeds a 2N5590 p.a. stage on a third p.c.b. to give a conservative 10 watts of output.

All p.c.b.'s are mounted on a shallow "U" shaped aluminium sub-chassis with the receiver board in the bottom of the "U", the exciter board on one vertical side of it and the two power stages on the other vertical side. The front panel contains the speaker and the various operating controls. Fig. 4 gives the general layout of the boards and control components.

THE RECEIVER

CONVERTER SECTION

The front end of the receiver uses two r.f. stages, the first a single neutralised TIS88 followed by a pair of TIS88s in a shunt cascode configuration. The choice of the shunt cascode was determined largely by the higher voltages per device that can be obtained. While a series cascode could have been used the roughly equal division of the available 12-13 volts supply would have meant that each device would only have about 6 volts of supply, a condition not conducive to the best results from FETs.

Double tuned circuits are used between the first and second r.f. stages and again between the second r.f. stage and the mixer. This method of coupling has been used to achieve an adequate band pass for use on the f.m. nets centred on 146 MHz., although there is no reason why the converter could not be centred on, say, 144.5 MHz. for a.m. work. In this case a normal tunable i.f. would be necessary.

FIG 1. BLOCK SCHEMATIC OF 146 MHz. F.M. TRANSCEIVER

---

1 54 Tennyson Street, Highett, Vic., 3190.
2 4 Elizabeth Street, East Brighton, Vic., 3187.
The mixer is a single TIS88 using low impedance injection from the oscillator into the source.

No dramatically new techniques have been used in the converter section of the receiver, but the resultant high performance and ease of alignment has been achieved only after much detail work on layout and circuit constants. The need to go through this (quite frustrating!) phase of development underlines the often forgotten maxim that at v.h.f. the circuit diagram alone is not a guarantee of success.

The six-band oscillator section is about as simple as it can be. A single 2N3564 uses third overtone crystals in the 45 MHz. range and triples into the collector tuned load. A second tuned circuit μ away from the collector tank cleans up the injection waveform and is tapped to provide impedance transformation into the mixer source. Adequate injection voltage is available.

Crystal switching uses the tried and true rotary switch. Considerable work was done on a diode switching system, but it did not prove to be completely reliable under service conditions. The reasons for this are not fully known, but appeared to be tied up with the small but finite and variable resistance of the diode in its switched-on condition.

THE RECEIVER I.F. SYSTEM
It is in this part of the receiver that the most interesting technical developments have been used.

Input from the converter at 10.7 MHz. is applied to a Toyo Type 10M2A1 filter having a 3 dB. bandwidth of 30 KHz. and a passband ripple of less than 2 dB. Narrower filters were tried, but it was found that off-frequency and/or over-deviated stations were unintelligible. Note that the filter input and output transformers are supplied with the filter and are essential to its proper performance. The bandpass and shape of the passband on the four filters so far tried have been very close indeed to the individual calibration sheets supplied with each filter.

Output from the second filter transformer at low impedance is amplified in a conventional MC1550 stage whose output feeds an AWM1272 oscillator/amplifier/mixer device. This device is implemented by A.W.V. and has only recently become available.

Fig. 5 gives the internal circuitry of the 1272. It contains two Clapp type oscillators (only one of which is used in the receiver under discussion) and an emitter coupled balanced mixer. This one device has replaced the large number of discrete components used in some of the earlier experimental work.

Using a 10.7 MHz. input and a heterodyning crystal on 11.155 MHz. (or 10.245—it makes no difference) the output of the 1272 is on 455 KHz. Two standard Rapar miniature transistor i.f. transformers are used back to back to couple output into the AWM1306 stage. The two transformers are top coupled and resistively loaded to give optimum bandpass.

The 1306 is another multipurpose A.W.V. microcircuit. Its configuration and mode of operation were described in an excellent article by John Reynolds, VK9ZMU, in the June 1970 issue of "A.R."

Essentially the 1306 acts as an amplifier, a limiter and a quadrature detector and gives two audio outputs. In the Australis circuitry the second audio output is used to give a.f.c. and mute, but in the current design, a.f.c. is not used and a very simple mute circuit has been adopted.

The whole i.f./detector strip is run from a 9-volt zenered rail.

AUDIO AND MUTE
The audio section proper consists of a Motorola MC1454 IC to give a watt of output with an 8 ohm speaker. A very simple 2N3665 pre-amplifier is used to give some audio lift.

Muting is obtained as follows. Audio output from the 1306 is taken to the "tops" of two paralleled 10K potentiometers. One of these potentiometers acts as a normal volume control and feeds the audio pre-amplifier (Audio 1). The slider of the second potentiometer, the mute control, is taken to a second pre-amplifier (Audio 2) whose coupling capacitors emphasise the higher audio components. Amplified output from this stage is rectified and the resultant d.c. applied to the base of a third 2N3565. The collector of this transistor is connected to pin 4 of the 1454 via a 10K resistor.

With the mute control in the off position no d.c. is applied to the base of the 2N3565 switch and pin 4 of the 1454 is at its normal working level. As audio noise is applied to the pre-amplifier and rectified, the 2N3565 switch approaches the "on" stage. When "on" pin 4 of the 1454 is pulled down towards earth potential and cuts off the IC.

Some delay time is achieved by means of the 1.0 μF. capacitor immediately following the AN2001 noise rectifier.

GENERAL
The receiver as described has been in one writer's vehicle for a long shake-down period. While the signal generator says that the mute will open with less than 0.3 microvolt of input, the effect of this sort of sensitivity is only really apparent when used mobile over a long period of time under a wide variety of circumstances and over many different routes.

Suffice it to say that on the most used route (to work and back!!) copy has been consistently made from all parts of Melbourne when modified commercial units (both valve and transistor) have heard only noise.

Since the converter part of the receiver is that to be used in the next satellite for reception of 2 metre f.m. signals, the performance obtained augurs well for the future.

With the exception of two ICs, the p.c.b.'s, the filter and of course the crystal, no special components are needed and in fact those used were obtained ex stock through the VK3 W.L.A. components service.

Much interest has been shown in the development of this receiver and many
enquiries received for information on availability. P.c.b’s are available in any case and, if sufficient demand exists, the authors will undertake to provide kits, instructions, etc. Those interested are asked to contact either author at the addresses given.

**RECEIVER COIL DATA**

**L.F. Strip**
- T1—Supplied with filter.
- T2—Supplied with filter.
- L1—34 turns 29 B & S enameled wire close wound on Neosid 722/1 former. Hot end to base of the former. F29 slug.
- L2—8 turns 29 B & S, close wound over cold end of L1.
- T3, T4, T5—Miniature 5-pin 455 KHz. i.f. transformers. (“Rapar 6” replacement i.f. from Radio Parts, Melbourne).
- Converter
  - L3—43 turns 18 gauge tinned copper, 7/16” long on Neosid former. F29 slug. Hot end to top of former.
  - L4—55 turns 18 gauge tinned copper, 7/16” long on Neosid former. F29 slug. Hot end to top of former.
- L5—3 turns 29 B & S, close wound over cold end of L1.

**NEW CALL SIGNS**

**OCTOBER 1970**

VK3KB—E. G. Mackay, 300 Upper Heidelberg Rd., Ivanhoe, 3079.
VK3QO—B. T. Belshaw, 1 Mossman Dr., Heidelberg West, 3084.
VK3AWX—S. Davies, 3 Lauren St., Rosebud, 3939.
VK3BEK—C. E. Middleton, 7 Shamrock Ave., Cheltenham, 3939.
VK3BYW—J. E. McKenna, 14 Marshall Ave., Mentone, 3194.
VK3YEG—A. H. Hambleton, 10 Sharrow Rd., Ivanhoe, 3079.
VK3YYI—L. N. Osborne, 18 Male St., Brighton, 3185.
VK3YRQ—B. J. Kemp, 1/774 Sydney St., Murumbeena, 3163.
VK3YE—E. S. Rendell, 71 Broadway West, Hawthorn, 3122.
VK3ZSR—A. C. Greening, 3/72 Altona St., Kensington, 3031.
VK4DD—D. E. Graham, 42 Purdon Rd., Wembley Downs, 6019.
VK4EM—M. D. Scott, Station: U.S. Navecom, Exmouth; Postal: P.O. Box 26, Exmouth, 6707.
VK4EC—F. Beech, 42 Marshall Ave., Mentone, 3194.
VK5DK—C. M. Hutchesson, “Yabba,” via Mt. Gambier, 5290.
VK5TA—R. A. Couzens (call sign incorrectly typed in previous list).
VK5ZTR—D. T. Rhodes, 3 Angas Crt., Modbury, 5290.
VK5ZEB—B. C. Jellett. Not renewed.
VK5ZCS—A. S. Phillips. Now VK7CS.
VK6HK—D. E. Graham, 42 Purdon Rd., Wembley Downs, 6019.
VK6MD—M. D. Scott. Station: U.S. Navecom, Exmouth; Postal: P.O. Box 26, Exmouth, 6707.
VK6CT—A. Szopko, Beach Rd., Legana, 7251.
VK6EE—W. Schmitz, 16 Cowrie Cres., Mt. Gambier, 5290.
VK6DO—D. W. White, Station: U.S. Navecom, Exmouth; Postal: P.O. Box 20, Exmouth, 6707.
VK6EE—W. Schmitz. Now VK6DO.
VK6EM—M. D. Scott. Station: U.S. Navecom, Exmouth; Postal: P.O. Box 26, Exmouth, 6707.
VK6MK—M. D. Scott. Station: U.S. Navecom, Exmouth; Postal: P.O. Box 26, Exmouth, 6707.
VK6DD—D. W. White, Station: U.S. Navecom, Exmouth; Postal: P.O. Box 20, Exmouth, 6707.
VK6MK—M. D. Scott. Station: U.S. Navecom, Exmouth; Postal: P.O. Box 26, Exmouth, 6707.
VK6ZEB—B. C. Jellett. Not renewed.
VK6ZCS—A. S. Phillips. Now VK7CS.
VK6ZEB—B. C. Jellett. Not renewed.
VK6ZCS—A. S. Phillips. Now VK7CS.
The original muting circuit of the Pye Mk. 2 v.h.f. a.m. transceiver leaves much to be desired in its method of operation as undoubtedly owners of this particular model have found out. The trouble comes about through the use of a relay to switch the speaker on and off. It is a well known fact that a relay requires a much higher current to pull it in than to drop it out. In other words, the relay may require 10 mA. to pull it in, but the current may have to drop to 5 mA. before it drops out again, which actually means in the case of the Pye Reporter that the muting must be much harder than desirable, causing weak signals to be missed, for the convenience of having muting during no-signal times. This used to cause me to miss many of the weaker signals, much to my annoyance.

Having put up with this defect for some time, I decided some form of fully electronic mute was most desirable. I came across the circuit that follows in an American magazine. I have modified it slightly so that it will suit the Pye. The original circuit required no extra valves, but this can only be so when the set has simple a.g.c. or only a slightly delayed a.g.c. system. The original circuit used the variation in the screen voltage of one of the a.g.c. controlled r.f. or i.f. stages, as shown in the second diagram, to operate the muting circuit. I won't describe the original American circuit, just the one suitable for the Mk. 2—it will suit, of course, the Mk. 1 and Mk. 3 with the addition of a small triode such as a 6C4.

To convert the Mk. 2, first of all, get rash and remove all the muting circuit, including the relay, wiring the speaker line direct from the transformer to the speaker. Having done all these drastic alterations, you will now find you have quite a bit of space about the 12AT7 socket. Just wire it as per circuit diagram and away it should go.

The principle of operation is quite simple. With no signal input, V1 will have no bias and will be conducting as much as it is able, the 100K (R6) restricting the total current to a quite reasonable level. As a result of this, the anode of the OA202 will be negative in respect to the cathode and it will be cut off, which means that it is an effective switch between C3 and C4 so the set is effectively muted, providing of course that VR1 is set so that this condition does apply.

Should your valve be a bit different to mine, R4 and R7 can be juggled to get a voltage at the earthy end of VR1, which is slightly less positive than the voltage at the plate of the valve. This will mean that the diode is conducting and the set is unmuted. If the diode will act as a small series resistor between C3 and C4. As the slider on VR1 is advanced towards the positive un-earthed end, the diode will become reverse biased and the set muted.

When a signal comes in, a negative bias is developed across the detector load and this is applied to the grid of V1 causing it to gradually cut off which means that depending on the setting of VR1 the set will unmute at a set pre-determined signal level. It might be noted that the set can be made to unmute on signals which have not even actuated the a.g.c. I can hear signals now that I couldn't previously and the mute closes quickly and positively after every received transmission.

You may think that R1, R2, C1 and C2 are unessential for this job, but I can assure you that this is not so. The 12AT7 will act quite effectively as an audio valve and cause the diode to open and close at a audio rate. Mostly this caused the residual noise to leak through, in fact, all the noise that the noise limiter removes is being amplified by this circuit as it comes before the noise limiter. These four components are used as an audio filter so that truly pure d.c. is supplied to the 12AT7.

C5 is optional and is inserted to back up the aforementioned components to suppress audio leakage.

There is only one defect with this circuit that I have noted which should be able to be corrected. This defect is that if there is a quite high noise level, say ignition, etc., the mute will open, giving you a large dose of noise that can be well done without. I have thought of an addition to this circuit which may work. It consists of a small value capacitor of a 100 pF. or thereabouts possibly, followed by a diode and a series resistor as shown on the diagram dotted in. The theory behind this being that the noise pulses are much higher in frequency than the average audio. These are rectified in this circuit and applied to the grid of the 12AT7 to hold it fully conducting to counteract the negative voltage developed by the audio detector. The values of this addition would need to be played with to get the desired effect.

I have used this mute circuit on a couple of sets and in both, the result has been very successful and I feel I can recommend it. It would undoubtedly be quite suitable to use in other valved a.m. equipment, h.f. or v.h.f. This mute does not give an entirely quiet receiver as there is still a small amount of high frequency audio leakage across the capacity of the diode, but this is of such a low amount that it is of no consequence.

The value of C2 can be varied quite a bit to give slower response to incoming signals and particularly noise pulses. A suggested upper value could be about 0.047 uF.

One precaution: With the mute hard on, the back bias on the OA202 must not exceed 150 volts or the diode may break down.
Australis-Oscar 5 Spacecraft Performance

By JAN A. KING, W3GEY

In the rather brief lifetime of the Australis-Oscar 5 experiment a number of useful experimental and operational results have been achieved. The satellite was launched on 23rd January, 1970. As of this writing, 211 formal reports have been received from 27 countries around the world on both telemetry and propagation results. Many other stations were known to have received the satellite, but did not submit quantitative data.

Based on reports received, here is a summary of the performance of each system on the AO-5 spacecraft:

THERMAL BEHAVIOUR OF AO-5

The temperature of AO-5 after the initial 100 orbits. An exponential rise in temperature was observed in the design temperature range of 19° to 45° C. The effects of this higher temperature were, unfortunately, all adverse. Battery lifetime was somewhat shortened during the initial phase of discharge; but worse than this, the 144.05 MHz. beacon power dropped off faster with decreasing supply voltage due to the decreased efficiency of the r.f. power output transistor.

External temperature measurements were higher in sunlight and cooler during eclipse periods as observed by many reporting stations. As the spacecraft entered the dark portion of the orbit the skin temperature dropped from its 55°C average to 42°C. ±3°C. The internal temperature, however, remained fairly constant, dropping only two to three degrees during the entire eclipse period. Acknowledgment is due to Bill Armstrong, W0PG, John Fox, W0LER, Nastar, K2SS, and others for their data in this area.

The spin rate about the X-axis in later orbits became quite slow so that the skin sensor located on the +Y surface showed changes in temperature as parts of the satellite rotated in and out of its own shadow. This data was most useful in determining the roll rate about the stabilised axis of the spacecraft. John Goode, WSCAY, reported this data for many orbits between 100 and 250. Skin temperature data indicated a spin period of 7 to 8 minutes about the X-axis after the initial 100 orbits. An example of this data is shown in Fig. 1 for orbits 168, 205 and 206, along with horizon sensor data.

THE AO-5 POWER SYSTEM

The spacecraft battery voltage decreased with time faster than predicted by pre-launch testing of individual cells (see Fig. 2). It is now known that the accelerated battery discharge was caused by two factors. First, the higher satellite temperature accelerated the normal chemical reaction in the alkaline-manganese batteries. Secondly, an additional 18 mA of current was attributed to a failure of the 10 metre modulator that occurred on orbit 3. It was verified that the 18 mA was independent of the ten metre modulator itself by commanding the transmitter off and observing that the extra current was still present. The ten metre modulation failure has also been attributed to the higher spacecraft temperature.

MAGNETIC ATTITUDE STABILISATION SYSTEM AND HORIZON SENSORS

One of the best operating systems on board the satellite was not electronic in nature. The Magnetic Attitude Stabilisation System (MASS) functioned more efficiently than some of us had anticipated. Early reports indicated that antenna nulls were occurring on the 144.05 MHz. signal once every 15 seconds, making telemetry decoding very difficult. By orbit 100, signal fades had reduced to one or two per station pass (approximately 20 minutes in duration). To the Amateur using the spacecraft this is a significant improvement over past satellites in the Oscar series and should prove to be a valuable tool in future Amateur spacecraft to achieve the continuous reception of a down-link signal.

The three orthogonal earth or horizon sensors used in the spacecraft were 2N2452 photo-transistors operated in a diode mode, having a spectral response between 5,000 and 10,500 A. Each sensor's field of view had been stopped by a small collimation tube. A photometric calibration of these sensors was, unfortunately, not undertaken due to the shortage of time in the test schedule. While the original design of this part of the telemetry system was to give an on-off indication when looking toward or away from the bright earth, the devices were found to be more sensitive and capable of detecting the decreasing brightness of the earth's atmosphere as the sensors viewed the earth-to-space transition.

When viewing the bright earth the telegraph attenuation was approximately 1450 Hz. and during the transition the telemetry frequency gradually decreased to a dark condition of 600 Hz.

Amateurs using a fast discriminator to decode the modulation observed, during periods of good signal strength, small variations in the frequencies of the telemetry tones as the sensors swept across the earth's disc. These were attributed to cloud formations.
Two examples of this data are shown in Fig. 3.

With a discriminator of this type, the Goddard Amateur Radio Club, WA-3NAN, decoded telemetry information for all the passes received. Fig. 4 shows horizon sensor information for various passes. Each frame shows the maximum rate of change of brightness observed on any of the sensors during a given pass. During orbit 4 the maximum observed rate of frequency change was found to be 700 Hz. per second, while pass 192 exhibits a maximum rate of change of only 10 Hz. per second. This is indicative of the reduced spin rate of the satellite.

During daytime ascending nodes, after the spacecraft had stabilised, a regular sensor pattern was observed. W5CAY demonstrated this data most effectively (see again Fig. 1). The X-axis shows no true periodic nature; but rather a gradual transition followed by small variations about an average "light" condition. The Y and Z sensors show a periodic behaviour characteristic of the satellite's roll rate about the stabilised X-axis. The skin temperature shows a cyclic variation as the +Y face rotated in and out of the spacecraft's own shadow. Of particular significance is to observe that the Z sensor always lags behind the Y sensor (approximately two minutes) in detecting the earth. With the +X-axis pointing north as the satellite crossed the equator, the spacecraft spin was thus clockwise as observed from the north pole of the earth.

The maxima in the external temperature curve were (within experimental error) out of phase with the +Y sensor. Since the \( T_{\text{SKIN}} \) thermistor was located on the +Y face, then the temperature was a minimum during times when the +Y face was viewing the earth. This is, in fact, the time when the +Y face should have been in shadow.

As the spacecraft travelled north from the equator the +X-axis should have begun to dip toward the earth as the strong dipole moment of the satellite (11,800 pole-cm) followed the local geomagnetic field vector which caused it to rotate twice per orbit (see Fig. 5). W5CAY's data showed that the +X-axis sensor did begin to gradually come on shortly after his signal acquisition time over a period of several minutes. This is precisely what one would have predicted as the +X sensor looked deeper into the earth's atmosphere which reflected more and more scattered light into the sensor.

The average roll period observed in this data is 7.5 min. This is thought to be the degree of stabilisation that persisted until the termination of the satellite's active life. The effectiveness of this system is best evaluated in terms of the very large reduction in the signal fading rate due to antenna nulls. This, in turn, implies an overall reduction in the loss of spacecraft data. For a satellite in the Amateur Radio Service it is apparent that this method of stabilisation is most effective and very easily implemented.

**THE AO-5 COMMAND SYSTEM**

A telecommand link on two metres was utilised to turn on and off the ten metre beacon transmitter in an effort to conserve the spacecraft's power supply. An a.m. tone modulation technique was employed. The ten metre beacon which consumed 0.6 w. of power, was to be commanded on during weekends when a maximum number of users was anticipated.

Prior to launch, considerable difficulty was encountered with the spacecraft command receiver due to in-band interference from the 144.05 MHz beacon transmitter. It was only possible to eliminate the interference by adding a steep skirted bandpass filter centered at the command frequency. This filter gave 50 db. of rejection at the beacon frequency, but unfortunately had a relatively high insertion loss when placed in front of the receiver. The result was that the command receiver required a signal of \(-76 \text{ dBm. (}35.4 \mu \text{V.}\) under ambient (room) conditions to decode a command. This, to be sure, was considered marginal performance.

![Fig. 4](image-url) - The maximum rate of change of the horizon sensors during limb transition for various passes of AO-5. The data shows a despin factor of 70 in only 15 days. This is a particular graphic demonstration of the effectiveness of the stabilisation system. Time divisions are 1 sec.
The problem was further complicated by a detuning of the second i.f. stage that occurred during tests under vacuum conditions. This problem could not be traced to a single component in a timely fashion so it was decided to peak the receiver for maximum sensitivity under vacuum conditions. When the receiver was again tested under vacuum conditions the sensitivity was observed to be 10 dB better. Thus, it was expected that the in-flight sensitivity would improve some 10 dB over its ambient condition, giving a final sensitivity figure required to operate approximately the satellite down-link signal.

SPACECRAFT LIFETIME

As previously indicated, the failure of the ten metre modulator is considered responsible for the increased battery current drain of 18 mA. This additional current drain shortened the lifetime of the satellite. The two metre beacon could be received through approximately orbit 280 on the 23rd day after launch. The ten metre beacon was turned on by command on orbit 261 and was left on continuously until it reached end of life around orbit 580 on the 46th day after launch. The difference in beacon lifetimes is due to the variation in cut-off voltage for the transmitters. The two metre transmitter power output went to zero very rapidly at a supply voltage of 15v., while a significant output could be obtained from the ten metre transmitter even at voltages as low as ten volts. While the spacecraft lifetime on two metres was shorter than the design lifetime of thirty days, a significant quantity of telemetry data was obtained never the less.

THE NATURE AND RELIABILITY OF AMATEUR REPORTS

An additional feature of the AO-5 experiment was the opportunity to evaluate the performance of Amateurs in reporting scientific-type data. After allowing several months to be certain that all late reports had been received, an effort was made to determine what type of information Amateurs were most interested in reporting and approximately how much variation in measurement occurred from station to station.

It was decided to report on the results by I.T.U. regions since different satellite passes were common to these regions, i.e. Region 1 (Europe and Africa) could generally not hear the same passes as Region 2 (North and South America) and so forth. Table 1 lists the number of useful reports received from each region and those stations which reported no telemetry information. We may infer that stations not reporting telemetry results were primarily interested in other aspects of the experiment or phenomena such as Doppler measurement. (Only the telemetry results are covered in this report since they were the primary indicator of the spacecraft performance. Another report prepared by Raphael Solier, K3QBW, gives a detailed presentation of the ionospheric propagation results of AO-5.)

Table 1 indicates that, on a percentage basis, Region 1 and Region 3 participated more actively in the telemetry decoding activities. This is somewhat surprising, since it was anticipated that U.S. Amateurs would be suitably equipped to make telemetry measurements.

It was of interest to determine the variation in measured values from many stations as possible during a single pass. Variation in spacecraft parameters for a short period when the satellite passed over a given region, was thought to be quite small (except for skin temperature variation) during daylight passes. The variation in data from reporting stations, then, can be primarily considered as individual station measurement error. In each region a particular set of stations observed a significant number of reports was received.

Table 2 shows data for each station reporting and the range in data as well as error from the median value. The error observed for the spacecraft battery voltage shows the lowest error due to the relatively "flat" nature of the voltage-to-frequency conversion curve and the fact that most of those reporting rounded off the reported measurement (as called for by the telemetry reporting form).

Certain stations (those underlined) were used as control data for a region since they were known to have better than average decoding equipment.

![Fig. 6.](image-url)

Table 2.

<table>
<thead>
<tr>
<th>Region 1 Pass 11</th>
<th>Region 1 Pass 17</th>
<th>Region 3 Pass 21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Call Sign</strong></td>
<td><strong>Channel 1</strong></td>
<td><strong>Channel 2</strong></td>
</tr>
<tr>
<td>W1QIO 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1BUN 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1RAA 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1L97 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1MMZ 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1ZEL 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1K2Y 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1E87 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1A7X 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1BUN 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1RAA 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1L97 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1MMZ 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1ZEL 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1K2Y 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1E87 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1A7X 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1BUN 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1RAA 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1L97 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1MMZ 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1ZEL 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1K2Y 78</td>
<td>20.1</td>
<td>43.0</td>
</tr>
<tr>
<td>W1E87 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
<tr>
<td>W1A7X 78</td>
<td>20.2</td>
<td>43.5</td>
</tr>
</tbody>
</table>

![Table 2.](image-url)
All regions show comparable data error. The magnitude of the error (less than 10% max.) was approximately the error estimated prior to the launch. This data does not utilise more powerful statistical methods that could be used to more accurately evaluate the data (i.e. a uniform probability density was assumed for all data). The maximum error figure of 10% does indicate that Amateurs throughout the world are capable of making significant data measurements with considerable accuracy.

SUMMARY

With the exception of a failure in the modulator of the ten metre beacon transmitter, all Australis-Oscar 5 mission objectives were met:

(a) The spacecraft was effectively stabilised to two revolutions per orbit (geometric alignment) within the lifetime of the satellite.

(b) Reliable Amateur spacecraft telecommunications was demonstrated.

(c) The effectiveness of the seven channel telemetry system was verified. Amateur data generally showed less than ±10% variation from median values.

(d) Significant results were obtained on propagation effects over the satellite-to-earth link in the ten metre band.

(e) Partial success was obtained in achieving the design lifetime of several weeks for both spacecraft transmitters using only chemical batteries.

While the response to AO-5 was gratifying (many stations reported it to be the most interesting Amateur space activity to date) it does not compare with the level of excitement that was generated by the repeater satellites such as Oscar III. AMSAT is presently planning a next generation of Oscars. These satellites will carry two repeaters and an r.f.t.y. telemetry system capable of measuring as many as 60 parameters. The design lifetime of these satellites will be one year, using a solar cell power source. Whether you are interested in r.f.t.y., f.m., a.m., s.s.b., D.M. traffic handling, or even contesting there are activities and special experiments being planned for you with Oscar 6. If you are interested in finding out how you can contribute to this new and exciting chapter in Amateur Radio write: AMSAT, P.O. Box 27, Washington, D.C., 20044, U.S.A.

BIBLIOGRAPHY

1. Data taken from a series of reports on Australis-Oscar 5 submitted to AMSAT by John Goode, W8CAY.
2. Data taken from Australis-Oscar 5 (A Summary Report) submitted to AMSAT by John Fox, W8LBR.
4. Information taken from preliminary data reduced at the Goddard Space Flight Centre, NASA, by the Goddard Amateur Radio Club, CTV.

“CQ” W.W.P.X. S.S.B. CONTEST, 1971

PRECISE RULINS

Date: 25th/28th March. Time: Start 0000 GMT Saturday, finish 2400 GMT Sunday. Only 30 hours out of the 48 hours are permitted for single operator working. The 18 hours of rest may be taken in up to five periods during the contest and such periods must be logged.

Bands: 1.8 to 28 MHz.

Mode: Two-way s.s.b. only.

Exchange: RS report plus three digit contact number commencing with 001.

Scoring: QSO Points

- Between stations on different continents 6
- Between stations in the same continent but in different countries 3
- Between stations in the same country 2
- QSO between stations in the same continent and in the same country are permitted for multiplier purposes only 1.

Multiplier: Determined by the number of different prefixes worked. A prefix is considered to be the two or three letter number combination which forms the first part of an Amateur call, e.g. W1, W1X, W1A, 424, 424. Each prefix may be counted only once during the test.

Total: Single operator, single band—QSO points multiplied by the number of different prefixes worked: single operator, all bands—total QSO points from all bands multiplied by total number of different prefixes worked. No prefix is counted more than once on each band for QSO point credit. However, prefix credit can be taken only once regardless of the band.

Awards: In each category for each entry area of Austria. To be eligible for a single band award the log must contain a minimum of 12 hours of operation.


Note: Complete rules are published in recent issues of "CQ” magazine.

Table 3.

<table>
<thead>
<tr>
<th>Command Number</th>
<th>Station Commanding</th>
<th>Date</th>
<th>Orbit Number</th>
<th>Purpose of the Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 KW. WA1IOX (U.S.A.)</td>
<td>1/28</td>
<td>61</td>
<td>10M Beacon off (first command of Amateur S/C)</td>
</tr>
<tr>
<td>2</td>
<td>20 KW. VK3ZBJ (Aust.)</td>
<td>1/29</td>
<td>72</td>
<td>10M Beacon on</td>
</tr>
<tr>
<td>3</td>
<td>10 KW. VK3ZBJ (Aust.)</td>
<td>1/31</td>
<td>97</td>
<td>Command Receiver Freq. Check (Beacon off, on; off, on)</td>
</tr>
<tr>
<td>4</td>
<td>20 KW. VK3ZBJ (Aust.)</td>
<td>2/2</td>
<td>123</td>
<td>10M Beacon off (routine)</td>
</tr>
<tr>
<td>5</td>
<td>10 KW. VK3ZBJ (Aust.)</td>
<td>2/6</td>
<td>172</td>
<td>10M Beacon on (routine)</td>
</tr>
<tr>
<td>6</td>
<td>10 KW. VK3ZBJ (Aust.)</td>
<td>2/9</td>
<td>210</td>
<td>10M Beacon off (last command during S/C lifetime)</td>
</tr>
</tbody>
</table>

PROVISIONAL SUNSPOT NUMBERS

DECEMBER 1970

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day | R | Day | R | Day | R
---|---|---|---|---|---
1  | 80 | 2  | 60 | 3  | 80 | 4  | 60 | 5  | 80 | 6  | 80 | 7  | 80 | 8  | 80 | 9  | 80
10 | 80 | 11 | 80 | 12 | 80 | 13 | 80 | 14 | 80 | 15 | 80 | 16 | 80 | 17 | 80 | 18 | 80
19 | 80 | 20 | 80 | 21 | 80 | 22 | 80 | 23 | 80 | 24 | 80 | 25 | 80 | 26 | 80 | 27 | 80
28 | 80 | 29 | 80 | 30 | 80 | 31 | 80 | 32 | 80 | 33 | 80 | 34 | 80 | 35 | 80 | 36 | 80


Predictions of the Smoothed Monthly Sunspot Numbers

January 85 | April 78
February 83 | May 77
March 81 | June 75

—Swiss Federal Observatory, Zurich.

RESIN CORE SOLDERs for reliable connections

O. T. LEMPRIERE & CO. LTD. Head Office: 31-41 Bowden St., Alexandria, N.S.W., 2015 and at Melbourne - Brisbane - Adelaide - Perth - Newcastle

RESIN CORE SOLDERS

CHOOSE THE BEST—IT COSTS NO MORE
PART TWO—
GATING, DISPLAY TIME, RESET

ROBERT H. BLACK,* M.D., VK2QZ

The previous article in this series introduced the element of time as a first step towards measurement of frequency. I’m not sure what time is, especially these days, since the International Committee of Weights and Measures have been playing around with it (see Sheldon and Evans, 1965). However, for our purposes, something related to WWV or VNG was sufficient.

We are concerned with counting pulses over a standard interval of time and displaying the count for sufficient time for it to be read. The counter is reset to zero after each count and the process can be repeated over and over. The display will be apparently continuous if the time intervals are short enough (1/100th second), but shortening the counting time results in the loss of significant digits.

The circuit diagram shows a control unit which, in effect, produces batches of pulses for counting which are separated by time intervals for visual display followed by appropriate reset pulses. The unit also allows some amplification of the input signal which is converted to a series of positive pulses by means of a Schmitt trigger. The input amplifier could readily be elaborated and some overload protection provided. However, it is sufficient for present needs.

The gated amplifier is alternatively opened and closed by the time-pulse operated bistable. The best operating condition is found by adjusting the bias with a potentiometer which is later replaced by an appropriate fixed resistor. The input to the gate from the Schmitt trigger is a little weird and, no doubt, a more orthodox arrangement could be made to work. Note that the diodes in the gate circuit are silicon diodes—these can be differentiated from germanium diodes because they require a slightly higher voltage before they start to conduct.

Equal counts and display times are obtained when the reset pulse is taken directly from the time-pulse operated bistable. The version shown in the photograph includes an additional monostable in the reset circuit which sets the counter to zero an appreciable time before counting of the next batch begins. No real advantage was derived when this was included.

The time pulses are derived from the unit already described. Two binary counters, arranged as decade dividers, are actually included in the Control

(Continued on Page 15)
SOLID STATE CONVERSION OF THE G.D.O.*

Circuits for modernising your Grid-Dip Osc. to obtain greater flexibility and sensitivity

PETER A. LOVELOCK, W6AJZ

The grid-dip oscillator is one of the most useful items of test equipment to have around the Amateur station. The main short-coming of most tube-type g.d.o's is their requirement for a.c. power. This is no problem at the workbench, but it is a definite limitation for portable or mobile work. Anyone who has used a g.d.o. to tune an antenna knows what a chore it can be to run an a.c. power extension line up a tower—not to mention the safety hazard.

Today's catalogues offer a selection of solid state 'dippers' in an attractive price range. They have the advantage of being usable anywhere. If you already have an older g.d.o., you may have considered trading it in for one of the contemporary models, or maybe even building a solid state unit from scratch. A simpler and much cheaper solution is to convert your tube g.d.o. to a solid state circuit. If you are reluctant about tearing into a commercially built unit or kit—don't be. The conversion task is simple, painless, and can be done in an evening. The result will give you the performance and flexibility of the latest models at a fraction of the cost.

Advantages over the circuit in Fig. 2 are fewer components and greater sensitivity in obtaining a dip. This circuit requires a higher voltage supply, however. I used two 9-volt transistor batteries in series to obtain full-scale meter deflection over the instrument's range.

NPN OR PNP CIRCUIT

An NPN transistor circuit I used in converting a Heath model GD-1B, which has a split-stator tank, is shown in Fig. 2. This circuit worked well with many transistors, including the 2N2926 and 2N706, up to 200 MHz. A PNP transistor may be used in the same circuit if you reverse the battery polarity. In both cases oscillator output was more stable than in the original tube circuit. Less frequent adjustment of the sensitivity control was required during measurements.

COMMON-BASE CIRCUIT

If your tube g.d.o. has an ungrounded parallel tank, the common-base circuit shown on page 442 of the R.C.A. Transistor Manual, Series SC-12 (reproduced in Fig. 3) is suitable.

FET OSCILLATOR

The circuit I finally used to convert my Heath GD-1B is shown in Fig. 4.

CONSTRUCTION

After you have selected a suitable circuit, you are ready to start construction. Remove all the original oscillator and power supply components (if any) and their wiring. Don't remove the tuning capacitor, coil socket, meter or sensitivity control. Take care not to disturb the wiring between the tuning capacitor and coil socket.

The logical spot for the transistor is that vacated by the tube. You can mount a transistor socket on an adapter plate placed over the tube socket hole. If you don't like transistor sockets, cut and drill a small piece of perforated board and mount it over the tube socket hole. Flea clips inserted in the board will allow permanent soldering of the transistor—but don't do this until all other components are mounted.

After assembling and wiring the components, temporarily attach the transistor leads to the flea clips with-

out soldering. This allows preliminary checkout.

Component leads must be kept short, particularly those connected directly to the transistor and the tuned circuit.

Small-value capacitors should be high grade silver mica. Bypass capacitors should be ceramic, not paper, to avoid stray resonances in the oscillator. All resistors are composition type, 1/8 or 1/4 watt.

The battery may be mounted in the space previously occupied by the power supply, using an appropriate bracket for the type of battery suited to your voltage and space requirements. Be sure to wire the battery connector with the correct polarity for NPN or PNP transistors.

In the circuits shown in Figs. 2 and 4 the sensitivity control is a 250K, linear-taper potentiometer. If your g.d.o. uses a lower value, I suggest replacing it with a 250K potentiometer and an s.p.t. switch to control the battery power.

CHECKOUT

After wiring and carefully checking the circuit, install the battery and transistor. Plug in a coil, apply power, and turn up the sensitivity control. If you don't get a meter reading, the diode rectifier may be dead or your connections may be reversed. If you obtain a meter reading, the circuit isn't oscillating or you forgot to use a heat sink when soldering the diode rectifier.

Assuming you obtain a reading, increase the control for full-scale meter indication and tune the capacitor from minimum to maximum to check for zero drift over the entire range. Repeat this for each coil. If any false dips are noted without the coil coupled to another circuit, you have a "built-in" resonance. Most likely this will occur on the higher frequency coils (40 to 200 MHz.) if lead lengths are too long or if non-resonant bypass capacitors were used.

CALIBRATION

Finally, check the dial calibration by beating the oscillator against a good communications receiver. Calibration may be a bit off if stray capacitances of the new circuit vary from the original. While most dippers are only approximately calibrated, you will want to maintain reasonably accurate calibration. Loosening the dial-locking screw and re-adjusting its position relative to the tuning capacitor will take care of most cases. However, if the calibration error exceeds this method of correction, or if the error occurs only on certain coils, the following tips will help.

Sliding a one-half inch strip of aluminium foil over two or three turns of the coil will lower its frequency. Conversely, a single shorted turn of wire placed around the form will increase the coil's frequency as you slide it toward the coil. Fig. 5 illustrates these methods. After calibration has been adjusted, the shorted turn or foil strip may be permanently cemented in place.

REFERENCES


COUNTER USED FOR FREQUENCY MEASUREMENT (Continued from Page 13)

Unit to allow counting for 1 second and 10 second intervals. The longer time interval is necessary to count the last column (cycles) when the frequency is 1 MHz. (as the input is divided by ten).

WHAT DOES IT DO?

Well, what does the thing do? It counts the 10 cycles per second output of my unijunction sweep generator. It counts the output from a small transistor oscillator using a 1 MHz crystal.

While counting for 1 second at this frequency the overflow indicator comes on but it is easy to see how many times the 10th decade has counted. If you count for 1/10 second you lose a decade, of course, but the blinking display allows rapid calibration of an audio oscillator—you'll never go back to Lisajous figures. The last figure displayed will, of course, vary so that a frequency of 1 MHz. may be displayed as (1)000 00(0) or (1) 00 001(0)—this is the nature of the beast.

COMMENTS

Some comments are necessary. The input as shown is not protected (I don't seem to use valves any more) and resetting 9 x 104 activates the overflow indicator. The amplifier in the Control Unit will act as a receiver if you put an aerial onto the input—put your finger on it and measure your frequency. It will also count 100/sec if you feed it with insufficiently filtered d.c. It may be necessary, on occasion, to pay some attention to the input impedance of this amplifier.

It may be appropriate to point out that this was a project for the long winter evenings indoors of a summer temperature in Sydney occasionally rise to a level at which transistor devices misbehave if there is no temperature compensation.

The four sub-units are mounted in a cabinet as illustrated in the photograph. The second 12 volt regulated supply is identical to the first and is included in the Control Unit.

Thanks are due to Mr. D. Cato for panel decoration of the Counter Unit and Dr. Bruce McMillan for the photographs.

REFERENCES


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. Drawings will be done by "A.R." staff.

Please address all articles to: EDITOR "A.R.,” P.O. BOX 36, EAST MELBOURNE, VICTORIA, 3002

SUBSCRIPTIONS DUE

All members of the W.I.A. are reminded that annual subscriptions are now due and should be paid promptly to their Divisional Secretary. Non financial members will not receive a copy of "A.R." and back copies may not be available upon request. To preserve continuity of your files of "A.R." please pay your annual subscription now.
Lectures 5, 6, 7 and 8 have dealt with some aspects of alternating current and this lecture proposes to carry these further and deal with the power in a.c. circuits.

In Lecture No. 6 we described briefly a perfect a.c. generator and stated that if a purely resistive load was connected to it, then all the power flowing in the resistor would be used. This is because the resistor has unity power factor and no power is returned from the resistor to the generator as all the power in the resistor is converted into heat.

In an alternating current circuit containing only pure resistance the current and voltage are in phase. That is, the voltage and current pass through corresponding parts of their cycle at the same instant.

For instance, if the generator voltage equation is

\[ e = E_m \sin \omega t \]
\[ = 311 \sin 377 \text{ t} \]

then the current through the circuit is

\[ i = I_m \sin (\omega t + \phi) \]
\[ = 5.66 \sin 377 \text{ t} \text{ a.} \]

where \( \omega \) means maximum.

The voltage and current may differ widely in their amplitudes, the frequency factors are equal and the phase angle between current and voltage is 0°.

It should be obvious that Ohms Law says nothing about maximum, average or effective values of voltage or current. Any of these values may be used, i.e. maximum current may be used to find maximum voltage, but maximum voltage may not be used to find, say, the effective voltage unless the proper conversion constant is introduced into the equation.

It is the usual practice to consider all a.c. voltages and currents as "effective" values unless stated otherwise. The term r.m.s. is frequently used in place of "effective".

In a direct current circuit the power is equal to the product of the voltage and current, i.e. the instantaneous power is

\[ p = e \times i. \]

When a sine wave of voltage is impressed across a resistance, the relationships of voltage (\( e \)), current (\( i \)) and power (\( p \)) are shown in Fig. 1. For clarity the amplitudes of the voltage and current are different.

The voltage which exists across the resistance is in phase with the current flowing in the resistance. An examination of Fig. 1 shows that at the start of the cycle, both voltage and current commence at 0° and each reaches its maximum at 90°. Both fall to zero at 180°, then rise to maximum in the opposite direction at 270°, then again fall to zero at 360°.

In this case there is no phase difference between the voltage and current and this is the condition for unity power factor, i.e. p.f. = 1.0.

The power delivered to the resistance at any instant is represented by the height of the power curve. This is the product of the instantaneous values of voltage and current at that instant.

The shaded areas under the power curve (\( p \)) represents the total power delivered to the circuit during one complete cycle of voltage.

It should be noted that the power curve (\( p \)) is the product of the maximum height of the power curve. Therefore the a.c. power consumed by a resistance load is equal to the product of the effective values of voltage and current, i.e. r.m.s. values.

As in direct current circuits, this power is measured in watts.

**REACTIVE LOADS ONLY**

Having dealt with power in an a.c. circuit containing only pure resistance, we now turn our attention to an a.c. circuit containing only pure reactance as this will be a logical step towards an a.c. circuit containing both resistance and reactance.

Fig. 2 shows the voltage (\( e \)), current (\( i \)) and power (\( p \)) relationships when a sine wave of voltage is impressed across an inductance which has no resistance. This delightful state of affairs cannot exist in practice, but it is desirable to assume a pure inductance for this part of the lecture.

The maximum height of the power curve is the product of the maximum values of voltage and current, thus

\[ P_{\text{max}} = E_{\text{max}} \times I_{\text{max}} \]

The average power delivered to a purely resistive load is shown by the line a-b in Fig. 1, which is half the maximum height of the power curve. From this we have

\[ \text{Average Power} = \frac{P}{2} = \frac{E_{\text{max}} \times I_{\text{max}}}{2} \]

\[ \therefore P = \frac{E_{\text{max}}}{\sqrt{2}} \times \frac{I_{\text{max}}}{\sqrt{2}} \]

Therefore the a.c. power consumed by a resistance load is equal to the product of the effective values of voltage and current.

Guidance notes:
- \( e \) is voltage.
- \( i \) is current.
- \( p \) is power curve.
- Power above the axis is plus and below is minus.
- The shaded portion is power within the power curve.

It will be seen that the voltage has been drawn so as to start to rise in the positive direction, above the X axis, at 0° and that the current starts to rise positive 90° after the voltage started to rise. This means that the current is lagging behind the voltage by 90°, thus there is a phase displacement between the voltage and the current. Compare this with Fig. 1 where there was no displacement.

---

Guidance notes:
- \( e \) is the voltage curve.
- \( i \) is the current curve.
- \( p \) is the power curve.
Now let us examine Fig. 2 in detail. When current is increasing from zero to maximum positive, during the interval 90° to 180°, power is being taken from the source of electro-motive force (e.m.f.) and being stored in the magnetic field around the inductance. When current is decreasing from maximum positive to zero during the interval 180° to 360°, power being negative is returned to the source. This is shown by the shaded portion of the power curve below the X axis.

During the excursion of the current from 270° to 360°, although the current is negative (below the X axis), the power curve is positive (above the X axis). From 360° to 90° of the next cycle the current drops to zero at 90°, the magnetic field around the coil has been collapsing and power being negative is returned to the source.

Thus we have the situation that positive power is followed by negative power. The positive power is taken from the power source and the negative power is returned to the source, therefore the circuit does not consume power although power alternately flows from and to the source.

When a source of alternating current is impressed across a pure capacitance power is taken from the source and stored in the capacitance whilst the voltage is increasing to maximum in the positive direction, 90° to 180°. As the voltage falls from maximum at 180° to zero at 270°, the capacitance discharges back into the source, but this is negative power. The voltage then becomes negative from 270° to 360° lying below the X axis but the power is again positive, being taken from the source.

At the beginning of the next cycle the voltage starts to fall from 0° to 90° and the power is returned to the source as it is negative power.

The capacitive circuit may be understood by referring to Fig. 2 and transposing e and i. In this case the current lags behind the voltage v.

An examination of Figs. 1 and 2 shows that when the voltage and current are both of the same sign the power is always positive irrespective of whether for not they are positive or negative (above or below the X axis). However, when they are unlike, then the power is negative.

Further examination of Figs. 1 and 2 shows that when the circuit is purely resistive the voltage and current, being in phase, have the same sign at all times.

However, when the circuit is purely reactive there is a phase displacement between the voltage and current, at times they are of the same sign and at other times they are of opposite signs, thus there is positive and negative power in the circuit.

In a purely reactive circuit no power is absorbed by the reactance, however power does flow to and from the source.

This is known as reactive or apparent or watless power as it can be determined by voltmeter and ammeter readings and is given by

\[ P = E \times I \]

and is measured in volt-amperes (VA) or if large in kilovolt-amperes (kVA).

**RESISTANCE AND INDUCTANCE IN SERIES**

So far we have seen that when the load is purely resistive the voltage applied across the resistance and the current flowing through the resistance are in phase, whilst in a circuit where the load is purely reactive the voltage and current are 90° out of phase. The voltage will lead or the current lag the other when the circuit is inductive and the voltage will lag and the current lead the other when the circuit contains capacitance only.

However, circuits usually contain both resistance and reactance.

In Fig. 3 is shown a circuit containing resistance and inductance. \( R = 6 \) ohms and \( X_L = 8 \) ohms. These values have been chosen for ease in computations.

Using the methods shown in Lecture No. 6, the following results will be obtained:

**Current through circuit = 10 amp.**

**Voltage across resistance = 60v.**

**Voltage across inductance = 80v.**

Phase angle \( \phi \) between voltage and current = 53.1°

Thus the voltage leads the current by 53.1°, or the current lags behind the voltage by 53.1°.

**RESISTANCE AND CAPACITANCE IN SERIES**

If a capacitance of 8 farads is substituted for the inductance of Fig. 3, calculations will show that the same answers will be obtained, however in this case the voltage will lag the current or the current leads the voltage by 53.1°.

**RESISTANCE, INDUCTANCE AND CAPACITANCE IN SERIES**

We have shown that inductive reactance causes the current to lag behind the voltage and that capacitive reactance causes the current to lead the voltage, hence these two directions are opposite in effect. If the inductive reactance and the capacitive reactance have exactly the same value, then they cancel each other exactly, i.e. taking the two variations for Fig. 3, we have \( X_L = 8 \) ohms, \( X_C = 8 \) ohms, and if both are connected in series we have:

\[ +j8 - j8 = 0 \]

so the net reactance is zero. This is the condition for series resonance.

At one time in Australia's history there were wide differences in the voltages and frequencies of a.c. power supplied to the public, but nation-wide voltages between 200 and 250 volts at a frequency of 50 cycles per second is becoming standard. Western Australia used 40 c.p.s. for many years.

For Fig. 4 a voltage of 220 has been selected. This figure shows a series circuit containing resistance, inductance and capacitance having different values to those given in the circuit problem of Lecture No. 6 so that the student may gain experience in working out this problem and checking the answers given here.

![Fig. 4](image_url)

- \( R = 100 \) ohms
- \( X_L = 132 \) ohms
- \( X_C = 204 \) ohms

Impressed voltage = 200 volts

- Voltage across resistor = 179 volts
- Voltage across inductance = 286v.
- Voltage across capacitance = 365v.
- Current flowing in circuit = 1.79A.

Power factor is 0.8 (to nearest decimal place; 0.812 to three places). The impedance is 133 ohms, and the phase angle is \(-35.8°\), which means that the voltage lags the current by this phase displacement.

The net reactance of the circuit is:

\[ +j132 \text{ ohms} - j204 \text{ ohms} = -j72 \text{ ohms} \]

This shows that the net reactance is capacitive and the circuit resolves itself into a resistance of 100 ohms and a capacitive reactance of 72 ohms in series.

![Guidance notes](image_url)

Guidance notes:

- Draw as closely as possible for voltage, current and power for circuit of Fig. 4.
- \( e \) is voltage curve.
- \( i \) is current curve.
- \( p \) is positive power.
- \(-p \) is negative power.
- In this case most of the power is taken by the circuit and only a small amount as shown as the minus \( p \) is returned to the source.

Fig. 5 represents the relationship between voltage, current and power for the circuit and values of Fig. 4, and an attempt has been made to draw Fig. 5 to scale.

\( e \) is the impressed voltage

\( i \) is current flowing in circuit

\( p \) is the positive power in circuit

\(-p \) is the negative power in circuit

\( \phi \) is the phase angle.

As has been stated previously, the instantaneous power in the circuit is equal to the product of the impressed voltage and the current through the circuit.

It has been stated, also, that when the voltage and current have the same sign, irrespective of whether they are both positive (above) or negative (below the X axis) they act together and take power from the source. However, when their signs are different, again...
irrespective of their positions in relation to the X axis, they are operating in opposite directions, the power is negative and is returned to the source.

The apparent power, \( P_a \), whilst the true power, \( P \), is

\[
P = EI, \quad \text{where } E \text{ is the voltage across the resistance in the circuit.}
\]

Apparent power is sometimes called total power, whilst true power is the power which produces work.

The power factor is the ratio of the true power to the apparent power.

\[
\text{Power Factor (p.f.)} = \frac{P_{\text{true}}}{P_{\text{apparent}}}
\]

Thus the power factor of a series circuit may be obtained by dividing the resistance of the circuit by its impedance.

The power factor may be expressed in terms of the angle of lead or lag.

\[
R + Z = \cos \theta
\]

\[
\therefore \text{power factor} = \cos \theta
\]

and true power, \( P = P_a \cos \theta \)
or true power, \( P = EI \cos \theta \)

From the data given earlier,

\[
P = EI = 1.79 \times 100 = 320 \text{ watts (nearest whole number)}
\]

or \( P = E/I = 179 \times 1.79 = 320 \text{ watts} \)

or \( P = EI \cos \theta = 220 \times 1.79 \times \cos 35.8^\circ = 320 \text{ watts} \).

Power factor is usually expressed as a decimal and

\[
\cos \theta = \cos 35.8^\circ = 0.812.
\]

If expressed as a percentage

\[
p.f. = 100 \times \cos 35.8^\circ = 81.2\%.
\]

### RATING OF A.C. GENERATORS

Manufacturers of alternating current generators rate their machines as being capable of delivering a certain number of kilovolt-amperes (KVA) and not as being capable of delivering so many kilowatts (KWs).

This means that they guarantee that the generator if kept revolving at the correct speed will generate a certain voltage and that it will stand a certain amount of voltage without overheating.

This is because they cannot guarantee it as being able to generate a specified or certain amount of power under all conditions of use because they do not know the nature of the load that the user will use.

Suppose an a.c. generator was guaranteed to deliver 10 KW at 200 volts and that it was connected by the user to a load having a power factor of 0.7.

Then it would have to supply an apparent power of \( 10,000 \div 0.7 = 14,285.7 \text{ watts} \) or 14,286 watts to nearest whole figure.

So that the true power should be equal to the apparent power,

\[
14,286 \times \cos \theta (0.7).
\]

This means that the generator would have to supply a current of \( 14,286 \div 200 = 71 \text{ amps} \) (to nearest whole number) instead of \( 10,000 \div 200 = 50 \text{ amps} \).

The additional current that the machine has to produce would cause additional heating and could damage the machine.

From this it can be seen that the rating of a.c. generators is dependent upon the amount of heat that the windings can stand.

Thus a.c. generators are rated in kilovolt-amperes which is a direct measure of the heating factors in the windings and a true measure of the capacity of the machine to do work.

Large transformers are rated in the same manner and for the same reasons. Sometimes small transformers are rated in volt-amperes (VA). Some of the transformers detailed in Radio Parts Pty. Ltd. catalogue have their power ratings shown in VA because the manufacturers do not know the types of loads that users will employ, as it is one thing for a manufacturer to specify that a transformer is to be used for a particular purpose, then to ensure that the purchaser will use it for that purpose.

### RECAPITULATION

In this lecture we have assumed that the resistances were pure resistances, that is non-reactive. It is fairly easy to make resistances having little if any inductance, and with very little distributed capacitance. However, it is virtually impossible to make an inductance which does not have some resistance and capacitance, also it is impossible to make a capacitor which does not have some resistance, although it may be very small, also the capacitor may have a small amount of inductance, but it was desirable to make the assumptions that were made.

In an a.c. circuit containing only resistance the power factor is unity and in a circuit containing only reactance the power factor is zero.

In a well designed reactance the power factor will approach zero and the current will either lead or lag the voltage by nearly 90°. If the reactance is not well designed, then the power factor will lie between zero and 1.0 and the angle of lead or lag may be far less than 90° and losses in the reactance will be large.

Finally, in Lecture No. 5 there was shown the effective value of an alternating current. The effective value of an alternating current is the equivalent value of a d.c. current which would give the same power dissipation in a resistance \( R \) as an alternating current amplitude \( I \) effective.

The power dissipation in the d.c. case is:

\[
P = IR,
\]

\[
P = VI, \text{ or } V^2 \div R
\]

where \( P \) is the power, \( I \) is the d.c. current, and \( V \) is the d.c. voltage.

The power dissipation in an a.c. case of pure resistance is:

\[
P = IR,
\]

\[
P = VI, \text{ or } V^2 \div R
\]

where \( P \) is the power, \( I \) is the effective a.c. current, and \( V \) is the effective a.c. voltage. The term root-mean-square (r.m.s.) means the same as effective. The term r.m.s. is derived from the fact that it is the square root of the average (or mean) value of the square of all the different values the current can take during one complete cycle.

r.m.s. effective and virtual all mean the same thing when dealing with a.c. circuits.

---

**WIRELESS INSTITUTE OF AUSTRALIA—FEDERAL EXECUTIVE AMATEUR JOURNALS**

The Institute can now offer annual subscriptions to following Amateur Journals:

- **"OST"**—Associate membership and renewals, $6.40.
- **R.S.G.B. “Radio Communication”** (ex “The Bulletin”) is only sent with membership of Society, $8.80. Send for application form.
- **“CQ” Magazine**, $5.70; Three Years, $13.50.
- **“73” Magazine**, $5.50; Three Years, $11.50.
- **“Ham Radio” Magazine**, $5.50; Three Years, $11.50.
- **“Ohm”**—Oriental Ham Magazine, $2.50.

R.S.G.B., A.R.R.L., “CQ” and “73” Publications also available at special prices. 1970 N.Z. Call Book, 75 cents, plus 6 cents postage

Send remittance to F.E. Publications Dept., C/o P.O. Box 67, East Melbourne, Vic., 3002

Receipt of your first issue will serve as acknowledgment of your subscription. Allow six weeks for delivery.
Overseas Magazine Review

Compiled by Syd Clark, VK3ASC
and L. L. Gunther, VK1RC

"THE AUSTRALIAN E.E.B.
October 1970—
Good SCR CD Ignition System, VK1ZVG. A
very interesting system. Anybody who has a
little time on his hands might like to have a
try. My Holden is fast enough without it. Your
choice.

A report in the text is on the use of
Symmetry Amplifiers, VK7ZDF. Self explanatory.

Third Party Traffic, VK3TR. Seems to me and
he has been for years, that the government
operated commercial communications system
now, and has for years, that the government
workmate says his "Jag," goes better with
non-political interesting discussions of new tech­

A likely misprint: For the product
metre says his "Jag," goes better with
non-political interesting discussions of new tech­

The mainline ST-3 R.T.T.Y. Demodulator—
1970—

An F.M. Receiver for Two Metres—The
author discovered that by doing a good job at
the wrong job, which needs neutralisation as a
get better results than from a commercial unit.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A 2 Metre QQE06/40A Linear Amplifier.—
By DL6HA. A well designed workbench is
for amateurs. As with all magazines, some
issues are better than others, but the overall
standard is high, and the magazine is well
worth the modest subscription price, $1.50.

"HAM RADIO MAGAZINE"
September 1970—

Editorial: Jim Fisk continues his series
topical articles relating to the v.h.f.
technical developments. This time on microwave
acoustics, which provides a basis for
second-order resonators. The result is an improved
filter, delay line, resonator, or amplifier in the
Nichols-Nagell type.

An Integrated Circuit Balanced Modulator.—
A 2.000 MHz common-base npn bipolar
element, a.m. detector, product detector, mixer, or frequency doubler.

The 2 Metre Meter—You can trust the
reading of this s.w.r. meter, which you cannot do
with "s.w.r. bridges, antennascopes, or other
gadgets that baffle the confused, which is the
spurious product described. It is approved from
standard microwave procedures.

The Band (ie C.W.) Miniaturiser. A pocket
sized direct conversion receiver for 80 and
40 metres, using FET product detector in the
circuit base conode. A simple fed through a
low-pass RC filter, FET-amplified, and then
into a commercial all power module.

Designing with IC Voltage Regulators—
Inherent device constraints are analysed and
demonstrated to improve overall regulator performance.

Back to earth:—An aid for deter­
ing signal attenuation due to variance in
earth-moon distance.

A Low Noise Converter for 432 MHz.—A circuit
usually is the first in a design, which also appears
its gain is flat from 30 KHz. to over
50 MHz.

The Mainline ST-3 R.T.T.Y. Demodulator—
1970—

A 2 Metre Meter—You can trust the
reading of this s.w.r. meter, which you cannot do
with "s.w.r. bridges, antennascopes, or other
gadgets that baffle the confused, which is the
spurious product described. It is approved from
standard microwave procedures.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Propagating a.c. in an R.F. Impedance
Bridge.—Unlike the Antenna
Meter and You— Conversion to
Voltage-Probe Receiving Antenna.

Inherent device constraints are analysed and
demonstrated to improve overall regulator performance.

A 2 Metre Meter—You can trust the
reading of this s.w.r. meter, which you cannot do
with "s.w.r. bridges, antennascopes, or other
gadgets that baffle the confused, which is the
spurious product described. It is approved from
standard microwave procedures.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.

A Multimode Transmitter for Six and Two
Metres—The author presents versions of
previous designs which provide higher power
output on a.m. or s.s.b. of 2 or 8 metres.
AMATEUR BAND BEACONS

VK1 144.700 VK1VE Kitsily, 20m. E. of Melb.
VK1 144.390 VK1VV 107m. W. of Brisbane.
VK1 144.800 VK1VF Mt. Lofty.
VK2 52.900 VK2TS Carnarvon.
VK4 144.500 VK4VE Mt. Barker.
VK5 51.760 MHz. Melbourne.
VK6 52.006 VK6VF (on by arrangement).
VK6 52.900 VK6TS Carnarvon.
VK6VF 144.500 VK6VE Mt. Barker.
VK8 144.600 VK8XI Christmas Island.

For more details see DX News.

VK9 Division by Garry VK5ZK and Ian VK-1G, constructed solid state device running 15 watts output. Further notes from Bob's pen shows that he is becoming quite wide spread through Australia, comparing most DX stations from VK5 and a triangle area which Bob has been able to work south of Melbourne is VKOZPO. Some information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)

MEET THE OTHER MAN

Meet George Francis, VK3ASV/T, ex-VH3EN which he put in service when he was an active S.w.l. During his apprenticeship as ship radio servicing, thus gaining valuable mental call sign VJ3B, then in 1954 he turned to space tracking near Auckland. (Reprinted in "Meet the Other Man" from "Meet the Other Man" of many years standing who finally saw the light of day and tried v.h.f., and it turned out to be quite good. There's a moral to the story, but let's wait for the paragraph.

VK9 Division by Garry VK5ZK and Ian VK-1G, constructed solid state device running 15 watts output. Further notes from Bob's pen shows that he is becoming quite wide spread through Australia, comparing most DX stations from VK5 and a triangle area which Bob has been able to work south of Melbourne is VKOZPO. Some information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)

Further notes from Bob's pen shows that he is working VK6 shortly. Information about this area will be given later. (Continued on Page 21)
Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.B.W. 2750
(Times all in GMT)

The following stations can be QSLed via the

VHF Notes

(Continued from Page 26)

first VAs using FT. Since then he has worked all

V.H.F.-100 for 144 MHz and above, dated

16, 2G6A, KZG3DQ, VK3SDF, VK7AT, 4G6BC,

200 miles; 17/1/61, VK7AT, 300 miles; 25/1/61,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,

2G6BC, VK7AT, 300 miles; 25/1/61, VK7AT,
CONTEST CALENDAR
4th/7th March: 37th A.R.R.L. International DX Competition—Phone Section (2nd weekend).
13th/16th March: 34th B.F.R.U.
14th March: W.A.B. H.F. Phone Contest.
4th April: W.A.B. L.F. Phone Contest.
11th April: W.A.B. L.F. C.W. Contest.
16th/17th October: 11th W.A.D.M. Contest (C.W. only).

WORKED ALL BRITAIN CONTESTS 1971
FEES OF RULES
Dates: 14th March, H.F. Phone; 28th March, H.F. C.W.; 4th April, L.F. Phone; 11th April, L.F. C.W.
Fees: For H.F. Contest—14, 21 and 28 MHz.
For L.F. Contests—1, 3.5 and 7 MHz.
Time: For all contests: 0600 to 2100 GMT.
Exchange: RS(T) number and QSO serial number 1001 plus book number if a W.A.B. book-holder.
Scoring: QSO points—5 points for each different station worked. The same station may be worked again on a different band for five points.
Multiplier—Total number of different W.A.B. areas worked in the contest, one multiplier for each area band combination.
Total—Total QSO points multiplied by total multiplier.
Awards: Certificate of Merit to the leader in each country.
Log entry to be received within 50 days of the contest by W.A.B. Contest Manager, 49 Baggrave St., Leicester, United Kingdom.

KITS

COMMELEC INDUSTRIES
P.O. Box 1, Kew, Vic., 3101

PERMABOND
A One-Solution Adhesive
FAST SETTING: Forms most bonds in 10-45 secs.
VERSATILE: Joins most combinations of materials.
STRENGTH: Tensile strength up to 5,000 lb./sq.in.
READY TO USE: No catalysts, heating or mixing.
VIRTUALLY NO SHINKAGE.
Trade enquiries to Sole Australian Agents:
Industrial & Medical Electronic Co.
288 LITTLE COLLINS ST., MELBOURNE, VIC., 3000
Telephone 63-4781. Send for data sheet.

REPAIRS TO RECEIVERS, TRANSMITTERS
Constructing and testing: xtal conv., any frequency; Q5-ers, R9-ers, and transistorised equipment.

ECCLESTON ELECTRONICS
146a Gotham Rd., Kew, Vic. Ph. 80-3777

V.K. ELECTRONICS
63 HAROLD ST., DIANELLA, W.A., 6062 Service to Transceivers, Receivers, Transmitters, Antennae, etc.
Phone 78-2319

CANCERS RBSIO commods
EASTER CONVENTION—APRIL 9-12, 1971
This year the Easter convention is held in thename of the forthcoming Easter Amateur Radio Convention and we hope that you have taken the planning to an advanced stage. Firstly, may I tell you something about the convention.
Friday: The reception centre will be open for most of the day at the Griffin Centre, Burnley. There will be a large shop where you may participate in an all-band scramble (open to multieers only) in which you may work anyone, any mode on any band, but you must not use any ear piece of your own. Most of Friday is left free for sight-seeing and personal visits to your visits and some suggestions appear later in this programme. 3.5 and 1 MHz will also be manned.
Saturday: A keen contest committee has organised a programme of events which include a competition featuring special rules; 2 and 40 MHz receiving tests; and a special prize will be awarded to the highest aggregate points score.
The Convention Dinner will be held at the Hotel Canberra, Sunday night 7 p.m.
Sunday: The contest committee will be active from 10 a.m. to 6 p.m. on Sunday and Saturday, there will be several conducted tours of the capital and the surrounding towns.
The Convention Dinner will be held at the Hotel Canberra, Sunday night 7 p.m.

WGA 21 AWARD
The Radio Amateur Society of the Island of Gotland in Sweden is sponsoring the forthcoming Easter Contest in which all bands are valid for this very attractive award. The contacts shall be two-way (no cross-band) and in any mode which is legally allowed for the band used. WGA 21 cannot be exchanged to Amateurs operating from Gotland itself.
Each QSO gives the following number of points:
20 mx 3, 15 mx 3, 10 mx 3, 2 mx 6, 0.7 cr
The required number of points is 21.
Applications should be sent to the Awards Manager of the Radio Amateur Society of the Island of Gotland: c/o (GRK), P.O. Box 461, S-621 04 VISBY 4, Sweden. Please enclose excerpt of your log, certified by two licensed Amateurs. To cover this contest costs also each 10 IRC or 750 Swedish Kronor. A special prize will be awarded to the highest aggregate points score.

HAMS
Minimum $1 for forty words. Extra words, 3 cents each.
HAMS WILL NOT BE PUBLISHED UNLESS ACCOMPANIED BY REMITTANCE.

WANTED:
AR7 Coil Boxes. Prefer Band E or, even better, AR7. Hughenden, Old., 4821. All letters will be answered.

REPAIRS TO RECEIVERS, TRANSMITTERS
Constructing and testing: xtal conv., any frequency; Q5-ers, R9-ers, and transistorised equipment.

ECCLESTON ELECTRONICS
146a Gotham Rd., Kew, Vic. Ph. 80-3777

V.K. ELECTRONICS
63 HAROLD ST., DIANELLA, W.A., 6062 Service to Transceivers, Receivers, Transmitters, Antennae, etc.
Phone 78-2319

WGA 21 AWARD
The Radio Amateur Society of the Island of Gotland in Sweden is sponsoring the forthcoming Easter Contest in which all bands are valid for this very attractive award. The contacts shall be two-way (no cross-band) and in any mode which is legally allowed for the band used. WGA 21 cannot be exchanged to Amateurs operating from Gotland itself.
Each QSO gives the following number of points:
20 mx 3, 15 mx 3, 10 mx 3, 2 mx 6, 0.7 cr
The required number of points is 21.
Applications should be sent to the Awards Manager of the Radio Amateur Society of the Island of Gotland: c/o (GRK), P.O. Box 461, S-621 04 VISBY 4, Sweden. Please enclose excerpt of your log, certified by two licensed Amateurs. To cover this contest costs also each 10 IRC or 750 Swedish Kronor. A special prize will be awarded to the highest aggregate points score.

WANTED:
AR7 Coil Boxes. Prefer Band E or, even better, AR7. Hughenden, Old., 4821. All letters will be answered.

REPAIRS TO RECEIVERS, TRANSMITTERS
Constructing and testing: xtal conv., any frequency; Q5-ers, R9-ers, and transistorised equipment.

ECCLESTON ELECTRONICS
146a Gotham Rd., Kew, Vic. Ph. 80-3777

V.K. ELECTRONICS
63 HAROLD ST., DIANELLA, W.A., 6062 Service to Transceivers, Receivers, Transmitters, Antennae, etc.
Phone 78-2319
**WIA. V.H.F.C.C.**

**Amendment:***

- **Cert. No.**
- **Call No.**
- **Call**

**WIA. 52 MHz. W.A.S. AWARD**

**New Members:**

<table>
<thead>
<tr>
<th>Cert. No.</th>
<th>Call No.</th>
<th>Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>VK4ZJB</td>
<td>2</td>
</tr>
<tr>
<td>91</td>
<td>VK3AUN</td>
<td>1</td>
</tr>
</tbody>
</table>

**AMATEUR FREQUENCIES:**

**ONLY THE STRONG GO ON—SO SHOULD A LOT MORE AMATEURS!**

---

**LOW DRIFT CRYSTALS**

- 1.6 Mc. to 10 Mc., 0.005% Tolerance, $5
- 10 Mc. to 18 Mc., 0.005% Tolerance, $6
- Regrinds $3

**SPECIAL CRYSTALS: PRICES ON APPLICATION**

**MAXWELL HOWDEN**

15 CLAREMONT CRES., CANTERBURY, VIC., 3126

Phone 83-5090

---

**LOG BOOK**

**AVAILABLE IN TWO TYPES—VERTICAL OR HORIZONTAL**

Larger, spiral-bound pages with more writing space.

**Price 75c each**

plus 22 Cents Post and Wrapping

Obtainable from your Divisional Secretary, or W.I.A., P.O. Box 36, East Melbourne, Vic., 3002
SIDEBAND ELECTRONICS ENGINEERING

Another supply of YAESU MUSEN FT-200 Transceivers arriving soon, with a power supply kit of Australian made components. $25—A & R Melbourne Transformers of extra heavy duty special design, punched chassis, but no case or speaker included, for only $380 the package. Hurry, prices are going up now everywhere. FT-200s as usual corrected for CW kay-clicks. Further YAESU Units—

- FL-DX-2000 Linear Amplifier ........................................ $225
- FL-DX-400 Transmitter with table microphone ............... $375
- FL-2002-B Linear Amplifier with American CERTRON 572-Bs ... $350
- American CERTRON 572-Bs ........................................ per pair $45
- FC-6 or FC-2 Solid State Converters for 6 or 2 meters, 9V, inc. output: 28-30 MHz ................................................. each $25

500 Hz. CW Mechanical Filters. Kokusai, as used in the FR-DX-400 $20

Another supply of YAESU MUSEN FT-200 Transceivers arriving soon, for CW key-clicks. Further YAESU Units:

- KATSUMI ELECTRONIC KEYERS. Model EK26. for 240V. AC. switch ................................. $50
- FL-2000-B Linear Amplifier with American CETRON 572-Bs ........................................ $350
- American CETRON 572-Bs ........................................ per pair $45
- FC-6 or FC-2 Solid State Converters for 6 or 2 meters, 9V, inc. output: 28-30 MHz ................................................. each $25

500 Hz. CW Mechanical Filters. Kokusai, as used in the FR-DX-400 $20

FT-241 CRYSTALS, all channels 0 to 79. 375 to 515 KHz. in stock. ............................................... $25

OMEGA Noise Bridges. Model TE-7-01. still only $25—although they now cost U.S. $29.95 at the factory in Texas!

- BALUNS, 52 to 75 ohms, duplicates of the Hy-Gain BN-86, now with free co-ax plug! ........................................... $12.50

ANTENNAS:

Hy-Gain Hy-Quad. tri-band cubical quad, 10-15-20 metres with gamma matches for single co-ax feed, 1 KW. power ................................... $130

Hy-Gain TH6DXX ......................................................... $220

Package deal: TH6DXX with CDR Ham-M Rotator and 50 yards of 6-core rotator cable ................................................ $400

Hy-Gain 14-AVG Vertical ............................................... $52

Neutronics 4-BTV Vertical ........................................... $60

Mosley TA-33-JR, still only $105

Expected soon, the Mosley MUSTANG, 3 el. tri-band beam, 1 KW. capacity, equivalent of the Hy-Gain TH3MK3 ................................ $130

Webster and Mark Mobile Whips and Mounts as advertised before.

OMEGA Noise Bridges. Model TE-7-01, still only $25—although they now cost U.S. $29.95 at the factory in Texas!

FL-241 CRYSTALS, all channels 0 to 79, 375 to 515 KHz. in stock. ............................................... $25

Co-ax Connectors: Midland types PL-259, SO-239 females with or without flanges. PL-259L double-ended female per connector .............................................. $0.75 each $0.75

Co-ax Inserts for PL-259 for thinner co-ax, cable per $0.20

Expected soon, Midland 5 watt Base Station Transceivers, eight channels, 240V AC, fully P.M.G. approved for 27.860 MHz. operation, with S meter and power output metering, with SWR-Power Meter, dual meters (100 micro-amp.) for reflected power measurement, with SWR-Power Meter, dual meters (100 micro-amp.) for reflected power measurement, with PTT Dynamic Hand Microphone, steel case, 50K impedance, excellent voice quality, no rocking armature type, with coiled cord and mobile use clip ............................................... $125

PTT Dynamic Hand Microphone, steel case, 50K impedance, excellent voice quality, no rocking armature type, with coiled cord and mobile use clip ............................................... $125

Table Model Dynamic Microphone, with PTT bar or lock switch, 50K impedance, a quality bargain at ............................................... $15

Same Table Microphone with built-in two-stage pre-amplifier, adjustable for up to 50 dB. amplification ............................................... $25

Co-ax Connectors: Midland types PL-259, SO-239 females with or without flanges. PL-259L double-ended female per connector .............................................. $0.75 each $0.75

Co-ax Inserts for PL-259 for thinner co-ax, cable per $0.20

Expected soon, Midland 5 watt Base Station Transceivers, eight channels, 240V AC, fully P.M.G. approved for 27.860 MHz. operation, with S meter and power output metering, with SWR-Power Meter, dual meters (100 micro-amp.) for reflected power measurement, with PTT Dynamic Hand Microphone, steel case, 50K impedance, excellent voice quality, no rocking armature type, with coiled cord and mobile use clip ............................................... $125

PTT Dynamic Hand Microphone, steel case, 50K impedance, excellent voice quality, no rocking armature type, with coiled cord and mobile use clip ............................................... $125

Still a few NATIONAL brand-new Transformers and Chokes left. All prices quoted are net, cash with order. Sprinawood, N.S.W., subject to alteration without prior notice, sales tax included in all cases. Postage, freight and insurance are extras, and transformers are heavy.

SIDEBAND ELECTRONICS ENGINEERING

Telephone: Springwood (STD 047) 511-394, not part of the Sydney telephone exchange

DURALUMIN ALUMINIUM ALLOY TUBING

IDEAL FOR BEAM AERIALS AND T.V.

★ LIGHT ★ STRONG ★ NON-CORROSIVE

Stocks now available for Immediate Delivery

ALL DIAMETERS—1/4" TO 3"

Price List on Request

STOCKISTS OF SHEETS—ALL SIZES AND GAUGES

GUUNRSEN ALLEN METALS

PTY. LTD.

SALMON STREET, PORT MELBNE, VIC.

Phone 64-3351 (10 lines) T'grams: "Metals" Melb.

HANSON ROAD, WINFIELD, S.A.

Phone 45-9321 (4 lines) T'grams: "Metals" Adel.

GREAT CIRCLE BEARING MAPS

60c Post Free

Printed on heavy paper 20" x 30", Great Circle Map 16" diameter. Unavailable for all DXers and S.w.l's. Bearings around circumference allow precise beam headings to be made.

ALL MONEY GO TO "W.I.A. PROJECT AUSTRALIS"

Cheques, etc., to W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

SUPPORT PROJECT AUSTRALIS!

LIMITED SUPPLY OF—

GREAT CIRCLE BEARING MAPS

60c Post Free

Printed on heavy paper 20" x 30", Great Circle Map 16" diameter. Unavailable for all DXers and S.w.l's. Bearings around circumference allow precise beam headings to be made.

ALL MONEY GO TO "W.I.A. PROJECT AUSTRALIS"

Cheques, etc., to W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

Many Maps have been sold and we would like to thank all those people who have made donations over and above the price of the Map.

Only $3.00 for a subscription to—

"BREAK-IN"

OFFICIAL JOURNAL OF N.Z.A.R.T.

Send a cheque to the—

Federal Subscription Manager, W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

"BREAK-IN"

OFFICIAL JOURNAL OF N.Z.A.R.T.
FRONTIER' DIGITAL 500GT

It is our great pleasure to introduce to Australia a new and fascinating SSB, CW and AM transceiver—the "FRONTIER" DIGITAL 500GT. This model features a completely new design, making it possible to read directly to 1 KHz. accuracy both the transmitted and received frequency by means of a built-in digital nixie frequency counter. This transceiver also features very advanced design, using FETs and ICs throughout, balanced ring demodulator product detector, special Lamb noise blanker, very low noise RF and mixer receiver stages giving extra high signal-to-noise ratio, separate receiver tuned circuits. Blower cooled final tubes, two 6KD6 types. All facilities included, Schmidt trigger VOX, sidetone, ALC, AGC (fast and slow), upper and lower sideband, AM and CW. 580 watts PEP input, press-to-talk mike (ceramic), RIT control, heater switch for low-drain receiving. A full range of accessories are available for mobile operation. Band-edge indicator. 34 transistors, 14 diodes, 32 ICs, 6 tubes.

We feel that this transceiver is one of the most advanced units available in the world and expect demand to be high. We are accepting orders at present for delivery during late February and March.

W.F.S. ELECTRONIC SUPPLY CO.
12 BOWDEN STREET, NORTH PARRAMATTA, N.S.W., 2151. Phone 630-1621

BRIGHT STAR CRYSTALS
FOR ACCURACY, STABILITY, ACTIVITY AND OUTPUT

SPECIAL OFFER—
STANDARD AMATEUR CRYSTALS
STYLE HC6U HOLDER, FREQUENCY RANGE 6 TO 15 MHz.
0.01% $4.25
0.005% $5.50
Prices include Sales Tax and Postage

COMMERCIAL CRYSTALS
IN HC6U HOLDER, 0.005% TOLERANCE, FREQUENCY RANGE 6 TO 15 MHz.
$6.00 plus Sales Tax and Postage

Write for list of other tolerances and frequencies available.

COMPREHENSIVE PRICE LIST NOW AVAILABLE—WRITE FOR YOUR COPY

New Zealand Representatives: Mears. Carroll & Carroll, Box 2102, Auckland
Contractors to Federal and State Government Departments

BRIGHT STAR CRYSTALS PTY. LTD.
LOT 6, EILEEN ROAD, CLAYTON, VIC., 3168 Phone 546-5076

With the co-operation of our overseas associates our crystal manufacturing methods are the latest

"WILLIS" AIR-WOUND INDUCTANCES
Take the hard work out of Coil Winding, use — "WILLIS" AIR-WOUND INDUCTANCES

<table>
<thead>
<tr>
<th>No.</th>
<th>Dia. per L'gth</th>
<th>B. &amp; W.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-08</td>
<td>1/2</td>
<td>8 3</td>
<td>No. 3002</td>
</tr>
<tr>
<td>1-16</td>
<td>1/2</td>
<td>16 3</td>
<td>No. 3002</td>
</tr>
<tr>
<td>2-08</td>
<td>5/8</td>
<td>8 3</td>
<td>No. 3006</td>
</tr>
<tr>
<td>2-16</td>
<td>5/8</td>
<td>16 3</td>
<td>No. 3007</td>
</tr>
<tr>
<td>3-08</td>
<td>3/4</td>
<td>8 3</td>
<td>No. 3010</td>
</tr>
<tr>
<td>3-16</td>
<td>3/4</td>
<td>16 3</td>
<td>No. 3011</td>
</tr>
<tr>
<td>4-08</td>
<td>1</td>
<td>8 3</td>
<td>No. 3014</td>
</tr>
<tr>
<td>5-16</td>
<td>1 1/2</td>
<td>16 3</td>
<td>No. 3015</td>
</tr>
<tr>
<td>5-08</td>
<td>1 1/2</td>
<td>8 4</td>
<td>No. 3018</td>
</tr>
<tr>
<td>5-16</td>
<td>1 1/2</td>
<td>16 4</td>
<td>No. 3019</td>
</tr>
<tr>
<td>8-10</td>
<td>2</td>
<td>10 4</td>
<td>No. 3907</td>
</tr>
</tbody>
</table>

Special Antenna All-Band Tuner Inductance
7" length, 2" diam., 10 turns/inch,
Price $3.30


WILLIAM WILLIS & CO. PTY. LTD.
Manufacturers and Importers
77 CANTERBURY RD., CANTERBURY VIC., 3126 Phone 836-0707

Amateur Radio, March, 1971
Distributors
For Australian and
International
Manufacturers...

TEST EQUIPMENT:
RAPAR • BWD
SWE-CHECK • HORWOOD

SEMI-CONDUCTORS:
TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

Call and see our big range of test equipment

RAPAR Model SK100 Multi-tester

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!

Amateur Radio, March, 1971
AMERICAN RECORDING TAPE
(New, In sealed boxes)
1500 feet, 7-inch, Acetate, 1½ mil. .......... $3.50
1200 feet, 7-inch, Acetate, 1½ mil. .......... $2.50
1000 feet, 7-inch, Mylar, 1½ mil. .......... $2.00
1200 feet, 7-inch, Acetate, 1 mil. .......... $2.00
1200 feet, 7½-inch, Acetate, 1 mil. .......... $2.50
1200 feet, 7½-inch, Mylar, 1 mil. .......... $2.50
Postage 10c.

CASSETTE TAPES
Type C/20 .......... $1.50
Type C/90 .......... $1.20
New. Postage 10c.

NEW HEADPHONES AND MIKE
Phones 8 ohms. Mike 25 ohms
Price $15.75

METERS
MR3P METERS: square, face size 3½-in., M/Hole 2½-in.
Price $6.50 nett.
MR3P METERS: 0-5, 0-10, 0-20, 0-50 volt DC. Price $5.50.
MR3P METERS: 0.5, 1.0, 200, 1000 uA. Price $1.25.
MR3P METERS: 0.1, 0.22, 0.27, 0.33, 0.50, 0.0047,
25 volt working. Price $1.50 each.
MR2P METERS:square, face size 3½-in., M/Hole 2½-in.
Price $6.50 nett.
MR2P METERS: Square, face size 2½-in., M/Hole 2½-in.
Price $5.50.

DISC CERAMIC CONDENSERS
25 volt working
Sizes: 0.02, 0.027, 0.033, 0.05, 0.01, 0.0022,
Price $1.65 each.

BARGAIN ITEMS
Mini push-button Switches, new, 45c each.
Belling-Lee Sockets, 45c each.
Belling-Lee Plugs, 45c each.
Belling-Lee Line Joiners 48c each.
Spring-loaded Terminal Posts, yellow, green, red
or black, 15c each.
3.5 mm. Plugs. 25c each.
2.5 mm. Plugs. 15c each.
6.6 mm. Plugs. 40c each.
Stereo Plugs. 60c each; Stereo Sockets. 50c each.
R.C.A. Plugs, 50c each.
4-pin Speaker Plugs. 25c pair.
3-pin Dimp. Plugs. 50c each.
5293 Sockets, 10c each.
P259 Plugs. $1.00 each.
Ladel Crystal Mike, $1.20 each.
TV Plug/Socket. 45c pair.
Jabel Crystal Sets Coil, new. 55c each.
Jabel Aligning Tool Kits, set of two, 85c.
Jabel Aligning Tool Kit, set of 4, $1.30.
Adel Nibbling Tools. 75c each.
Car Radio Speaker Control and volume front and rear. 50c each.
Neon Spieler. 240 volt, 55c each.
10 pairs S/A Clips. 1.60.
Ditto with 6-inch lead (ideal jumper leads). $1.60.
3.5-3.5, 3-3 lb leads. $1.20.
Jabel Rotary Switches, $1.20. 1 pole, 12 positions. 24, 25, 26, 3-3, 4-2.
581 Edystable Variable Condensers. 50 pf. (no shaft). $1.50.

FOOTPRINT CRYSTAL RADIO
Type ER22. Set complete. Price $1.50.

A.C. ADAPTOR—BATTERY SAVER
Type PS64—240 volts to 6 or 9 volts, 300 mA. $12.50.
Type PS60—240 volts to 6 or 9 volts, 100 mA. $8.50.
Postage 30c.

C60 CASSETTE TAPES
Price 80c each.

EXTENSION SPEAKERS
Type T50 Tubular Extension Speakers, 8 ohms new.
Complete with lead and two plugs 2.5 and 3.5 mm. Price $4.30.
Wall mounting bracket 2.5c.

TELEPHONE INTER-COM. SETS
Telephone Inter-comunication Set with signal bulb,
12 volt D.C. Run 2 batteries, ideal for children.
Price $6.75. Postage 30c.

EGG INSULATORS
For your Aerial. 8c each.

VARIABLE CONDENSERS

RESISTORS
½ watt 8c each, 1 watt 18c each.

VERNIER DIALS
Ratio 8 to 1 reduction, scale 0-10.
Type T 501 ½ inch diameter ............... $2.00
Type T 502 2 inch diameter ............... $2.75
Type T 503 3 inch diameter ............... $3.30

LOW PASS FILTERS
A "Cabinet" Low Pass Filter will fix T.V. Cut off frequency at 60 MHz.
Better than 30 dB. Insertion loss negligible.
Impedance 50-72 ohms.
Price $5.50. Postage 10c.

SOLID STATE STEREO AMPLIFIER
8 watts r.m.s. per channel. Input for magnetic,
crystal and ceramic type microphone, P.V. cartridgés,
tape recorder input and output, tuner input.
Stereophone jack.
Reduced to $5.50. Postage 10c.

FIVE-CORE CABLE
5 x 50/36. Ideal for Intercoms, Telephones, etc.
New. 100 yd. rolls. 517 [517 75c], or 20c yd.

STEREO HEADPHONES
Professional quality (well known brand). Large
earpads, standard stereo plug, 6 ft. lead.
Price $5.75. Postage 50c.

CRYSTAL CALIBRATOR No. 10
Nominal range: 500 kHz. to 20 MHz. 500 kHz.
Stabilized at 250 KHz. 500 Hz. to 250 KHz.
BFO. Provides heterodyne output in steps of 1 KHz.
Output driven by machine cut strip gears, calibrated in 2 kHz.
Div. Easily read to 250 cycles. Output "spiked" approx.
1 sec. intervals. Identifies beat note.
Power requirements: 12V. DC at 0.3 amp., 250 volts at
15 mA. This is a precision instrument.
Complete with Precision Case.
Price $23.50.

CASSETTE TAPES
New. 100 yd. rolls. 517 (517 75c), or 20c yd.

STEREO HEADPHONES
Professional quality (well known brand). Large
earpads, standard stereo plug, 6 ft. lead.
Price $5.75. Postage 50c.

CRYSTAL CALIBRATOR No. 10
Nominal range: 500 kHz. to 20 MHz. 500 kHz.
Stabilized at 250 KHz. 500 Hz. to 250 KHz.
BFO. Provides heterodyne output in steps of 1 KHz.
Output driven by machine cut strip gears, calibrated in 2 kHz.
Div. Easily read to 250 cycles. Output "spiked" approx.
1 sec. intervals. Identifies beat note.
Power requirements: 12V. DC at 0.3 amp., 250 volts at
15 mA. This is a precision instrument.
Complete with Precision Case.
Price $23.50.

HAM RADIO SUPPLIERS
323 ELIZABETH STREET, MELBOURNE, VIC., 3000
Phones: 67-7329, 67-4286 All Mail to be addressed to above address

Our Disposals Store at 104 HICHEET ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 10.30 a.m. to 5.0 p.m.,
and on Saturdays to midday.

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, April, 1971
amateur radio
JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA. FOUNDED 1910

APRIL, 1971
Vol. 39, No. 4

CONTENTS

Technical Articles:

A Transistorised Carphone, Part Two—Transmitter .......... 5
Errata—Part One ........................................ 16
A 20W. 576 MHz. Varactor Multiplier Transmitter .......... 9
Practical VXO Design ...................................... 12
The Decibel and Decibels V. % Distortion—Lecture No. 11 ... 8

General:

Book Review: Single Sideband for the Radio Amateur ........ 17
Cook Bi-Centenary Award ........................................ 20
DX News ........................................................ 13
Expedition to Laccadive Group of Islands .................... 13
Federal Comment ............................................. 4
Federal Repeater Secretariat ................................... 17
From the W.I.A. Novice Investigation Committee ............ 17
Licensed Amateurs in VK ....................................... 19
New Call Signs ................................................ 19
New Equipment: Yaesu FT101 Solid State Transceiver ........ 17
Overseas Magazine Review ..................................... 14
Some N.Z.A.R.T. Awards ....................................... 16
The Brisbane DX Club Award .................................... 16
The Pretoria Award ............................................ 16
VHF .............................................................. 18
W.I.A. D.X.C.C. ................................................. 20
W.I.A. V.H.F.C.C. ............................................... 15
70th Anniversary of Old "CC" to be observed by W1SS ....... 11

Contests:

Winter V.H.F. and U.H.F. Contest ......................... 11

COVER STORY

The latest piece of equipment from the Yaesu Musen Co. Ltd. of Japan is their model FT-2F fully solid state 12-channel 144 MHz. FM Transceiver. Of compact dimensions, 6½" w. x 2½" h. x 10" d., and light weight of 4 lbs. It is ideally suited to "personal portable" operation as well as mobile or base station use. It can be powered from a 12v. DC source such as car battery, portable battery pack, or from the matching FP-2 AC power supply. Details from the Australian Agent, Ball Electronic Services, Melbourne.
WAYNE COMMUNICATION ELECTRONICS
Catering specially for the Amateur with Components, Receivers, Transmitters, Test Equipment. Everything from Resistors to 100 MHz. Frequency Counters

ALL AT UNBEATABLE PRICES

- COLLINS ART13 AUTO-TUNE TRANSMITTER. 2-18.1 MHz. AM or CW. 813 PA, 2 x 811 Modulators. Complete with all tubes. In good condition. $30 each. Freight forward.

- COMPUTER BOARDS. Removed from functional equipment. Contain 4 VHF transistors, 12 high speed switching diodes, 2% metal oxide resistors. $1.50 each.

- CERAMIC 1625 SOCKETS. Suit also 3AP1 CRO tube. 15c each.

- POWER SUPPLIES. 230v. 50 Hz. input, 300v. 100 mA. DC output. Manufactured by A & R. Brand new. $10 each.

- WIRE WOUND RESISTORS. Range: 1.8 to 620 ohms. 6 watt. New. 5c each.

- SPECIAL! TRANSFORMERS: Primary 230v. 50 Hz., Secondary 27v. 3 amp. This month only. $3.00 each.

All items plus pack and post.

Come and inspect the full range of equipment and components at

WAYNE COMMUNICATION ELECTRONICS
757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122
Phone 81-2818

BRIGHT STAR CRYSTALS
FOR ACCURACY, STABILITY, ACTIVITY AND OUTPUT

SPECIAL OFFER—

STANDARD AMATEUR CRYSTALS
STYLE HC6U HOLDER, FREQUENCY RANGE 6 TO 15 MHz.
0.01% $4.25
0.005% $5.50
Prices Include Sales Tax and Postage

COMMERCIAL CRYSTALS
IN HC6U HOLDER, 0.005% TOLERANCE, FREQUENCY RANGE 6 TO 15 MHz. $6.00 plus Sales Tax and Postage

Write for list of other tolerances and frequencies available.

COMPREHENSIVE PRICE LIST NOW AVAILABLE—WRITE FOR YOUR COPY

New Zealand Representatives: Messrs. Carrell & Carrell, Box 2102, Auckland
Contractors to Federal and State Government Departments

BRIGHT STAR CRYSTALS PTY. LTD.
LOT 6, EILEEN ROAD, CLAYTON, VIC., 3168 Phone 546-5076

With the co-operation of our overseas associates our crystal manufacturing methods are the latest

DURALUMIN ALUMINIUM ALLOY TUBING
IDEAL FOR BEAM AERIALS AND T.V.
★ LIGHT ★ STRONG
★ NON-CORROSIVE
Stocks now available for Immediate Delivery
ALL DIAMETERS — ¼" TO 3"
Price List on Request
STOCKISTS OF SHEETS—ALL SIZES AND GAUGES

GUNNERSEN ALLEN METALS
PTY. LTD.
SALMON STREET, PORT MELB'NE, VIC.
Phone 64-3351 (10 lines)
T'grams: "Metals" Melb.
HANSON ROAD,
WINGFIELD, SA.
Phone 45-6021 (4 lines)
T'grams: "Metals" Adel.

 Amateur Radio, April, 1971
SIDEBAND ELECTRONICS ENGINEERING

YAESU MUSEN:
FT-DX-400 Transceiver, with PTT microphone, still only $545
FT-200 Transceiver with power supply components kit $380
FT-200 Transceiver with AC supply-speaker unit and PTT mike $410
FL-DX-2000 Linear $225
FL-2000-B Linear with 572Bs $250
SP-400 Speaker for FT-DX-400 $22
FL-DX-400 Transmitter with PTT table microphone $17.50

HY-GAIN:
TH6DXX 6 element tri-band Master Beam $220
HY-QUAD tri-band Cubical Quad with gamma matches for single co-ax. feedline $110

14AVO four-band Vertical, 10 to 40 metres $52

MOSELEY: TAJ3JR 3 element tri-band Junior Beam $105

MUSTANG: 3 element tri-band Beam for up to 1 kw. power, comparable to the Hy-Gain TH3Mk3 $130

NEWTRONICS: 4-BTV four-band Vertical, 10 to 40 metres $60

MOBILE WHIPS AND MOUNTS:
Webster Bandspanner, Mark Helical Whips ... $55
Swivel body-mount and spring ... per set $10

DIGITAL CLOCKS: 24-hour, date and day of the week $25

OMEGA Antenna Noise Bridges, few left for only $25

CRYSTALS:
FT-241 type, 375 to 515 KHz., per box of 80 crystals $15
Sets of six matched FT-241 Crystals, including matched BFO or Carrier Crystals, 375 to 450 and 465 to 515 KHz. ... per set $7.50

BALLUNS: Locally made, electrical copy of the Hy-Gain BN-88 ... $12.50

FILTERS: Kokusai mechanical type 455 KHz., 500 cycles for CW ... $20

SIDEBAND ELECTRONICS ENGINEERING
Proprietor: ARIE BLES
P.O. BOX 23, SPRINGWOOD, N.S.W., 2777

TRIMAX for a complete transformer range!

Trimax have available most types of transformers, ranging in weight from a fraction of an ounce to half a ton. You bring us the problem — we will supply the transformer.

L M ERICSSON PTY. LTD.
"TRIMAX" DIVISION

FACTORY: CMP. WILLIAMS RD. & CHARLES ST., NORTH COWRA, VICTORIA. PHONE: 31-1389 . . . TELEGRAPH ADDRESS: "TRIMAX" MELB.
In the January issue I wrote about the Federal Executive's problems revolving round the near impossible situation facing the many honorary officers administering the organisation and this magazine. I gave a brief outline of the facts which brought about the decision to employ a Secretary/Manager. In that same issue there appeared an advertisement for filling this post.

I am very pleased to tell you that the post has now been filled following upon interviews with candidates on a short list selected from all the applications which were received. The successful candidate happened to be in Australia at the time when the post was advertised and it is our good fortune that his services are now available to us.

He is 53-year-old PETER B. DODD, VK6/5/3/1/2CIF, better known perhaps as a past DXer with such call signs as VQ4PBD, VQ5PBD, VQ1PBD, 5H3PBD, 7Q7PBD, G3PBD and many others dating back to 1946 and to pre-war as a listener. He has also operated for a short time as ZL1BDC portable/mobile s.s.b. from a motor caravan in which he and his family travelled overland from Europe. On this safari he operated 4U1ITU and held calls as OE1ZBW and YA1PBD.

In addition to being reasonably well known on the DX bands, he is a Life Vice-President of the Radio Society of East Africa. He served on the Council of that Society, organised Amateur Radio familiarisation exercises for the benefit of local Ministers of at least two African governments, was closely involved with the establishment and progress of the East African Emergency Network allied with communications for the world-renowned annual East African Safari and, when not resident in Mairobi, the Society's headquarters, reminded them that there were such people as country members. I gather from another source that he was awarded a medal by the Belgian Government for work done during the Congo crisis.

On the general administrating side, Peter Dodd had come up through the ranks of Customs and Excise in East Africa, culminating as Head of the Department in Malawi where he was responsible for establishing it in that country. For a period he was a Director of an Amateur equipment manufacturing company in the U.K. The Selection Committee were satisfied that he would bring to the position almost unique experience with impartial detachment, a wealth of administrative ability and a fund of enthusiasm. We wish him well.

It is fortunate too that we will possess someone capable of effecting a smooth transition from the existing to the new Constitution of the W.I.A. which is mentioned in my Report, to be published in "A.R.," to be considered at the Federal Convention in Brisbane this month. No doubt your Federal Councillor will have informed you about the various motions which are to be debated at this Convention.

However, it is thought that the Convention will give more time in considering the precise plans which will be necessary to effect the change-over to the new W.I.A. Constitution, the I.A.R.U. Region 3 Conference in Tokyo and the I.T.U. World Administrative Radio Conference in Geneva later in the year. I ask you to read these references with care and to observe the work being done on behalf of all Amateurs in this part of the globe.

Once again I seek your support by continuing your interest and by each one of you recruiting at least one more member this year.

MICHAEL ONEW, VK3KI.
Federal President, W.I.A.
The authors continue this second part of the article with a description of the transmitter and associated circuits. From correspondence received, it appears that boards, diagrams and/or kits of this Carphone will be in demand. Accordingly, work is proceeding along these lines.

The transmitter can conveniently be dealt with in three parts—the exciter/modulator, the driver stage, and the final power amplifier. This grouping is chosen since each module represents a physically separate entity with each module on a separate circuit board. The exciter/modulator is on a p.c.b. 7" x 2", while both driver and p.a. stages are each on boards 3½" x 2".

It must be stated right at the outset that the transmitter is a frequency modulated device and not (as are the popular Vintens, A.W.A's and T.C.A's) a phase modulated system. The decision to use f.m. rather than p.m. was based mainly on circuit simplicity and ease of adjustment.

Briefly, the main difference between the two methods is that with f.m. the amount of deviation is proportional only to the level of audio drive and is independent of the modulating frequency. With p.m. on the other hand, the amount of deviation is proportional not only to the audio level, but also the frequency of the modulating signal, the higher the modulating frequency the greater the amount of deviation. Thus in a p.m. system it is necessary in the transmitter to reduce the audio drive as the modulating frequency increases (de-emphasis) and in the associated receiver to increase the audio "highs" to compensate (pre-emphasis). The amounts of pre-emphasis and de-emphasis used in surplus commercial units varies from make to make.

In order that the transmitter now described be compatible with the wide variety of transceivers in Amateur use, it has been necessary to provide some audio shaping in the modulator. Since this shaping has been done with only two fixed resistors and two fixed capacitors and since these can be altered to taste, obtaining audio compatibility presents no problem.

THE EXCITER/MODULATOR

Fig. 6 gives the circuit diagram of the complete exciter. It uses three bipolar transistors in the audio section, a bipolar oscillator and three protected dual gate MOSFETs as multipliers. These latter devices are quite new on the Australian scene and can best be described as higher dissipation, epoxy packaged 3N140s, but without the problems of static destruction associated with the latter device. They can be handled and soldered into place with no more care than the normal run of transistors.

The MPF121s have been used in this design on two grounds. Firstly, they are the same price as the type of bipolar transistor used to date in multiplier service (2N3564, 2N3565, BF115, etc.), but more importantly they are to be preferred in view of the almost perfect waveform purity that can be obtained. Those who have had experience with bipolars as frequency multipliers will be aware of the difficulties of obtaining a sub harmonic and spurious-free waveform from them.

Input from a medium impedance dynamic or rocking armature micro-

---

**FIG. 6.** 2 METRE F.M. EXCITER

* May be needed to adjust frequency response.
coupled pair L103/L104 to the parallel gates of the second MPF121 doubler. Again a pair of coils is used to transfer the 144 MHz. output to the third MPF121. Some capacitive top coupling is used in this case. The third MPF121 is used as an amplifier and has about 7 volts applied to its second gate. A series tuned circuit in the drain uses a capacitative divider to give a 50 ohm output impedance. The trimmer at the bottom of this divider is a standard Philips 3-30 pF. unit.

Setting up of the Unit

This is simple but does require some form of output indicator, a milliammeter, and an absorption wavemeter/g.d.o. covering 30 to 80 MHz. A circuit of a suitable output indicator is given in Fig. 10. It consists of a 47 ohm load resistor, a germanium diode such as an OA91 and a voltmeter. Assuming an output of 100 mW. from the exciter, the rectified d.c. will be about 21 volts. If the voltmeter is used to set up the driver and p.a. stages then voltages of respectively 7-8 and 20-25 will be encountered.

A carbon resistor must be used and not a wire wound one. A one watt resistor is suitable for the exciter (and even possibly for the driver), but the best overall solution is to parallel ten 470 ohm one watt resistors to give a power handling capacity of ten watts. The indicator can then be used for the p.a. as well. Keep all connections as short as possible.

Bear in mind that the above indicator is just that. If a proper measuring power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter is required then a kit of parts for a fully shielded, two range power meter.

The commissioning procedure is as follows. Set the deviation control (TP1) to minimum, i.e. with the slider earthed. Put a dummy load across the output of the exciter. This load may consist simply of a 47 ohm resistor, or the indicator described or a proper 50 ohm power meter. Apply 12 volts through a 0-250 mA. meter. Set TP2 so that the voltage between the collector of the 2N4249 modulator transistor and earth is about 5 volts. TP2 should be about the middle of its range. At this stage the current drawn should be around 20 mA. and the oscillator may or may not be going.

Couple an absorption wavemeter (g.d.o. in the wavemeter position) to the oscillator collector coil L101 and adjust its core until output on 36 MHz. is obtained. Then set the wavemeter to 72 MHz., couple it to L103 and adjust the cores of L102 and L103 for maximum output. Note that as each of the cores is adjusted, and as output comes up the total current drawn will increase, each of the MPF121 stages pulling some 20-25 mA. as it comes on to resonance.

THE DRIVER STAGE

The driver stage uses a Motorola 2N5589 (MM1601) to raise the power level to 111 watts. Fig. 8 gives the appropriate circuit diagram.

Input from the exciter at 50 ohms is matched to the transistor base by the two 1-9 pF. trimmers and L108, while the output impedance is brought up to 50 ohms by means of L109 and its associated capacitors.
A low value resistor is used across the collector choke to reduce Q and inhibit parasitic oscillation. The h.t. supply is decoupled by means of RFC5 and the 470 pF./10 μF. combination.

RFC6 at the base of the transistor consists of a single wire running through a half-inch length of ferrite rod which has high losses at the frequency of operation. Use of high frequency material such as the Neosid F29 slugs used as decoupling devices elsewhere in the design is to be avoided. In the absence of suitable ferrite, a ¼ watt 47 ohm resistor can be substituted with only a small drop in overall efficiency.

The 470 pF. h.t. decoupling capacitor is a normal disc ceramic and the 10 μF. tantalum, but all other capacitors in the signal circuits are Philips ceramic beads. The trimmers are the Shinmei type previously mentioned.

Setting up is relatively simple. A 50 ohm dummy load is connected to the output and all variable capacitors set to full capacity. Drive is applied from the exciter together with the initial h.t. of 5-6 volts fed in through a 0-500 mA. meter. The input (series) trimmer is reduced in capacity until the current drain begins to rise and output is indicated.

All three capacitors are then adjusted for maximum output. The h.t. is then raised to, say, 9 volts and the trimmers adjusted for maximum output. Finally, full h.t. is applied and again the three trimmers adjusted for maximum output.

Note that at full h.t. the 1-9 pF. trimmer between L108 and earth should be between half and full capacity, while the series trimmer should be between half and zero capacity. The current drawn by the driver stage alone should be about 250 mA. Currents grossly in excess of this are an indication either of mistuning or of parasitic oscillation. Power output should be at least ½ watts.

THE OUTPUT STAGE

A Motorola 2N5590 (MM1602) is used to raise the output power to the 10 watt level. Note that this is r.f. power output and not d.c. power input.

In most respects the p.a. stage is a copy of the driver stage except that it uses fixed capacities and variable inductors rather than the other way round. All the capacitors except the 470 pF./10 μF. tantalum are Philips beads and two are paralleled at the output to increase the power handling capacity of the stage. The normal disc ceramics are not intended to carry large r.f. currents and, if used, will run hot or blow. The “lossy” ferrite RFC technique is again used in the base of the transistor.

Tune up follows the same lines as the driver. The cores of L110 and L111 are set full in, a 50 ohm load connected, drive is applied and a low level of h.t. fed in through a 0-2 amp. meter. The cores of the two coils are adjusted for maximum output. H.t. is then raised in two or three steps to maximum, at each step the coil slugs being adjusted for maximum output consistent with the lowest collector current drain. If, at any time, the collector current rises at a more rapid rate than the r.f. output is rising, then it is possible that the stage is breaking into oscillation or is being mistuned. As a guide, at 10 watts r.f. output and a 13.5 volt rail, the p.a. should draw no more than 1 amp.

COIL DATA

L101—20 turns 26 B. & S. enamel, tapped 6 turns, close wound on Neosid 722/1 former, F29 slug.
L102—20 turns 26 B. & S. enamel, close wound on Neosid 722/1 former, F29 slug.
L103—11 turns 23 B. & S. enamel, tapped 3 turns, close wound on Neosid 722/1 former, F29 slug.
L104—10 turns 23 B. & S. enamel, close wound on Neosid 722/1 former, F29 slug.
L105—⅜ turns 18 B. & S. tinned copper, spaced ⅜", tapped 2 turns, on Neosid 722/1 former, F29 slug.
L106—⅜ turns 18 B. & S. tinned copper, spaced ⅜", on Neosid 722/1 former, F29 slug.
L107—⅜ turns 18 B. & S. tinned copper, spaced ⅜", tapped 2⅝ turns, on Neosid 722/1 former, F29 slug.
L108 (driver)—⅘ turns 18 B. & S. tinned copper, air cored, 5/16" i.d., spaced ⅛".
L109 (driver)—5 turns 18 B. & S. tinned copper, air cored, 5/16" i.d., spaced ⅛".
L110 (p.a.)—⅜ turns 18 B. & S. tinned copper, spaced ⅜", on Neosid 722/1 former, F29 slug.
L111 (p.a.)—3 turns 18 B. & S. tinned copper, spaced ⅜", on Neosid 722/1 former, F29 slug.
RFCL—2, 3, 5, 7, 10—Single wire through F29 slug.
RFCC—6 turns 23 B. & S. enamel, close wound on ⅛" i.d., air cored, ⅛" long.
RFCD—Single wire through ferrite rod ¼" long (or 33 ohm resistor).

RFC8—3 turns 18 B. & S. tinned copper, 1/16" i.d., spaced to occupy ⅛ length.
RFC9—Single wire through ferrite rod ¼" long (or 33 ohm resistor).

GENERAL

While the designs presented for both the receiver and transmitter are well up with the current state of the art, they are not so far “out” that they are impractical to build because the key components are obtainable. The two key components in this case are the Toyo 10M-2A-1 filter which is marketed in Australia by Arbor Pty. Ltd., of 282 Bell Street, Coburg, Vic., and the AMC1272 and 1306 which can be obtained from A.W.V. in Sydney. The 455 KHz. i.f. transformers used are “Rapar 6” replacement transformers from Radio Parts Pty. Ltd. in Melbourne (who also stock the Fairchild transistors), whilst all the Motorola devices (MPF121, 2N5589/90, and the MC1454) are from Total Electronics of 239 Bay Street, Brighton, Vic., 3186. All other “bits” are normal components held by the VK3 W.I.A. new components service at P.O. Box 65, Mt. Waverley, Vic.

At the end of Part One it was stated that boards, diagrams and/or kits would be made available if required. In subsequent correspondence it appears that such requirement exists and, accordingly, work is proceeding to do this. Further details can be obtained from either of the above addresses.

In conclusion there are a couple of points that may be of interest. It was stated earlier in this article that the MPF121s had been used because of their ability to give excellent waveform. The complete transmitter, running 10 watts into a dummy load, when checked with a Philips v.h.f. sampling c.r.o. showed no sign of sub harmonic content and an excellent waveform, indicating minimal higher order harmonics. Secondly, it should be noted that the driver and p.a. transistors are rated for infinite s.w.r., i.e. they should work into an open circuit or a short circuit. Whilst most definitely not recommended as normal operating procedure, such a specification does much to reduce fears of catastrophic failure of relatively expensive devices due to accidental short or open output conditions.

Amateur Radio, April, 1971
THE DECIBEL AND DECIBELS V. % DISTORTION

LECTURE NO. 11

C. A. CULLINAN, VK3AXU

THE DECIBEL

In communications systems it is convenient when making measurements or calculations to express the RATIO between any two amounts of electric or acoustic power in units on a logarithmic scale.

The DECIBEL (1/10th of the BEL) on the Briggs (Base 10) scale is in almost universal use, although sometimes the NEPER on the Naperian base-e-scale is used.

Because voltage and current are related to power by impedance, both the decibel and the neper can be used to express voltage and current ratios, provided care is taken to account for the impedances associated with them.

In a similar manner, corresponding acoustical powers may be compared.

It must be understood, thoroughly, that both the decibel and the neper are RATIOS and have no meaning unless a reference is stated. For instance, it makes sense if we state that the ratio of one thing to another is 10 to 1, but it is meaningless if we simply state that the ratio is 10, because we no longer have a reference.

In radio work the decibel is used almost exclusively to express ratios and in dealing with Audio Frequency power it is almost universal to use a reference level of 1 milliwatt power in 600 ohms, known as 0 dbm. or zero dbm. In this context 0, or zero, does not mean nothing or nil but the transition between powers less than or greater than 1 milliwatt in 600 ohms (0 dbm.).

The number of decibels (Ndb) corresponding to the ratio between two amounts of power $P_1$ and $P_2$ is

$$Ndb = 10 \log_{10} \frac{P_1}{P_2}$$

when two voltages $E_i$ and $E_o$, or two currents $I_i$ and $I_o$ operate in the same or equal impedances,

$$Ndb = 20 \log_{10} \frac{E_i}{E_o}$$

and

$$Ndb = 20 \log_{10} \frac{I_i}{I_o}$$

If $E_i$ and $E_o$, or $I_i$ and $I_o$ operate in unequal impedances,

$$Ndb = 20 \log_{10} \frac{E_i}{E_o} \pm 10 \log_{10} \frac{Z_i}{Z_o} \pm 10 \log_{10} \frac{K_i}{K_o}$$

and

$$Ndb = 20 \log_{10} \frac{I_i}{I_o} \pm 10 \log_{10} \frac{Z_i}{Z_o} \pm 10 \log_{10} \frac{K_i}{K_o}$$

where $Z_i$ and $Z_o$ are the absolute magnitude of the corresponding impedances and $K_i$ and $K_o$ are the values of power factor for the respective impedances.

---

Decibels Distortion %

<table>
<thead>
<tr>
<th>Decibels</th>
<th>Distortion %</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20</td>
<td>10.00</td>
</tr>
<tr>
<td>-21</td>
<td>8.913</td>
</tr>
<tr>
<td>-22</td>
<td>7.943</td>
</tr>
<tr>
<td>-23</td>
<td>7.079</td>
</tr>
<tr>
<td>-24</td>
<td>6.310</td>
</tr>
<tr>
<td>-25</td>
<td>5.623</td>
</tr>
<tr>
<td>-26</td>
<td>5.012</td>
</tr>
<tr>
<td>-27</td>
<td>4.467</td>
</tr>
<tr>
<td>-28</td>
<td>3.981</td>
</tr>
<tr>
<td>-29</td>
<td>3.548</td>
</tr>
<tr>
<td>-30</td>
<td>3.162</td>
</tr>
<tr>
<td>-31</td>
<td>2.818</td>
</tr>
<tr>
<td>-32</td>
<td>2.512</td>
</tr>
<tr>
<td>-33</td>
<td>2.239</td>
</tr>
<tr>
<td>-34</td>
<td>1.995</td>
</tr>
<tr>
<td>-35</td>
<td>1.778</td>
</tr>
<tr>
<td>-36</td>
<td>1.585</td>
</tr>
<tr>
<td>-37</td>
<td>1.413</td>
</tr>
<tr>
<td>-38</td>
<td>1.259</td>
</tr>
<tr>
<td>-39</td>
<td>1.222</td>
</tr>
<tr>
<td>-40</td>
<td>1.000</td>
</tr>
</tbody>
</table>

The full output voltage is the reference of 0 db = 100%.

It will be seen from the above formulae that power, voltage and current ratios may be expressed logarithmically in decibels irrespective of whether the impedances are equal or unequal.

It is possible to convert decibels to nepers and vice-versa.

Multiply decibels by 0.1151 to find nepers.

Multiply nepers by 8.686 to find decibels.

DECI BELS V. % DISTORTION

In its Standards for the Technical Equipment and Operation of Medium Frequency Broadcasting Stations, second edition, 18th June, 1968, the Australian Broadcasting Control Board requires that the harmonic distortion in equipment be expressed in a percentage of the effective value of the fundamental audio frequency voltage and the harmonic voltages present in the output.

However, in recent times there has been a tendency for some authorities and manufacturers of equipment to express harmonic distortion in decibels instead of in percentage, and until one becomes familiar with this it can be very inconvenient.

Therefore a conversion table has been prepared showing the equivalent distortion for a given db. ratio covering 10% to 0.1% distortion.

SUPPORT PROJECT AUSTRALIS!

LIMITED SUPPLY OF—

GREAT CIRCLE BEARING MAPS

60c Post Free

Printed on heavy paper 20" x 30", Great Circle Map 16" diameter. Invaluable for all DXers and S.w.l's. Bearings around circumference allow precise beam headings to be made.

ALL MONEY TO GO TO "W.I.A. PROJECT AUSTRALIS"

Cheques, etc., to W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

Many Maps have been sold and we would like to thank all those people who have made donations over and above the price of the Map.

Only $3.00 for a subscription to—

"BREAK-IN"

OFFICIAL JOURNAL OF N.Z.A.R.T.

Send a cheque to the—

Federal Subscription Manager, W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

Page 8

Amateur Radio, April, 1971
A 20W. 576 MHz. VARACTOR MULTIPLIER TRANSMITTER

R. J. HALLIGAN,* VK3AOTT

After an examination of the theory of varactor frequency multiplication, two practical frequency quadruplers are presented. The first will deliver 10 watts FM/CW at an efficiency of 33%, while the second will deliver 20 watts FM/CW at an efficiency of 50%. Operation with amplitude modulated signals is also possible.

Varactor diodes are a class of semiconductor device intended for power-frequency multiplication at v.h.f. and above. Circuits are characterised by the absence of any d.c. power input, high r.f. output to r.f. input efficiencies, and simple construction. Using varactor techniques powers in excess of 300w. at 100 MHz. and 25w. at 1,000 MHz. have been obtained.

The response of varactor multiplier circuits to amplitude modulated inputs is dependent on the power level, modulation percentage and type of diode. Most designs are capable of providing results acceptable to the Amateur. Some of the more recently developed diodes have been used commercially for the frequency multiplication of television signals, an application requiring a high degree of linearity.

**THEORY OF OPERATION**

**Abrupt Junction Varactors.**—Early varactor diodes relied on the capacitance-voltage non-linearity characteristic of an abrupt P-N junction. Such a junction is the result of a constant resistivity profile in both the P and N regions. See Fig. 1. The dependence of capacitance on voltage is given by equation 1.

\[
C_j = \frac{C_0}{(1 + V/\phi)^{1/n}} \quad (1)
\]

where \( C_j \) is the voltage dependent junction capacitance, \( C_0 \) is the capacitance at zero bias, \( V \) is the reverse bias voltage across the varactor, and \( \phi \) is the contact potential, approx. 0.5 for silicon.

In order to ensure high diode 'Q' and therefore good efficiency, series resistance and therefore resistivity must be kept low. However, low resistivity results in low breakdown voltage, giving rise to significant power limitations.

There are also limitations in the response of abrupt junction varactors to amplitude modulated signals. The harmonic generation mechanism as given by equation 1 is voltage dependent, therefore the abrupt junction varactor cannot react to both high and low level signals with the same efficiency. Of greater importance is the variation of varactor capacitance with changes in signal level, leading to circuit detuning during the amplitude modulated cycle. This undesirable level mechanism causes the “switching” commonly seen with varactor multipliers. In some cases the varactor will even act as the active element of a parametric oscillator, with the input signal acting as pump source. When this occurs an unwanted discontinuity or oscillation appears on the amplitude modulated waveform.

**Step-Recovery Varactors.**—More modern devices are not subject to these power and linearity limitations. These devices are constructed so that the resistivity of the material peaks sharply in the vicinity of the junction (depletion region), but is low elsewhere. A typical impurity profile for this type is also shown in Fig. 1.

The effect of this construction is to reduce the dependence of junction capacitance on voltage so that this is no longer the dominant mechanism for the generation of harmonics. Instead, harmonics are generated by a pulse of reverse current resulting from the return of stored carriers. This is known as the step-recovery effect.

**AVAILABLE DIODES**

The table lists the characteristics of some varactor diodes which are available. Also listed are some transistors, the collector-base junctions of which can be used for varactor multiplication.

**A PRACTICAL 576 MHZ. QUADRUPLER**

The circuit of a practical quadrupler is shown in Fig. 2. L1-C1 and L2-C2 form a simple double tuned circuit matching network at 144 MHz. Currents at that frequency are caused to flow in D1, which is effectively a capacitor. However, since this capacitance is non-linear, harmonics of 144 MHz are produced. As is common with
harmonic generators, the second harmonic is strongest, with subsequent harmonics progressively diminishing in amplitude. It is quite feasible to simply couple the diode to a tuned circuit at 576 MHz and extract energy at this frequency. However, because of the small amplitude of the fourth harmonic efficiency would be low.

Efficiency can be improved by the addition of series resonant idler circuits at 288 MHz (L3-C3) and 432 MHz (L4-C4). These idlers re-circulate the harmonics, which are mixed with other components or multiplied within the diode, so enhancing 576 MHz output.

Resistor R serves to develop self-bias for the diode. While the varactor is primarily a variable capacitor for harmonic generation, it does conduct at one peak of every cycle. The subsequent d.c. current flow through R establishes a bias point for the diode.

L5-C5 and L6-C6 are resonant at 576 MHz and attenuate undesired products. The load is tapped onto L6 at a point such as to reflect the optimum load impedance to the diode.

Resistor R serves to develop self-bias for the diode. While the varactor is primarily a variable capacitor for harmonic generation, it does conduct at one peak of every cycle. The subsequent d.c. current flow through R establishes a bias point for the diode.

L5-C5 and L6-C6 are resonant at 576 MHz and attenuate undesired products. The load is tapped onto L6 at a point such as to reflect the optimum load impedance to the diode.
f.m./c.w. input, 20 watts output was obtained at 576 MHz.

Physical layout of the improved design is given in Fig. 5 and can also be seen from the photographs. Basic dimensions are the same as for the single-diode design.

CONCLUSION

The designs presented provide ready means of generating more c.w. power on 576 MHz than can be conveniently generated with valves, and with considerably less complexity.

REFERENCES

1. Motorola Application Note AN147, "High-Power Varactor Diodes: Theory and Application."
2. Motorola Application Note AN181, "Varactor Diodes and Circuits for High Power Output in Linear Response."
3. Turner, R. P., "ABCs of Varactors" (Foulsham-Sams).

70th ANNIVERSARY OF OLD "CC" TO BE OBSERVED BY W1SS

The year 1971 marks the 70th anniversary of the start of construction of the old "CC" — the original Marconi station on Cape Cod, Massachusetts, where the first wireless messages between England and the United States were exchanged by President Teddy Roosevelt and King Edward VII. of England.

Those stations desiring to work the site of the old Marconi station will find W1SS active on all bands from 160 metres through 2 metres during the DX hours for each band on the last week-end in April. Look for W1SS to be posted not later than 31$t August, 1971.

Rules

1. There is only one division—Transmitting.
2. All Australian Amateurs may enter for the Contest whether their stations are fixed, portable or mobile.
3. Test A.M., S.S.B., v.h.f. and u.h.f. bands may be used, but cross-band contacts are prohibited. Cross mode contacts will be permitted after each successive contact.
4. Only one contact per band per station is allowed each E.A.S.T. calendar day. Should two or more licensed Amateurs operate a particular station, each will be considered a separate contestant and must submit a separate log under his own call.
5. Entries must operate within the terms of their licences.
6. Ciphers. Before points may be claimed for a contact, serial numbers must be exchanged. The serial numbers of five or six figures will be made up of RS (telephony) or RS (repeater) plus three figures, commencing at 001 for the first contact and increasing in multiples of 10 for each successive contact.
7. Ineligible Contacts: (a) On the 52 MHz. band, contacts using the mode usually referred to as "Sporadic E" will be disqualified. The sponsor reserves the right to make decisions in doubtful cases.
8. Contacts over distances below 50 miles on the bands 52 to 585 MHz. will be disqualified as will contacts below 20 miles on the bands 1215 MHz. and above.
9. Contacting on net frequencies or through repeaters will be disqualified.
10. Scoring for all contacts will be based on mileage. The score will be inversely proportional to the distances which currently be expected at that time of the year on each band.
11. The multipliers are based on the capabilities of Australian stations using "state of the art" equipment or techniques and are in roughly inverse proportion to the distances which currently be expected at that time of the year on each band. The maximum distances are based on the normal maximum range of beginner type stations running 10 watts output to relatively small (by today's standards) antennas, including 6 metres. This has been made possible by the disqualification of "Sporadic E" contacts which only occur infrequently at this time of the year.
12. Contacts over distances below 50 miles on the bands 52 to 585 MHz. will be disqualified as will contacts below 20 miles on the bands 1215 MHz. and above.
13. Entries to the above Contest should be sent to:—

D. D. Tanner, VK8AU.

Table 1—Some available varactor diodes and transistors which can be used as varactors.

<table>
<thead>
<tr>
<th>Type</th>
<th>Source</th>
<th>Power (Watts)</th>
<th>Frequency (MHz)</th>
<th>Efficiency (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAY66</td>
<td>Mullard</td>
<td>10</td>
<td>500</td>
<td>50</td>
</tr>
<tr>
<td>BAY96</td>
<td>Mullard</td>
<td>30</td>
<td>144</td>
<td>66</td>
</tr>
<tr>
<td>MA4060A equiv.</td>
<td>Surplus</td>
<td>40</td>
<td>144</td>
<td>50</td>
</tr>
<tr>
<td>1N4386</td>
<td>Motorola</td>
<td>147</td>
<td>50</td>
<td>72</td>
</tr>
<tr>
<td>1N4387</td>
<td></td>
<td>60</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td>1N4388</td>
<td></td>
<td>25</td>
<td>500</td>
<td>60</td>
</tr>
<tr>
<td>1N5144</td>
<td>Mullard</td>
<td>10</td>
<td>144</td>
<td>60</td>
</tr>
<tr>
<td>BXY27</td>
<td></td>
<td>6</td>
<td>2000</td>
<td>58</td>
</tr>
<tr>
<td>BXY28</td>
<td></td>
<td>6</td>
<td>2000</td>
<td>58</td>
</tr>
<tr>
<td>2N3632 (C-6)*</td>
<td>Numerous</td>
<td>30</td>
<td>100</td>
<td>33</td>
</tr>
<tr>
<td>PT2163D (C-6)*</td>
<td>T.R.W.</td>
<td>30</td>
<td>144</td>
<td>33</td>
</tr>
<tr>
<td>2N4012*</td>
<td>Numerous</td>
<td>25</td>
<td>432</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 1.—Some available varactor diodes and transistors which can be used as varactors.

* By measurement.
PRACTICAL VXO DESIGN
An Interesting Approach to Frequency Stability in Oscillator Circuits

GUS GERKE, K6BIJ

You're on the air having an enjoyable conversation. You switch over to the other station and the fellow says, "Sorry, missed most of that. Someone drifted onto your frequency." Sound familiar? The "someone" is usually a combination of unstable v.f.o.'s and receiver drift.

The drifting signals one hears today suggest that v.f.o. stability is not really as good as claimed by equipment manufacturers and authors of v.f.o. articles in the Amateur magazines. The best answer I've found to this problem is the variable-frequency crystal oscillator, or vxo.

The vxo circuits described in this article combine the flexibility (within limits) of a v.f.o. with the inherent stability of crystal frequency control. Frequency can be varied between 2 to 720 KHz., depending on the crystal frequency and other considerations, which I'll discuss. Many Amateurs I have talked to never heard of varying crystal's frequency over such a wide range.

Very little information has been written about the vxo. One article describes a circuit that can pull down the frequency of an 8 MHz. crystal about 4-5 KHz. before the circuit becomes "a rather inferior v.f.o." With this circuit (Fig. 1) as a starting point, I designed the circuits of Figs. 2 and 3, using FT-241 crystals in the 450 KHz. region and the circuit of Fig. 4 using 3.5 - 8.5 MHz. crystals.

CIRCUIT DEVELOPMENT

The vxo shown in Fig. 2 is a modification I made to a BC604 f.m. tank transmitter. The vxo output goes through a stage of amplification and several frequency multipliers to obtain output on 21 MHz. I have used this vxo on 7 and 21 MHz. c.w. with excellent results. The circuit has also been used to operate a 2 metre transmitter. Eight crystals were needed to cover the entire 2 metre band.

The only addition to the BC604 was L1, C1. Capacitor C1 is used to pad the crystal frequency over a certain range, in this case 2 KHz. With an increase in padding range, the effects of temperature, vibration, and hand capacitance become more pronounced; and the same precautions in building v.f.o.'s must be used. These effects are small, however, and the crystal is still the frequency-controlling element. If you don't exceed the padding range, the vxo won't become an "inferior v.f.o."

The circuit of Fig. 3 seems to work well with the same low-frequency crystals used in the vxo of Fig. 2. The solid state version shown was also used with the BC604. Since the crystals furnished with the BC604 are less than 2 KHz. apart, continuous coverage to the next lower-frequency crystal is possible. Stable 2 KHz. padding was obtained with the circuit of Fig. 3.

A transistor vxo that produces stable 50 KHz. padding is shown in Fig. 4. This vxo can also be used with a crystal in the 8 MHz. region for 6 or 2 metre operation. Doubling will produce a padding range of 100 KHz. on 14 MHz., 150 KHz. on 21 MHz., with tripling, and 200 KHz. on 28 MHz. with quadrupling. To cover the entire 2 metre band, you'll need eight crystals (500 KHz. padding range).

The circuit described in Reference 1 An excursion of 4.5 KHz. is claimed for an 8 MHz. crystal.

L1—16-24 µH. for 8-5 MHz. crystal.
L2—40 turns of No. 35 gauge wire, tapped at 16 turns.
O1—2N706, 2N2219, 2N3662 or R.C.A. 40237.

FT-241 Crystal Table 1 gives recommended padding ranges for the FT-241 crystals when used in the circuits of Figs. 1 through 3. If you are interested in a particular frequency range (as for net operation), try to use a crystal that will cover the first 25 per cent. of the padding range —then you'll have crystal stability.

The transistor circuits will start oscillating with 2.4 v., for more output, up to 12 v. can be used. Unless followed by a frequency-multiplier, a buffer amplifier will be needed, as in Fig. 1.

Table 1—Padding ranges.

<table>
<thead>
<tr>
<th>FT-241 Crystal</th>
<th>Figs.</th>
<th>(MHz.)</th>
<th>(MHz.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.45 (fundamental)</td>
<td>Fig. 1 and 3</td>
<td>0.20</td>
<td>2.00</td>
</tr>
<tr>
<td>4.00 (9th harmonic)</td>
<td></td>
<td>2.00</td>
<td>20.00</td>
</tr>
<tr>
<td>8.00 (18th harmonic)</td>
<td></td>
<td>4.00</td>
<td>40.00</td>
</tr>
<tr>
<td>144.00 (324th harmonic)</td>
<td></td>
<td>72.00</td>
<td>720.00</td>
</tr>
</tbody>
</table>

A VXO FOR EXCITER USE

Suppose you want to design a vxo covering the entire 40 metre band and you have an exciter such as the Central Electronics 20A using a 9 MHz. crystal.

Higher than 9 MHz. injection frequency is preferred to avoid unwanted mixer products. Therefore the injection frequency will be from 7 + 9 = 16 MHz. to 7.3 + 9 = 16.3 MHz. Crystals in this range are overtone types and won't operate in these circuits. The solution is to use an 8.150 MHz. crystal and operate it on its second harmonic, 16.3 MHz. Padding 50 KHz. on the crystal fundamental frequency will produce 100 KHz. shift in the output. This will give you full coverage of the 7 MHz. phone band. An 8.1 MHz. crystal will cover the next 100 KHz., and another crystal at 8.05 MHz. will extend coverage to 7 MHz.

Crystals with frequencies of 8.125 and 8.075 MHz. will be useful if you want extra stability and don't wish to pad more than 50 KHz. on harmonics.
528.0x716.4

CONSIDERATIONS

work. crystals are also useful for 2 metre variable capacitors.

The tuning capacitors shown in the circuits of Figs. 1 through 4 are common broadcast-band variables. When these are used, frequency decreases slowly at first as the capacitor rotor is turned. Then the frequency change becomes faster, until finally a hairline change in rotor position will produce a 1 KHz. jump. This, of course, is very inconvenient at the lower frequencies. The sketch of Fig. 6 illustrates the geometrical relationship of the stator plates in these two versions of variable capacitors.

CIRCUIT DESCRIPTION

The purpose of R1 in Fig. 5 is to lower the Q of L1. This allows a larger padding range and more stable operation near the low end of the range. If the frequency changes when touching the r.f. choke, the choke is too small. Resistor R2 prevents oscillation at the r.f.-choke resonant frequency.

When the capacitance of the rotor plates changes, the frequency changes when touching them. Then replace the b.c. capacitor with two silver micas. A value of 200 pF seems right for the circuit.

Battery voltage may be 2.4-12 volts. Higher voltage may result in drift due to heating. I use 6 volts in my vxo.

As far I know, the vxo designs described in this article have never been published before. The circuit for the 20A exciter has been used on 40 and 15 metres in both the c.w. and s.s.b. mode. All reports were crystal quality, and all operators asked for the circuit diagrams; so I've presented them here to share with others. My old v.f.o. has since drifted into the junk box.

REFERENCE


DX NEWS

It will be noticed that there are no DX notes in this issue. The following letter was received from the DX Editor and it is regretted that no items of news were received from VK AMATEURS. If this DX page is wanted by readers, more co-operation will be necessary.—Editor.

Editor "A.R.,” Dear Sir,

I am afraid we shall have to give the DX page a miss this month. The absence of news from England due to the mail strike has upset the work and only one bulletin has arrived from the U.S.

There has not been one item of news from VK this month, and with nil coming in, I guess I can’t get anything out.

I hope to have a full page for the following month as I have arranged a fresh source from the States. 73.

Don Grantley.

EXPEDITION TO LACCADIVE GROUP OF ISLANDS

The Amateur Radio Society of India has sponsored a team headed by Lt. General K. Umrao Singh, VU2US, to visit the Laccadive group of Islands and operate an Amateur station for ten days covering two consecutive weekends in April 1971. Details are given below:

Operation is expected to start on Saturday, 10th April, 1971, ending on Monday, 19th April, 1971.

Frequencies: 14 MHz. consistently, optional 21 and 20 MHz., both on c.w. and s.s.b.

The call sign will be VU7US.

The rig to be used: 150 watts p.e.p. The QSL address: Strictly via A.R.S.I., P.O. Box 534, New Delhi-1, India.

The operators in the party will include VU2CK, VU2QM, VU2HV, VU2RM and VU2RK.

Note.—All QSL cards will be posted to the I.A.R.U. QSL Bureaus by the A.R.S.I. and no string is attached in any shape whatsoever.

CHANGE OF ADDRESS

W.I.A. members are requested to promptly notify any change of address to their Divisional Secretary—not direct to "Amateur Radio".
November 1970

Concerning the new IC, the Sigmetics NS65 monolithic phase-locked loop, a truly remarkable item for automatic frequency detection, frequency multiplication or division. I'm demodulating, and with the aid of the data and applications (from the manufacturer).

Solid State 1380 MHz. Converter, by VK4ZT.

A Simple Test Set for Transistors and Diodes. Simply a transistor crystal oscillator for a 1 MHz. crystal and a series using S.R.R. Transistors.

Auxiliary Receiver for 60 Hz. Meters. Raise the main receiver to a gare for frequency counters.

Voltage Regulation using the R.C.A. CA-3838 FET, by W5JJ.

Linear V.H.F. Tank Circuits. The design of a linear single ended v.h.f. tanks using quarter wave transmission lines on 2 metres.

Printed Circuit Boards without Printing. An interesting item by use of an engraving or dentist's drill, (Fermitric?).

360 Linemarkers. A Simple Test Set for Transistors and Diodes. Not very good. You can accomplish as much by judicious use of an ohmmeter but not on its lowest ohm scale.

December 1970

A.C. Switching with Self-Powered ICs—
Products allow turning a Triac on and
off by switching only the a.c. voltage
phase through zero.
Piezoelectric Radar, the Prairie—Rather
interesting tale of the activities of E. E. Krebs
on the prairies.
The SSTT: Solid State Transceiver
for 440 MHz.--B.V. Trawinski describes
his QST design of a direct conversion design
using an R.C.A. IC.
Clapp's Wattmeter.—The usual diode probef.v. meter.
Lightning Wire—Our old friend, B.B. Vebbre,—Best the calibrator
against WY (or Lyndhurst), and adjust
"crystal tune" until the meter stops pulsing.
Amateur Radio, April, 1971

Police: Nine Lives, W3HFO. Nine
years: A brief look at the
new Type LFP01 M.F. filter.
Study Guide: General Class Licence, Part IV.
V.B. Trawinski then describes a. u.h.f.
diode to the conduction point through a large
resistor. Zeners also work, at lower freq.

Solid State Exciter, WSYUY. S.s.b.
for the home-brewer with plenty of test equipment.
Delta: Fair, S.B. and State Control of S.B.B. Ex-
cept for l.f. drive, a v.f.o. and a.f. board.
Metre Moliomiter for Repeater, WBEAR.
One watt output, 18 MHz. xtal, 225 volt supply.
Receiver Offset Tuning for BW100, WAEAW.
A.D.C. coupled remote tuning system for
v.f.o.'s.
The Little Gate Dipper, W3ETT. Another simple 1.7 to 255 m.G.d.o. with MPS102.
V.F.O. Control for the hairpin v.f.o.

V.F.O. with the leads stripped for a newspaper.
Transistor Test, W6EQOP. A very simple
Beta, leakage, shorts tester.
Two-Channel Linear Limiter, Gerald Beene.
A b Mono-fused fuse to protect the three-legged

January, 1971—
The usual editorial tirades, and some interest-
ing articles on the use of transistors in
minimizing the manufacturing of amateur
equipment. R.I.P. And a number of individual
items of interest in the "Letters to the Editor."

LI for Leisure, G2BBD. "If you would like a
leisurely vacation with a bit of amusing radio
operation thrown in, you might consider Lux-
embourg."

D.V.X'ing the World.—The Hard Way.
KGM1, an u.h.f., world tour costing "thir-
ten thousand kilobucks" in which the new
Transistors have allowed numerous antennas
and operating positions.
With this knowledge, the operator may
choose the ideal spot to install the

Split Phases, A DX Operating Aid, GW4PG.
Gives a clue to operators, who are not
completely diversified, with headgear.
Phonest n. V.

A Special Report: Ham Radio Manufacturing:
A region of the country in which Art
is: will amateur Radio survive? "U.S. ham-
equipment manufacturers" could meet under-


Duty Cycle, Duty Factor, W20LU. Good intro-
duction to the concept of duty cycle (percent,
of time the key is held down). But unsatis-
factory results for the choice of
valves or transistors are left unsaid; see "Inter-
mediate Frequency Amplifiers," by J. C. Zeschau,
W6SAI. in "Ham Radio," 7/71, for the real low.

Repeaters Zera Beater, W3HR. Monitors the
receiver's discriminator voltage during a
transmission and stores a voltage in a con-
ductor. The voltage is taken to the
amplifier. The voltage is then
converted to a tone which is
transmitter during the repeater's tail period.

Getting HEP to ICs, W6V. Tips on wiring,
protecting ICs, and interfacing with
other projects using the Motorola HEP Integrated
Circuits.
Notes from the Past, Staff. Quotes from
Amateur Radio 50 years ago, Radio 30 years
ago and Amateur Radio 10 years ago.

Radio 1970—

W jac, R.R.C.. A magnificent world tour costing "thir-
teen thousand kilobucks" in which the new
Transistors have allowed numerous antennas
and operating positions.

Split Phases, A DX Operating Aid, GW4PG.
Gives a clue to operators, who are not
completely diversified, with headgear.
Phonest n. V.

A Special Report: Ham Radio Manufacturing:
A region of the country in which Art
is: will amateur Radio survive? "U.S. ham-
equipment manufacturers" could meet under-


Duty Cycle, Duty Factor, W20LU. Good intro-
duction to the concept of duty cycle (percent,
of time the key is held down). But unsatis-
factory results for the choice of
valves or transistors are left unsaid; see "Inter-
mediate Frequency Amplifiers," by J. C. Zeschau,
W6SAI. in "Ham Radio," 7/71, for the real low.

Repeaters Zera Beater, W3HR. Monitors the
receiver's discriminator voltage during a
transmission and stores a voltage in a con-
ductor. The voltage is taken to the
amplifier. The voltage is then
converted to a tone which is
transmitter during the repeater's tail period.

Getting HEP to ICs, W6V. Tips on wiring,
protecting ICs, and interfacing with
other projects using the Motorola HEP Integrated
Circuits.
Notes from the Past, Staff. Quotes from
Amateur Radio 50 years ago, Radio 30 years
ago and Amateur Radio 10 years ago.

Radio 1970—

W jac, R.R.C.. A magnificent world tour costing "thir-
teen thousand kilobucks" in which the new
Transistors have allowed numerous antennas
and operating positions.

Split Phases, A DX Operating Aid, GW4PG.
Gives a clue to operators, who are not
completely diversified, with headgear.
Phonest n. V.
**THE PERTORIA AWARD**

The Pretoria Award will be issued to any Amateur station in Southern Africa who can prove, by sending in five contacts to the Award Custodian, that he has worked stations in the British area of South Africa. Details are given on inside page.

**THE BRISBANE DX CLUB AWARD**

The Brisbane DX Club has been in existence for many years and now has been extended to cover all of Australia and New Zealand. The Club Certificate can be issued to all members of the Club, whose address will be given by the Club Secretary for the award issue.

**THE A.R.C. AWARD**

The Award is for being first in the A.R.C. Telegraphy Competition. Details are given on inside page.

**THE GIBSON AWARD**

Send certified list of Gibson contacts made after 1st January, 1969. ZL1 awards are 50 QSOs with ZL1, ZL2, ZL3, ZL4 on a v.f.h. band. Four confirmed QSOs equal 1 from a ZL Territory (N.Z. Antarctica or Chatham Is. or Kermadec Is. or Campbell Is.). N.B. This won't be a great popular award, as everyone will do it. Only 10 extra ordinary ZL confirmations if desired.

Applications should be posted to ZL1GQ, 152 Lyttelton Rd., Christchurch, N.Z., who will check the contact list. These lists may be sent—most overseas Societies will check QSL's, etc. Please ensure that full information is given on submitted lists.

---

**THE PRETORIA AWARD**

The Pretoria Award will be issued to any Amateur station in Southern Africa who can prove, by sending in five contacts to the Award Custodian, that he has worked stations in the British area of South Africa.

**THE BRISBANE DX CLUB AWARD**

The Brisbane DX Club has been in existence for many years and now has been extended to cover all of Australia and New Zealand. The Club Certificate can be issued to all members of the Club, whose address will be given by the Club Secretary for the award issue.

**THE A.R.C. AWARD**

The Award is for being first in the A.R.C. Telegraphy Competition. Details are given on inside page.

**THE GIBSON AWARD**

Send certified list of Gibson contacts made after 1st January, 1969. ZL1 awards are 50 QSOs with ZL1, ZL2, ZL3, ZL4 on a v.f.h. band. Four confirmed QSOs equal 1 from a ZL Territory (N.Z. Antarctica or Chatham Is. or Kermadec Is. or Campbell Is.). N.B. This won't be a great popular award, as everyone will do it. Only 10 extra ordinary ZL confirmations if desired.

Applications should be posted to ZL1GQ, 152 Lyttelton Rd., Christchurch, N.Z., who will check the contact list. These lists may be sent—most overseas Societies will check QSL's, etc. Please ensure that full information is given on submitted lists.

---

**THE PRETORIA AWARD**

The Pretoria Award will be issued to any Amateur station in Southern Africa who can prove, by sending in five contacts to the Award Custodian, that he has worked stations in the British area of South Africa.

**THE BRISBANE DX CLUB AWARD**

The Brisbane DX Club has been in existence for many years and now has been extended to cover all of Australia and New Zealand. The Club Certificate can be issued to all members of the Club, whose address will be given by the Club Secretary for the award issue.

**THE A.R.C. AWARD**

The Award is for being first in the A.R.C. Telegraphy Competition. Details are given on inside page.

**THE GIBSON AWARD**

Send certified list of Gibson contacts made after 1st January, 1969. ZL1 awards are 50 QSOs with ZL1, ZL2, ZL3, ZL4 on a v.f.h. band. Four confirmed QSOs equal 1 from a ZL Territory (N.Z. Antarctica or Chatham Is. or Kermadec Is. or Campbell Is.). N.B. This won't be a great popular award, as everyone will do it. Only 10 extra ordinary ZL confirmations if desired.

Applications should be posted to ZL1GQ, 152 Lyttelton Rd., Christchurch, N.Z., who will check the contact list. These lists may be sent—most overseas Societies will check QSL's, etc. Please ensure that full information is given on submitted lists.

---

**THE PRETORIA AWARD**

The Pretoria Award will be issued to any Amateur station in Southern Africa who can prove, by sending in five contacts to the Award Custodian, that he has worked stations in the British area of South Africa.

**THE BRISBANE DX CLUB AWARD**

The Brisbane DX Club has been in existence for many years and now has been extended to cover all of Australia and New Zealand. The Club Certificate can be issued to all members of the Club, whose address will be given by the Club Secretary for the award issue.

**THE A.R.C. AWARD**

The Award is for being first in the A.R.C. Telegraphy Competition. Details are given on inside page.

**THE GIBSON AWARD**

Send certified list of Gibson contacts made after 1st January, 1969. ZL1 awards are 50 QSOs with ZL1, ZL2, ZL3, ZL4 on a v.f.h. band. Four confirmed QSOs equal 1 from a ZL Territory (N.Z. Antarctica or Chatham Is. or Kermadec Is. or Campbell Is.). N.B. This won't be a great popular award, as everyone will do it. Only 10 extra ordinary ZL confirmations if desired.

Applications should be posted to ZL1GQ, 152 Lyttelton Rd., Christchurch, N.Z., who will check the contact list. These lists may be sent—most overseas Societies will check QSL's, etc. Please ensure that full information is given on submitted lists.

---

**THE PRETORIA AWARD**

The Pretoria Award will be issued to any Amateur station in Southern Africa who can prove, by sending in five contacts to the Award Custodian, that he has worked stations in the British area of South Africa.

**THE BRISBANE DX CLUB AWARD**

The Brisbane DX Club has been in existence for many years and now has been extended to cover all of Australia and New Zealand. The Club Certificate can be issued to all members of the Club, whose address will be given by the Club Secretary for the award issue.

**THE A.R.C. AWARD**

The Award is for being first in the A.R.C. Telegraphy Competition. Details are given on inside page.

**THE GIBSON AWARD**

Send certified list of Gibson contacts made after 1st January, 1969. ZL1 awards are 50 QSOs with ZL1, ZL2, ZL3, ZL4 on a v.f.h. band. Four confirmed QSOs equal 1 from a ZL Territory (N.Z. Antarctica or Chatham Is. or Kermadec Is. or Campbell Is.). N.B. This won't be a great popular award, as everyone will do it. Only 10 extra ordinary ZL confirmations if desired.

Applications should be posted to ZL1GQ, 152 Lyttelton Rd., Christchurch, N.Z., who will check the contact list. These lists may be sent—most overseas Societies will check QSL's, etc. Please ensure that full information is given on submitted lists.

---

**THE PRETORIA AWARD**

The Pretoria Award will be issued to any Amateur station in Southern Africa who can prove, by sending in five contacts to the Award Custodian, that he has worked stations in the British area of South Africa.

**THE BRISBANE DX CLUB AWARD**

The Brisbane DX Club has been in existence for many years and now has been extended to cover all of Australia and New Zealand. The Club Certificate can be issued to all members of the Club, whose address will be given by the Club Secretary for the award issue.

**THE A.R.C. AWARD**

The Award is for being first in the A.R.C. Telegraphy Competition. Details are given on inside page.

**THE GIBSON AWARD**

Send certified list of Gibson contacts made after 1st January, 1969. ZL1 awards are 50 QSOs with ZL1, ZL2, ZL3, ZL4 on a v.f.h. band. Four confirmed QSOs equal 1 from a ZL Territory (N.Z. Antarctica or Chatham Is. or Kermadec Is. or Campbell Is.). N.B. This won't be a great popular award, as everyone will do it. Only 10 extra ordinary ZL confirmations if desired.

Applications should be posted to ZL1GQ, 152 Lyttelton Rd., Christchurch, N.Z., who will check the contact list. These lists may be sent—most overseas Societies will check QSL's, etc. Please ensure that full information is given on submitted lists.

---

**THE PRETORIA AWARD**

The Pretoria Award will be issued to any Amateur station in Southern Africa who can prove, by sending in five contacts to the Award Custodian, that he has worked stations in the British area of South Africa.

**THE BRISBANE DX CLUB AWARD**

The Brisbane DX Club has been in existence for many years and now has been extended to cover all of Australia and New Zealand. The Club Certificate can be issued to all members of the Club, whose address will be given by the Club Secretary for the award issue.

**THE A.R.C. AWARD**

The Award is for being first in the A.R.C. Telegraphy Competition. Details are given on inside page.

**THE GIBSON AWARD**

Send certified list of Gibson contacts made after 1st January, 1969. ZL1 awards are 50 QSOs with ZL1, ZL2, ZL3, ZL4 on a v.f.h. band. Four confirmed QSOs equal 1 from a ZL Territory (N.Z. Antarctica or Chatham Is. or Kermadec Is. or Campbell Is.). N.B. This won't be a great popular award, as everyone will do it. Only 10 extra ordinary ZL confirmations if desired.

Applications should be posted to ZL1GQ, 152 Lyttelton Rd., Christchurch, N.Z., who will check the contact list. These lists may be sent—most overseas Societies will check QSL's, etc. Please ensure that full information is given on submitted lists.
New Equipment

YAESU FT-101 SOLID STATE TRANSCEIVER

Some time has elapsed since the Yaesu Musen Co. Ltd. of Japan produced their first solid state transceiver, model FT-100. The present model, FT-101, basically similar, incorporates the latest advances featuring 10 FET's, 3 integrated circuits, plug-in modules, mini-400, 2000 with transistors and 38 silicon diodes. The transmitting section employs 3 tubes only, a 12BY7A driver and 2 x 6J6SA final amplifier with an output on s.s.b. of approx. 160 w. p.e.p.

The built-in dual power supply provides for operation from alternative power sources, 12v. d.c. or 234v. a.c. Selection of the appropriate power cord, from the two provided, is the only adjustment for a change-over.

A desirable feature in a set such as this is the built-in speaker. A matching external speaker, external v.f.o., c.w. filter and mobile mounting hardware are available as optional extras. It covers the usual Amateur bands of 80-10 metres, plus the 11 metre band, and includes reception of WWV on 10 MHz. Modes of operation are s.s.b., c.w. and a.m. C.w. input power is adjustable. Panel meter indicates p.a. cathode current, r.f. output, and a.l.c. On receive, the meter functions to read "S" units.

Taking into account the advantage of low current drain, the FT-101 is the perfect choice for use in a car, caravan, boat, aircraft, and field day activity. It also excells as a primary base station.

Of special interest to brass pounders, c.w. operation is a real pleasure with its perfect keying characteristics, absence of chirp, stability, high selectivity, and "break-in" with side tone monitoring.

A photo appears elsewhere in this issue, and full details are available from the Australian agent, Ball Electronic Services of 60 Shannon St., Box Hill North, Vic., 3129.

Book Review

SINGLE SIDEBAND FOR THE RADIO AMATEUR

Over the last twenty years the A.R.R.L. has done a great deal to popularise s.s.b. amongst the Amateur fraternity; nowadays one hears many amateurs on s.s.b., especially on the DX bands and some a.m.'s have been known to think that the s.s.b. operators will not talk to them.

We live in a rapidly changing world, exciting developments are taking place every day of the week and the rate at which change is advancing is said to double itself every ten years.

The fifth edition of Single Sideband for the Radio Amateur is aimed at making it easier for us in becoming acquainted with the mode and bring the old-timer up to date on the nature of the material is new and heavy emphasis has been given to the effect of the F.M.

This issue contains thirty-one practical constructional projects from easy-to-build station accessories through simple receivers to the more sophisticated crystal filter and phasing type exciters, transmitters and complete transceivers.

A desirable feature in a set such as this is the built-in speaker. A matching external speaker, external v.f.o., c.w. filter and mobile mounting hardware are available as optional extras. It covers the usual Amateur bands of 80-10 metres, plus the 11 metre band, and includes reception of WWV on 10 MHz. Modes of operation are s.s.b., c.w. and a.m. C.w. input power is adjustable. Panel meter indicates p.a. cathode current, r.f. output, and a.l.c. On receive, the meter functions to read "S" units.

Taking into account the advantage of low current drain, the FT-101 is the perfect choice for use in a car, caravan, boat, aircraft, and field day activity. It also excells as a primary base station.

Of special interest to brass pounders, c.w. operation is a real pleasure with its perfect keying characteristics, absence of chirp, stability, high selectivity, and "break-in" with side tone monitoring.

A photo appears elsewhere in this issue, and full details are available from the Australian agent, Ball Electronic Services of 60 Shannon St., Box Hill North, Vic., 3129.

GEELOONG "HAMFEST" OVER THE WEEK-END OF 1st and 2nd MAY, 1971

Saturday: 1400 hours onward, registration and raffle-chew. Dinner and entertainment.

Sunday: Displays of commercial gear, scrambles and tx hunts on 40 and 2 metres, barbecue lunch, disposals sale, entertainment for everyone.

Further details from VK3 W.I.A. Broadcasting or the Geelong Amateur Radio-T.V. Club, Secretary, Bob Wookley, VK3IC, P.O. Box 529, Geelong, Vic., 3220. Telephone 212674.

FEDERAL REPEATER SECRETARIAT

This month we are pleased to be able to include this new and important section in our column. We invite the technical officers of the various repeater groups to submit reports along similar lines about their own systems, both for our own records and publication in "A.R."

The first report for 1971 from the F.R.S. has been produced and has been sent out. If we have any reports from other groups, we shall be happy to publish them. If you care to prepare a copy, write to the F.R.S. care of P.O. Box 342, Crowes Nest, N.S.W., 2065.

CHANNEL ONE SYSTEM ON QUEENSLAND & GOLD COAST

The Gold Coast Repeater Club, a new club project, has established an f.m. repeater station to service the South Eastern Qld. and Northern Eastern N.S.W. areas. The repeater has been P.M.G. licensed and fully operational since April 1970. Details of the repeater are as follows:

Call Sign: VK4EX/R2.

Location: Mt. Tamborine. Approx. 16 miles west of Southport and 40 miles south-west of Brisbane. Site elevation is approx. 2000 ft. a.s.l.

Tx: Complete valve design, multiplying from 4 MHz. xtal. 25 watts carrier output from Q.E.06/40 p.a. valve. The power output is to be boosted to 50 watts when construction of a new site is complete.

Rx: Solid state throughout, realising 20 dB. signal to noise ratio for 0.5 microvolt p.d. input with the tx carrier on. 1st i.f. is 167 MHz and 2nd i.f. is 455 KHz.

Aerials: Both tx and rx use identical aerial types for improved repeater and system performance. Both aerials are mounted on poles 40 ft. above ground level and are horizontally separated by 50 ft.

Availability: The repeater is available on a 24/7 basis. The rx unit can be programmed to null out when the squelch is opened the tx units are keyed on. Eight minutes after the squelch has closed, and the initial squelch opening, each successive squelch operation returns the tx units shut-down time delay to zero.

Identification: Automatic station identification after a five-minute "carrier on" duration. Solar powered, and identification times are presently being experimented with.

Coverage: Good service is available within a 250 yard diam. range of the site. Good mobile to mobile QSOs have been conducted between the following sites:

- Mornington, to Byrnes, B. Dumbrell, Toowoomba, Brisbane, Gold Coat, North Coast region, Murwillumbah, Boonah, and many other places.

Well that is roughly the story regarding the Gold Coast repeater. A repeater for Brisbane is still being considered by the VK4 V.H.F. Group, but details of the air testing. Channel 4 will be used for the Brisbane unit and will be known as "RI" until an official call sign is allocated.

The Gold Coast Radio Club will be only too happy to pass on information regarding the progress of the other f.m. repeaters in the region, and their cues in establishing a repeater. A note of thanks to the Gold Coast Radio Club, P.O. Box 588, Southport, Qld., 4125, who will ensure full technical details, etc. by return mail.

Recently a copy of Ken Sessions, Jnr., K6MVH's "Radio Amateur's F-M Repeater Handbook" arrived in Australia. This is an excellent publication, and much of the contents applies only to the American scene. However, there are a few chapters that are of interest to all. As usual in a book of this nature, the page numbers are given at the end of each chapter.

AMATEUR FREQUENCIES:

ONLY THE STRONG GO ON—SO SHOULD A LOT MORE AMATEURS!
2 metre contact. month. He advises that John VK3AJM and sends some further useful information this chaps, shows the effort was worthwhile for a over a rather mountainous path. Good work It did not seem like a v.h.f. field day without Eric 3ZKN, Jim 3AEF and so I could go on. Signals have been quite good some of the

Wally formerly was ZL2TCW living at Lower Hut, New Zealand, and several years ago came to Australia with his wife Dorothy and EP3 TAP. There seems no evidence of any of them arriving in chandlery. Wally was first licensed in 1943 and while in New Zealand was a keen DX enthusiast, particularly on 144 MHz. where he worked ZL1, 3, 5, and VK3 and VK5 the latter including the contact with Hughie VK3BC, a distance of 1850 miles, running 30 watts and 8 watts. From his present location on 52 MHz, he has worked VK1, 2, 3, 5, 6, 7, 8, 1A2, 1A3, 4, 4A and 1A4. On 144 MHz areas worked are VK3, 5, 6 and 7 and contacts have been made within VK5 on 432 MHz.

Equipment In use at present on 52 MHz, uses a EKW/40 in the final, 150 watts d.c. input s.s.b. to a 9 element yagi up 30 feet. He uses a VK3 FET converter. The system changes to a.m. for 432 MHz, running 15 watts to a 6936 16 element colinear up 30 feet, VK5 FET converter. The tuned bath i.f. for each antenna is on the slopes of the Mt. Lofty Ranges, at an elevation of 750 feet, living amongst the elite able to look down on most of the population of Adelaide. Wally is a member of the W.I.A., was a member of the Amateur Advisory Committee for 1970, and is getting rather late for contacts or hearing either. He is in a position to try JA1IGY on 1296 MHz. record has been broken again, on 18th Feb., when John VK3ARC in Geelong and Ken VK3WJ in former established contact over a path of 274.3 miles, bettering the previous record by more than 26 miles. Both stations were using s.s.b. with signals running around S5. The equipment at VK3WJ has been recently modified to a watt output and a 5 feet by 2 feet parabolic section antenna. According to the initial contact test, from VK1AO, there were about 5 minutes by VK7AH and VK1QV. Congratulations to Ron, VK3WK, and particularly to Ron, who previously only held the record. He has now added to that list and certifies that both stations again made contact on 27th at 2219, which VK2ZAH and VK1QV. Ron will soon be running out of suitable territory in Tasmania if he continues to push his signals south, next we may hear he has moved to Lakes Entrance and concentrating signals on the path to New Zealand.

Bob continues his writing with some excerpts from the VK5 53.044 VK5AR Antarcctica. J. It was not until the 2nd day of the v.h.f.-u.h.f. contest, showing the growth rate of various radio services for the 1969-70 financial year. Amateur full licences for operation in v.h.f.-u.h.f. for any purpose have increased by 6.3%. The overall growth rate of radio communications stations was 16.1%, while the proportion of the population growth for the same period was 2.0%. Some so-called thoughts came out of these statistics, sufficient to make good evidence. Many thanks again Bob for your continuing efforts.

A further reminder of the Geelong Amateur Radio and TV Club Hamfest scheduled for 1st May, 1971. In the next issue will be the final entry accounts go to both for a great effort, and indicate that both stations again made contact when in the shack over Easter. A further reminder of the Geelong Amateur Radio and TV Club Hamfest scheduled for 1st May, 1971. In the next issue will be the final entry accounts go to both for a great effort, and indicate that both stations again made contact. A number of entries are in the shack over Easter, keep a wary eye for the month: "A church is a hospital for sinners, not a museum for saints." Under next month, 13, Eric VK3LPL. The Voice In the Hills.

MEET THE OTHER MAN

Meet Wally Watkins, VK5ZWW, of Bellevue Heights, his life story not yet written. His Callsign (VK5ZWW) is a story of the Mt. Lofty Ranges, at an elevation of 750 feet, living amongst the elite able to look down on most of the population of Adelaide. Wally has been somewhat scarce this month, only two letters received, but there may be more next time. In closing here is the thought
COOK BI-CENTENARY AWARD

The following additional stations have qualified for the Award:

<table>
<thead>
<tr>
<th>Cert. No.</th>
<th>Call</th>
<th>Cert. No.</th>
<th>Call</th>
<th>Cert. No.</th>
<th>Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>1149</td>
<td>DJ8JZ</td>
<td>1150</td>
<td>AX5NM</td>
<td>1151</td>
<td>AX7PS</td>
</tr>
<tr>
<td>1152</td>
<td>AX2ACZ</td>
<td>1153</td>
<td>WAUHR</td>
<td>1154</td>
<td>EL8UK</td>
</tr>
<tr>
<td>1155</td>
<td>ZSMBW</td>
<td>1156</td>
<td>AX7PS</td>
<td>1157</td>
<td>AX2VN</td>
</tr>
<tr>
<td>1158</td>
<td>AX2SF</td>
<td>1159</td>
<td>AX4FV</td>
<td>1160</td>
<td>AX2AW</td>
</tr>
<tr>
<td>1161</td>
<td>AX2BDC</td>
<td>1162</td>
<td>JH1BLX</td>
<td>1163</td>
<td>G3WGF</td>
</tr>
<tr>
<td>1164</td>
<td>DL9EM</td>
<td>1165</td>
<td>WA5UHR</td>
<td>1166</td>
<td>I1ACY</td>
</tr>
<tr>
<td>1167</td>
<td>JA3FD</td>
<td>1168</td>
<td>W3AZD</td>
<td>1169</td>
<td>W3ATF</td>
</tr>
<tr>
<td>1170</td>
<td>W3ATF</td>
<td>1171</td>
<td>W5KYD</td>
<td>1172</td>
<td>DL6CL/</td>
</tr>
<tr>
<td>1173</td>
<td>JA1CCE</td>
<td>1174</td>
<td>W6ATF</td>
<td>1175</td>
<td>W6ATF</td>
</tr>
<tr>
<td>1176</td>
<td>WA6HOM</td>
<td>1177</td>
<td>W5DOE</td>
<td>1178</td>
<td>JAIOTE</td>
</tr>
<tr>
<td>1179</td>
<td>VS6CW</td>
<td>1180</td>
<td>DJ8JY</td>
<td>1181</td>
<td>OE3RHA</td>
</tr>
<tr>
<td>1182</td>
<td>K4WZG</td>
<td>1183</td>
<td>DL6CL/</td>
<td>1184</td>
<td>W9AG</td>
</tr>
<tr>
<td>1185</td>
<td>WB6BKD</td>
<td>1186</td>
<td>GM6KN</td>
<td>1187</td>
<td>WA1H</td>
</tr>
<tr>
<td>1188</td>
<td>WA1H</td>
<td>1189</td>
<td>WA1H</td>
<td>1190</td>
<td>WA1H</td>
</tr>
<tr>
<td>1191</td>
<td>WA1H</td>
<td>1192</td>
<td>WA1H</td>
<td>1193</td>
<td>WA1H</td>
</tr>
<tr>
<td>1194</td>
<td>WA1H</td>
<td>1195</td>
<td>WA1H</td>
<td>1196</td>
<td>WA1H</td>
</tr>
<tr>
<td>1197</td>
<td>WA1H</td>
<td>1198</td>
<td>WA1H</td>
<td>1199</td>
<td>WA1H</td>
</tr>
<tr>
<td>1200</td>
<td>WA1H</td>
<td>1201</td>
<td>WA1H</td>
<td>1202</td>
<td>WA1H</td>
</tr>
<tr>
<td>1203</td>
<td>WA1H</td>
<td>1204</td>
<td>WA1H</td>
<td>1205</td>
<td>WA1H</td>
</tr>
<tr>
<td>1206</td>
<td>WA1H</td>
<td>1207</td>
<td>WA1H</td>
<td>1208</td>
<td>WA1H</td>
</tr>
<tr>
<td>1209</td>
<td>WA1H</td>
<td>1210</td>
<td>WA1H</td>
<td>1211</td>
<td>WA1H</td>
</tr>
<tr>
<td>1212</td>
<td>WA1H</td>
<td>1213</td>
<td>WA1H</td>
<td>1214</td>
<td>WA1H</td>
</tr>
<tr>
<td>1215</td>
<td>WA1H</td>
<td>1216</td>
<td>WA1H</td>
<td>1217</td>
<td>WA1H</td>
</tr>
<tr>
<td>1218</td>
<td>WA1H</td>
<td>1219</td>
<td>WA1H</td>
<td>1220</td>
<td>WA1H</td>
</tr>
<tr>
<td>1221</td>
<td>WA1H</td>
<td>1222</td>
<td>WA1H</td>
<td>1223</td>
<td>WA1H</td>
</tr>
<tr>
<td>1224</td>
<td>WA1H</td>
<td>1225</td>
<td>WA1H</td>
<td>1226</td>
<td>WA1H</td>
</tr>
<tr>
<td>1227</td>
<td>WA1H</td>
<td>1228</td>
<td>WA1H</td>
<td>1229</td>
<td>WA1H</td>
</tr>
<tr>
<td>1230</td>
<td>WA1H</td>
<td>1231</td>
<td>WA1H</td>
<td>1232</td>
<td>WA1H</td>
</tr>
<tr>
<td>1233</td>
<td>WA1H</td>
<td>1234</td>
<td>WA1H</td>
<td>1235</td>
<td>WA1H</td>
</tr>
<tr>
<td>1236</td>
<td>WA1H</td>
<td>1237</td>
<td>WA1H</td>
<td>1238</td>
<td>WA1H</td>
</tr>
<tr>
<td>1239</td>
<td>WA1H</td>
<td>1240</td>
<td>WA1H</td>
<td>1241</td>
<td>WA1H</td>
</tr>
<tr>
<td>1242</td>
<td>WA1H</td>
<td>1243</td>
<td>WA1H</td>
<td>1244</td>
<td>WA1H</td>
</tr>
<tr>
<td>1245</td>
<td>WA1H</td>
<td>1246</td>
<td>WA1H</td>
<td>1247</td>
<td>WA1H</td>
</tr>
<tr>
<td>1248</td>
<td>WA1H</td>
<td>1249</td>
<td>WA1H</td>
<td>1250</td>
<td>WA1H</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Cert. No.</th>
<th>Call</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>VK7DK</td>
<td>231/231</td>
</tr>
<tr>
<td>116</td>
<td>VK3ADO</td>
<td>231/231</td>
</tr>
</tbody>
</table>

Amendments:

<table>
<thead>
<tr>
<th>Cert. No.</th>
<th>Call</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>VK7DK</td>
<td>231/231</td>
</tr>
<tr>
<td>116</td>
<td>VK3ADO</td>
<td>231/231</td>
</tr>
</tbody>
</table>

LOG BOOK

AVAILABLE IN TWO TYPES—VERTICAL OR HORIZONTAL
Larger, spiral-bound pages with more writing space.

Price 75c each plus 22 Cents Post and Wrapping

Obtainable from your Divisional Secretary, or W.I.A., P.O. Box 36, East Melbourne, Vic., 3002

SOANAR ELECTRONICS Pty. Ltd.

NEW 1971 20 PAGE CATALOGUE AVAILABLE

NEW 1971 20 PAGE CATALOGUE AVAILABLE

LOW DRIFT CRYSTALS

- 1.6 Mc. to 10 Mc., 0.005% Tolerance, $5
- 10 Mc. to 18 Mc., 0.005% Tolerance, $6
- Rerounds $3

THESE PRICES ARE SUBJECT TO SALES TAX

SPECIAL CRYSTALS: PRICES ON APPLICATION

MAXWELL HOWDEN
15 CLAREMONT CRES., CANTERBURY, VIC., 3126
Phone 83-5090
SOLID-STATE BREAK THROUGH from YAESU

FT-101 Dual Power Supply TRANSCEIVER

Perfect choice for car, caravan, boat, aircraft, field day activity, or primary base station

FEATURE CHECK LIST
- Built-in AC and DC power supplies
- Built-in WWV 10 MHz. band
- Noise Blanker
- 25 and 100 KHz. Calibrators
- Built-in VOX
- ±5 KHz. Clarifier
- Break-in CW with Side Tone
- 1 KHz. Dial Read Out
- Selectable SSB
- AM Capability
- Built-in Speaker
- Microphone
- Dual VFO Adaptor
- Crystal Channel Oscillator

ACCESSORIES (optional extras)
External VFO ... Model FV-101
External Speaker ... Model SP-101
Mobile Mounting Bracket
CW Filter (600 Hz.)

SPECIFICATIONS
- Maximum Input Power: 300W. speech peak SSB, 180W. CW, 80W. AM.
- Sensitivity: 0.3 microvolt for 10 dB. S/N.
- Selectivity: 2.4 KHz. (6 dB. down), 4.2 KHz. (60 dB. down).
  CW Filter: 0.6 KHz. (6 dB. down), 1.2 KHz. (80 dB. down).
- Frequency Range: 3.5 to 4, 7 to 7.5, 10 to 10.5, 14 to 14.5, 21 to 21.5, 27 to 27.5, 28 to 30 MHz.

GENERAL
- Frequency Stability: Less than 100 Hz. drift in any 30-minute period.
- Antenna Impedance: 50 to 100 ohms-SWR 2:1 or less.
- Audio Output: 3 watts, 350 - 2200 Hz., 4 ohms impedance.
- Devices and Tubes: 10 FETs, 3 IC, 31 Si Tr, 38 Si Diodes,
  One 12BY7A driver, two 6JS6A final amp.
- Power Source: 12 volts DC, or 100, 117, 200, 220, 234 volts AC.
- Power Consumption: AC: Receive 0.5A., Transmit 3A.,
  DC: Receive 0.5A., Standby 5A., Transmit 20A. max.
- Dimensions: 13½" wide, 6" high, 11½" deep.
- Weight: 30 pounds.

All sets are pre-sales checked for operation on all bands, and covered by our 90-day warranty. Full facilities are available for after-sales service.

Sole Authorised Australian Agent:

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 67-1650 (AH 37-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379
Distributors
For Australian and
International
Manufacturers . . .

TEST EQUIPMENT:

RAPAR • BWD
SWE-CHECK • HORWOOD

Call and see our big range of test equipment

SEMI-CONDUCTORS:

TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

1971-72 CATALOGUE NOW AVAILABLE, S3

RAPAR Model SK100 Multi-tester

RADIO PARTS GROUP

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!
AMERICAN RECORDING TAPE
(New, in sealed boxes)
1500 feet, 7-inch, Acetate, 1/4 mil. ...... $3.50
1200 feet, 7-inch, Acetate, 1/8 mil. ...... $2.50
1200 feet, 5 1/4-inch, Mylar, 1/16 mil. ...... $3.00
1200 feet, 5 1/4-inch, Mylar, 1/32 mil. ...... $2.20
Postage 10c.
CASSETTE TAPES
Type C120 ...... $1.50
Type C90 ...... $1.20
NEW HEADPHONES AND MIC
Phones 8 ohms, Mike 25 ohms
Price $15.75
METERS
MR2P METERS: square, face size 1/2"-in., M/Hole 1/2"-in., res. 99 ohms 0.1-0.25, 0.25-0.50, and 0.50-0.01
Price $5.00 nett.
MR2P METERS: 0.5, 0.1-0.25, 0.25-0.50, 0.50-0.01
Price $5.25 nett. Postage 20c.
Res. 120 ohms 0.1-0.5, 0.5-1.0, 1.0-2.0, 2.0-5.0, 5.0-10.0, 10.0-50.0, 50.0-0.01
Price $2.75 nett. Postage 20c.
Res. 0.1-0.01, 0.01-0.02, 0.02-0.05, 0.05-0.10, 0.10-0.25, 0.25-0.50, 0.50-1.00, 1.00-2.00, 2.00-5.00, 10.00-50.00
Price $1.75 nett. Postage 10c.
POSTAGE TOLERANCE
Not more than 20c.
PS2 "S" METER: Price $6.50 nett.
PS2 METER: New, face size 1/2"-in., M/H 2 3/4-in.
Res. 60 ohms 0.1-0.5, 0.5-1.0, 1.0-2.0, 2.0-5.0, 5.0-10.0, 10.0-50.0
Price $5.90 nett. Postage 10c.
Res. 120 ohms 0.1-0.5, 0.5-1.0, 1.0-2.0, 2.0-5.0, 5.0-10.0, 10.0-50.0
Price $7.90 nett. Postage 20c.
Plain face. Price $4.00 nett. Postage 20c.
Plain face. Price $3.70 nett. Postage 20c.
Price $4.50 nett. Postage 20c.
GREEN CAP CONDENSERS
Sizes: 0.001, 0.002, 0.003, 0.0047, 0.0056.
Price 0.008, 0.0082 uf, Price 12c each.
Sizes: 0.01, 0.02, 0.03, 0.04, 0.05, 0.06.
Price 0.068, 0.0682 uf, Price 8c each.
Sizes: 0.1, 0.22, 0.33, 0.39, 0.47 uf.
Price 1.00c each. 1 uf. (200v.w), 2 uf. (200v.w).
Price 9c each.
BARGAIN ITEMS
Mini push-button Switches, new, 45c each.
Bell-Lee Plugs, 45c each.
Bell-Lee Plugs, new, 45c each.
Bell-Lee Lugs, Joiners 48c each.
Spring-loaded Terminal Posts, yellow, green, red or black, 15c each.
3-5 mm. Plugs, 25c each.
5-5 mm. Plugs, 15c each.
6-5 mm. Plugs, 40c each.
Stereo Plugs, 60c each; Stereo Screws, 50c each.
R.C.A. Plugs, 50c each.
4-pin Speaker Plugs, 25c pair.
3-pin Din Plugs, 50c each.
S0293, Screws, 50c each.
PL259 Plugs, 100c each.
Lodel Crystal Mike, $1.20 each.
1/4" Plugs/Socket, 45c pair.
Jabel Crystal Sets Coil, new, 95c each.
Babel Aligning Tool Kits, set of 2, 85c.
Babel Aligning Tool Kits, set of 4, 1.50c.
Adel Nibbling Tools, 75c each.
Car Radio Speaker Control and volume and fader, 5.00c.
Neon Screwdriver, 20 volt, 50c each.
10 pairs 5/16" Clips, 60c.
Dito with 6-inch lead (ideal jumper leads), 90c.
3-5-3 304T. leads, 1.50c.
Jabel Rotary Switches, 50c. 1 pole, 12 positions.
TV Plug/Socket, 45c each.
Jabel Crystal Mikes, 1.00c each.
Jabel Crystal Mikes, SET, 45c each.
Jabel Crystal Mikes, 500 feet, (no shaft), 1.50c.
DISC CERAMIC CONDENSERS
25 volt working
Sizes: 0.1, 0.2, 0.27, 0.33, 0.01, 0.033, 0.047, 0.056, 0.082, 0.10c.
Price 0.47c. Price 4c each.
BROADCAST BAND TUNER
Locally made, Model 401 uses a shielded 3-stage I.F. Module with a single transistor mixer-osc. An A.G.C. voltage is developed and applied to the 1st F.M. stage. High sensitivity is obtained with a ferrite rod, 8-inch long, 1/8-inch diameter. Sensitivity: 150 v.u.; bandwidth: 8 KHz; supply voltage: 9v.; supply current: 5 m.a; audio output voltage: 0.5-1.0v.; load impedance not less than 47K; Complete in plastic box with dial. Ready to plug in. Price $5.25 nett.
POCKET CRYSTAL RADIO
Type ER22. Set complete. Price $1.50.
A.C. ADAPTOR—BATTERY SAVER
Type PS54—240 volts to 6 or 9 volts, 300 m.a. $3.50
Type PS54—240 volts to 6 or 9 volts, 100 m.a. $1.50
Postage 30c.
C60 CASSETTE TAPES
Price 8c each.
EXTENSION SPEAKERS
Type 530 Tubular Extension Speakers, 8 ohms, New, complete with lead and two plugs 2.5 and 3.5 mm. Price $4.30. Postage 20c.
TELEPHONE INTER-COM. SETS
Telephone Inter-communication Set with signal bulb, two U2 batteries, ideal for children. Price $6.75. Postage 30c.
EGG INSULATORS
For your Aerial. 8c each.
VARIABLE CONDENSERS
RESISTORS
1/2 watt 8c each, 1 watt 10c each.
VERNIER DIALS
Ratio 8 to 1 reduction, scale 0-10.
Type T 501 1/2 inch diameter ...... $2.00
Type T 502 1 inch diameter ...... $2.50
Type T 503 3 inch diameter ...... $3.00
LOW PASS FILTERS
A "Cebena" Low Pass Filter will fix T.V.I. Cut-off frequency, 30 MHz; attenuation at 80 MHz, better than 30 db.; insertion loss, negligible. Impedance 50.7 ohms.
Price $11.50. Postage 10c.
SOLID STATE STEREO AMPLIFIER
8 watts r.m.s. per channel. Input for magnetic, crystal and ceramic type microphone. P.W. cartridges, tape recorder input and output, tuner input, stereo headphone jack.
Reduced to $55.00. Postage 1.20.
FIVE-CORE CABLE
5 x 5/0076. Ideal for Intercoms., Telephones, etc.
New. 100 yd. rolls, $17 (postage 75c), or 20c yd.
STEREO HEADPHONES
Professional quality (well known brand). Large earpads, standard stereo plug, 6 ft. lead.
Price $3.75. Postage 50c.
CRYSTAL CALIBRATOR No. 10
Nominal range. 500 KHz. to 30 MHz. 500 KHz. at 10 MHz. and 250 KHz./500 KHz. BFO. Provides heterodyne output in steps of 1 MHz. Dial driven by machine cut strip gears, calibrated in 2 KHz. div. Easily read to 250 cycles. Output "spiked" approx. 1 sec. intervals. Identifies best note. Power requirements: 12V. DC at 0.3 amp. 250 volts at 15 m.a. This is a precision instrument. Complete with crystal.
Price $23.50
**CONTENTS**

**Technical Articles:**

- Amplitude Modulation—Lecture No. 12 ........................................... 9
- Circuits for All—A Simple Method of Drafting .................................. 5
- Crystals for Carphones—and Other Things ....................................... 6
- Home Station Antenna for 160 Metres—Part One .................................. 3

**General:**

- Australian Standards for Electro-Magnetic Interference .................. 17
- Awards ........................................................................................................ 13
- Book Review .................................................................................................. 27
- Cook Bi-Centenary Award ........................................................................ 28
- Correspondence .............................................................................................. 16
- DX .................................................................................................................. 24
- Federal Comment .............................................................................................. 2
- F.E. Report to Federal Council (1971) ....................................................... 19
- Frequency Measuring Equipment ............................................................... 15
- IPS-H5 Handbook .......................................................................................... 16
- Licensed Amateurs in VK ....................................................................... 13
- New Call Signs .............................................................................................. 28
- Overseas Magazine Review ......................................................................... 25
- Prediction Charts for May 1971 ................................................................. 15
- Recovery of Stolen VK2 Institute Property ............................................... 23
- Silent Keys ...................................................................................................... 28
- VHF .................................................................................................................. 26
- When Visiting Auckland, N.Z. .................................................................. 15
- "Wind of Change" ........................................................................................ 23

**Contests:**

- Ross Hull Memorial V.h.f. Contest, 1970-71, Results ............................ 16
- 1971 John Moyle Memorial Field Day Contest Results ......................... 16

**COVER STORY**

One channel of the VK Repeater, four of which will be carried on AO6. The receiver accepts signals on 146 MHz. and the transmitter gives 1 watt out on 432 MHz.
Barely a day passes but what there is a report of some form of pollution to be found in the mass news media, and as a result there is a growing public awareness of the problem and loud cries for action to have the problem abated. Generally the pollution is only too obvious, being offensive to one or more of the senses. Unfortunately various forms of pollution have been with us for so long that their eradication is going to be a long and costly process, but at least the methods are known. In the meantime, as prevention is better than cure, many industries which have been responsible for pollution have either installed or are in the process of installing the equipment necessary to remove what they have contributed to the overall problem. In many cases this action has been undertaken voluntarily, but by the same token, all too many waited until action was forced on them by legislation.

There is still one form of pollution which has received little or no public attention, indeed I doubt that more than five per cent of the population is aware of it. I refer to electrical noise with which we, as Amateurs, are only too familiar. The sources of origin are legion, and well known to most of us, although due to our localities we suffer to varying degrees. Those near tram or train routes have their special problems, those on main roads have more trouble with auto ignition than those in quite back streets. If you live near an industrial area, no doubt you are plagued by electric welders and other industrial equipment, or you may live somewhere near high tension lines. Are you plagued by dirty insulators?

How much of this noise are you contributing to the total or have you suppressed your household electrical equipment such as the vacuum cleaner and food mixer? How much is radiated from your electric drill? True, these items should all be suppressed when manufactured, but how well has it been done? Probably it leaves much to be desired, and you have overcome your noise problem by yelling at the XYL to “turn that damned thing off”. Not good engineering practice, nor is it conducive to domestic harmony!

How many of us are troubled by spots from t.v. oscillators, and why do they invariably fall on our favourite operating frequency.

To remove all the foregoing offenders is a formidable task and will certainly call for strict legislation to achieve the maximum results.

What, if anything, can we do towards achieving such a massive clean-up? We can at least make a start by cleaning up our own bands. Intruders to our small share of the spectrum are a form of pollution—report them to your Intruder Watch Co-ordinator. With sufficient suitable reports there is every chance of having them moved, but no reports—no action.

There are further forms of pollution on our bands which can be easily and cheaply eradicated. To be specific, I refer to the unmodulated carriers and carriers modulated only by whistles, or the sounds of tools being thrown around the work bench. These transmissions are neither necessary nor legal, so why not remove them. The regulations cover such transmissions and you are supposed to know the regulations. At least you have a certificate to say you do. If your memory has failed you, now is a good time to do some revision. The handbook costs only a few cents.

There was a time when the v.h.f. bands were the preserve of the more serious Amateur, and much useful work was done there. With the advent of large quantities of surplus v.h.f. equipment and the subsequent formation of the many “nets” the lower v.h.f. bands have become contaminated by large amounts of inane chatter, frequently of extremely dubious character, punctuated with language which would have automatically brought a “bluey” a few years ago. This pollution does nothing to improve the public image of the Amateur Service, and the sooner it disappears from the bands the better for everybody.

As is the case with most forms of pollution, a great amount is created by very few, but all suffer equally. Let us all, therefore, resolve to do our share towards getting our own house in order. Perhaps we can then legitimately complain about what others are doing to us.

—K. E. PINCOTT, VK3AFJ
HOME STATION ANTENNA FOR 160 METRES

PART ONE—INTRODUCTION

J. A. ADCOCK, M.I.E. (Aust.) VK3ACA

The basic difference between a 160 metre antenna and an antenna for any other band is that the 160 metre antenna is usually much shorter than a resonant length and much lower than that desirable for maximum efficiency. For these reasons special precautions have to be taken in the design of the antenna.

SUMMARY

The methods, results and conclusions given in this article are based on several years of experience on 160 metres. The main aim is to examine the basic medium frequency antennas shorter than resonant length ('T', 'L', sloping antenna and centre-fed horizontal). Graphs are given which have been derived from standard formulae and a number of conclusions from assumptions have been made. These conclusions have been so that interested persons may examine them and assess their value in practice.

The article is aimed particularly at showing where horizontal series resistance of the load.

parallel resistance part of the load which produces radiated power.

DEFINITIONS

The following are definitions of the terms used in this article:

A Short Antenna: In general, an antenna with each leg shorter than one-eighth wavelength, but in some cases shorter than one-quarter wavelength.

A Low Antenna: Height less than one-eighth wavelength.

Radiation Resistance (R<sub>a</sub>): In this article radiation resistance is taken as that part of the effective series resistance of the load of the antenna at the feed point which produces radiated power.

Radiated power = R<sub>a</sub> \times I<sup>2</sup>

This is not the only way of taking it and in some treatments it may be the effective resistance at the current point or virtual current point of the antenna. Also, it could be the effective parallel resistance part of the load which produces radiated power.

Radiated power = \frac{E^2}{R<sub>a</sub> parallel}

Loss Resistance (R<sub>l</sub>): Is the effective series resistance part of the load which produces loss.

Power lost = R<sub>l</sub> \times I<sup>2</sup>

Total Resistance: Is the effective series resistance of the load.

\[ R = W + I^2 \]

where \( W \) = power delivered to the an-

\[ R = R_a + R_l \]

P.O. Box 108, Preston, Vic., 3072.

Effective Length of the Antenna

(Ref. 1): The effective length of the antenna, used for the purpose of calculating radiation resistance, is the part of the effective series resistance at the feed point which, if carrying a constant current along its whole length equal to the current at the feed point, would radiate the same power. Where the direction of the effective antenna is not the same as the actual antenna, the component of the actual antenna is considered.

Form Factor of the Current Distribution (Ref. 1): Is the ratio of effective length to actual length of the radiating section being considered.

Surface Wave: Ground wave. The surface wave was adopted in preference to ground wave as recommended in the A.R.R.L. "Antenna Book". In general, it refers to any part of the wave which follows the earth's surface. Dividing the wave up into direct, indirect and beyond line-of-sight are not of great importance.

Fig. 1.—Illustrating the vertical radiation patterns of a short low horizontal and a short ground vertical. The patterns shown are for antennas of equal radiated power. Although the pattern for the short horizontal may be attractive, its efficiency is very much reduced.

HORIZONTAL AND VERTICAL POLARISATION—GENERAL

One characteristic of 160 metres is that of improved surface wave propagation. A vertical antenna will produce surface waves whereas a horizontal will produce practically no surface wave.

Vertically polarised radiation will produce good surface wave coverage during the day, whereas at night there exists a primary and secondary service area with a zone of poor reception in between, as described in standard texts on broadcast band propagation.

The horizontal antenna is rarely used commercially on medium frequencies, but good results have been obtained for the Amateur and provide coverage in the poor reception zone.

Radiation patterns in the vertical plane of a short vertical and a low short horizontal antenna are shown in Fig. 1.

As can be seen from the diagram, the radiation from the vertical is zero straight up and rises to maximum horizontally, whereas the radiation from the horizontal is zero horizontally and maximum straight up.

For a vertical antenna, as far as distant radiation is concerned, the very low angle radiation is largely absorbed by the ground, as shown by the dotted line. The shape of the radiation patterns are brought about by the interaction between the direct wave and the reflected wave from the ground. This can be considered as an antenna and a virtual image of the antenna an equal distance below the ground.

Fig. 2 shows three standard antenna arrangements and the well known phenomena of how the current in the image of the vertical is in phase with the current in the antenna, and the current in the horizontal is in anti-phase with that of the image. This fact is most significant.

The power radiated by a particular antenna depends upon the effective current and the length of the antenna. If the antenna is short, a large current must flow in the wire in order to be effective and, by \( R = W + \frac{I^2}{2} \), the resistance must necessarily be low. Similarly, if a short antenna is close to an antenna with current in the opposite phase, still more current must flow to radiate the same power and its radiation resistance will be lower still.

The lower the radiation resistance, the greater the proportion of loss.

The resistance of a vertical antenna depends upon the radiation resistance obtained from calculation plus the series loss resistance. The resistance of a horizontal antenna depends upon the series loss resistance, the induced loss from the ground, and the radiation resistance, the latter two being greatly influenced by the height above the ground. For these reasons a low horizontal antenna is much more influenced by the ground proximity than a vertical.

(Continued on Page 13)
**BEAM ROTATOR**

**EMOTATOR MODEL 1100M**

**YOU CAN CONTROL THE DIRECTION OF YOUR BEAM ANTENNA FROM YOUR OPERATING POSITION**

The heavy duty model 1100M features rugged cast aluminium construction, stainless steel bolts, nuts and washers. Bearing design with 90-ball bearing provides high vertical carrying capacity, and resistance to bending pressures due to unbalanced weight, wind, etc. Limit switches prevent over-run. Positive braking with solenoid operated double plunger, operates when drive paddle is released. Steel gears transmit drive from a fractional horse-power motor.

The 1100M can be mounted on a fixed tubular mast if an additional clamp assembly is bolted to the base. Otherwise, the rotator is base mounted on a flat plate fixed to the top of the mast or tower. Six mounting holes are provided. The antenna boom is supported on a short vertical tube held by the top clamp assembly. Clamp assemblies are of sturdy construction and clamp blocks are reversible for small or large tube within the range 1¾" to 2½" diameter. U bolts are stainless steel 9 mm. diam.

The Indicator-Control Box is attractively finished in grey, with large illuminated meter, indicator lights, power switch, and "Left-Right" controls. Transformer is within Control Box. Control Box size: 5½" x 8½" x 4"; weight 8½ lbs.

1100M with Indicator-Control Box and bottom mast clamp, $165.00.
1100M with Indicator-Control Box (less bottom mast clamp), $148.50.
Special 7-conductor Cable for 1100M, 60 cents per yard.
All prices include Sales Tax. Freight is extra.

**AUSTRALIAN AGENT:**

**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 67-1650 (AH 37-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379
Circuits for All—A Simple Method of Drafting*

KENNETH L. GILLESPIE,† VK3GK

Farmers, clerks, shopkeepers and anyone else you care to name are Amateur Radio operators, but the converse is not true. Amateurs, in addition to being farmers, etc., are Electronic and Mechanical Design Engineers, Servicemen, Mechanics, Radio Operators and manufacturers of all types of equipment with the ability to meet and overcome a variety of problems associated with their hobby. Occasionally they are not Draftsmen, but why not? Isn’t this just another of the various trades an Amateur should have?

Anything home constructed should have a circuit diagram for reference for future servicing or to supply a copy to another chap in need of just that particular piece of apparatus. Additionally, and this is the point of this screed, a well drawn diagram supplied separately from the text is a great help to the editor of this magazine who is always in need of articles.

NECESSARY TOOLS

What to be done to acquire a modicum of skill in this direction, and what tools are necessary to do the job? Obviously anything from a ball point pen to a proper Indian ink pen and stencils will do.

It would suggest that each Amateur should have as part of his shack a foolscap pad of 4" squared paper and tracing paper for a start (although a parchment type lunch wrap paper will do for the latter) plus ruler or a piece of perspex with a straight edge for drawing straight lines.

Suppose that something has been built and modified until it works properly, there are most likely working sketches scribbled on scraps of paper with the appropriate amendments found desirable also shown. These have to be made presentable. To provide the first diagram, sketch by hand the complete circuit with soft pencil on the lines of the squared paper, leaving plenty of room between components for written identification of values. No need for a ruler or square, the paper takes care of spacing, parallel and right angle lines.

While there are people for and against showing a pop when one crosses another, it is simpler and standard practice not to use it but draw the line straight through. The thing to remember with this, is to see that all wires are drawn a particular wire, connect at different points so that all junctions show as a "T". This is good drawing practice anyway. These junctions are shown with a dot and this method of junctioning is valid even if the dot is accidentally omitted.

Having sketched the circuit, check carefully to see that it is the same as the original—if one has, or can get, someone else to check, so much the better because it is all too easy to overlook something that has been missed in the first place.

Now the next part of the job, whether it is for an article or for your permanent record, is to make an ink tracing (by putting the transparent paper over the pencil drawing and tracing in ink everything that has been sketched). This time a straight edge is used to rule the lines.

To make the job easier I would suggest investing in a solid clear plastic setsquare and drilling or reaming a series of different size holes along the straight edge. With a ball point pen and these, circles of different diameters can be easily drawn. Make the smallest diameter suitable for junction dots, the next for switch contacts. Both in conjunction will produce a co-ax connector. Largers ones would take care of the outline of a valve or transistor.

By careful use, drawing only part of a circle at a time and sliding the square, a coil can be drawn. If a little more work is undertaken a stencil of a simplified coil, as in modern practice, can be filed out or cut with a jeweller's saw.

RESISTORS can be a problem, but the simple rectangle (which will also double for a condenser) is easily made or if a zig-zag type is wanted, I suggest one or two triangles be cut and the square moved longitudinally until the resistor is formed.

LETTERING

Lettering is another bugbear of the non-draftsman, but quite reasonable uppercase lettering can be done if a long slot is sawn in the square and the pen worked so that it makes contact with the bottom and top of the slot for each letter. This keeps all lettering even and of the same height because the pen cannot move further than the limits of the slot. Two or more slots will give a choice of letter size.

For reproduction, whether a dyeline, blueprint, electrostatic, photo copy or line block for printing, use a broad ball point pen as this produces good contrast. Never use blue—it does not print. Black ball point is such a mixture of colours that it does not work as well as red.

Of course the ultimate for all drawing and lettering is Indian ink and here I suggest the Indian ink fountain pen, a drawing and writing instrument which has a hollow steel tube as its writing point. There are about four makes of these with a variety of diameters for different thickness lines. A good all round size is 0.6 mm in dia-

Amateur Radio, May, 1971

† P.O. Box 5, Clayton, Vic., 3168.
Crystals for Carphones—and Other Things

DAVID RANKIN,* VK3QV

In the last ten years the ready availability of commercially obsolete v.h.f. mobile transceivers has given rise to a new phase of Amateur Radio—the use of the a.m. and f.m. net frequencies with the subsequent development of v.h.f./u.h.f. Repeaters within the 52, 144 and 432 MHz. Amateur bands.

One of the elementary requirements for the successful operation of this type of equipment was that all the transmitters and receivers be tuned to the same frequency within close limits. Simple as it sounds, this was something alien to the methods of the v.h.f. Amateur of the 50s and early 1960s. Operators usually picked a crystal in the 8 MHz. range, and whatever frequency it multiplied out to within the 6 or 2 metre band became the “frequency” something to be guarded jealously. There was seldom any real thought given to achieving operation on a predetermined frequency to say within 0.005%.

CARPHONES
The appearance of cheap v.h.f. mobile transceivers—now usually known as “Carphones” after the name used commercially by one of the leading manufacturers—changed Amateur techniques because of the necessity for all units to be on the same frequency. With these Carphones, the receiver as well as the transmitter, was crystal locked, and no trimming controls were provided for the operator. Early thoughts were that if the same frequencies were required at the antenna, then use the same crystal frequencies in all the receivers and also the same in all the transmitters—surely the frequency marked on the crystal holder must be right. However, this philosophy was not borne out in practice, particularly where different model sets were involved. Some other factors must then be considered to explain these differences.

CRYSTAL FREQUENCY
The simplified equivalent circuit of a crystal is easily found in such well known texts as the R.S.G.B. Handbook or the A.R.R.L. Handbook. Suffice to say here that for the case of parallel resonance, the frequency of operation is dependent upon the total value of capacitance appearing across the terminals of the crystal whilst it is operating. In other words, the operating frequency depends upon the effective dynamic capacitance presented to the crystal.

Table 1 shows the variations in frequency obtained for different values of load (effective dynamic) capacitance and the corresponding series resonant frequency. These figures were taken on standard HC6/U plated crystals at 4 MHz., 10 MHz. and 45 MHz. The first two crystals were fundamental types—the 45 MHz. was a third overtone. The variations measured can only be taken as a guide, as the differences may be different in various crystal units produced by other manufacturers.

Table: Circuit Loading | Nominal Frequency | Measured Frequency
--- | --- | ---
10 pF. | 4055.556 KHz. | 10,285.71 KHz.
20 pF. | 4056.094 KHz. | not measured
29.3 pF. | 4055.556 KHz. | 10,284.38 KHz.
29.8 pF. | not measured | 10,284.02 KHz.
30 pF. | 4055.526 KHz. | 10,280.08 KHz.
40 pF. | 4055.199 KHz. | 10,282.69 KHz.
50 pF. | 4054.988 KHz. | 10,284.38 KHz.
60 pF. | 4054.838 KHz. | 10,284.02 KHz.
100 pF. | 4054.518 KHz. | 10,283.25 KHz.
Series Resonance | 4053.960 KHz. | 10,281.91 KHz.

The degree by which they vary from nominal frequency when terminated into the correct circuit condition is part of the adjustment tolerance and the total amount of this permitted variation is usually quoted as a plus or minus so much percentage. Alternatively, a “parts per million” or “Hz. per MHz.” phrase is frequently abbreviated to p.p.m.

1. The fundamental crystals measured were manufactured to suit a load capacitance of 30 pF. Refer to the third column of Table 2. The overtone crystal measured was manufactured for use at series resonance. When none of the crystals oscillated precisely at nominal frequency (i.e. the required frequency on 30 pF.) they are closest to nominal with this 30 pF. load condition and series resonance, respectively.

2. The variation in frequency between extreme values of load capacitance is so great that in the usual oscillator circuit, it becomes impractical to accommodate the changes required in load. Table 2 shows the frequency deviation from nominal for a typical 4 MHz. HC6/U plated crystal, and since the unit has been calibrated for a 30 pF. load, it could not be made to operate on correct frequency in a series resonant circuit unless that circuit was modified away from the series resonant condition. Again, in the case of small values of load capacity, the strays in the circuit, particularly if switching is involved, may be greater than the load capacity for which the crystal is designed. In this case, also, the crystal could not be made to oscillate on nominal frequency. Thus, in some multi-channel transceivers there are smaller values of fixed capacitance associated with the crystal oscillator than in the corresponding single channel model—the rest of the capacitance is made up of wiring capacity in the leads to the switch, and capacity in the switch itself. This approach of reduced fixed capacitors ensures that the crystals suitable for operation in the multi-channel models are also satisfactory in the single-channel versions.

ADJUSTMENT TOLERANCE
In effect, the adjustment tolerance is an allowance given to a manufacturer who cannot be expected to produce devices that are “spot on”. Resistors, capacitors, coils, etc., all have tolerances associated with their nominal values, and so also must crystals. However, in the case of a crystal unit, the user can do something about the situation. The nominal frequency can be produced by an appropriate value of load capacitance. Some thought given to the figures in Table 1 should make this clear. At some value of capacitance between 29 and 30 pF., both the 4 MHz. and 10 MHz. crystals oscillate on nominal frequency. In practice...
If a small trimmer is wired into the oscillator circuit, the load can be varied up or down, so that output on the precise nominal frequency can be achieved.

**LOAD CAPACITANCE**

Experience has shown that the best compromise for load capacitance for fundamental crystals is 30 pF. for frequencies up to 10 or 12 MHz. Initially, the U.S.A. adopted a value of 32 pF, which is somewhat academic, but the latest issues of the U.S. MIL specifications have changed to the 30 pF. value.

**S.S.B. Receivers**

Achieving 1 KHz. readout economically on a number of Amateur bands, modern s.s.b. receivers are of the double (at least) conversion superhet. design, where the first local oscillator is crystal locked and the second local oscillator is tunable. If the various crystals used for the different bands in the first oscillator are not specified precisely, the dial calibration will not hold from band to band.

These receivers usually have movable pointers—fiducaries—or some similar scheme to take up small differences of the order of 1 or 2 KHz. that will occur from band to band because of the adjustment tolerances on the individual crystals. If the crystals are not specified precisely, the differences from band to band may be beyond the correct range of the fiducary, in which case one of the main assets of the receiver is lost. On the other hand, if trimming facilities are provided, the adjustment tolerances may be tuned out, and then the dial calibration can be made to hold from band to band within 100 or 200 Hz. at least.

For the real enthusiast, there is nothing like switching on the 100 KHz. calibrator and the b.f.o. and tuning zero beat on one of the 100 KHz. marker signals, and then "clunking" the band switch from one band to another, and finding zero beat being maintained on all bands. What joy!

**V.H.F./U.H.F. Converters**

With the main receiver thus aligned, it should also become a joy to operate it as a v.h.f./u.h.f. tunable i.f. Any modern converter worthy of the name is crystal locked, and thus the frequency of this locking crystal becomes important if the main receiver dial is to become in turn direct reading on the v.h.f. or u.h.f. band concerned. A fairly simple way to check the converter crystal as follows, and let us take simple examples to illustrate the approach.

Consider a 6 metre converter that has an i.f. of 6 to 8 MHz., i.e. 52.000 MHz., to come up on 6.000 MHz. on the receiver dial. Choose a marker signal such that a harmonic will appear on both 6.000 and 52.000 MHz. exactly.

In the interests of a strong a harmonic as possible at the higher frequency, use the highest possible marker frequency. For the 6 metre converter, 2.000 MHz. is the highest possible figure that will divide evenly into both 6.000 and 52.000 MHz. Ensure that the receiver calibration is correct at 6.000 MHz. in the normal way (WWV, in-built calibrator, etc.), and then zero beat the third harmonic of 2.000 MHz. marker to the corrected 6.000 MHz. calibration. Having ensured that the 2.000 MHz. frequency is correct (within ±100 Hz. should be easily achieved), switch off the receiver calibrator and put the v.h.f./u.h.f. converter into operation and lock the fundamental marker frequency to 2.000 MHz. marker. Provided that the levels of the third harmonic into the main receiver and the 26th harmonic into the converter are adjusted appropriately, a beat note may be observed between these two signals at 6.000 MHz. on the dial. This, of course, is on the assumption that the converter crystal is oscillating close to its nominal frequency. In some instances the markers may not divide at all, in which case the trimming should bring the two signals into zero beat, provided, of course, that the converter crystal has been specified to suit the oscillator circuit in use. Once zero beat has been achieved the 6.000 MHz. dial calibration becomes 52.000 MHz. as far as the overall receiver system is concerned.

Other examples are given in Table 4. Some thought on the subject will show that since all the popular v.h.f./u.h.f.

<table>
<thead>
<tr>
<th>Percentage %</th>
<th>Parts per Million PPM</th>
<th>Hz. per MHz at 52 MHz</th>
<th>Actual Variation at 146 MHz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>± 0.01</td>
<td>± 100</td>
<td>± 100</td>
<td>± 5.2 KHz.</td>
</tr>
<tr>
<td>± 0.005</td>
<td>± 50</td>
<td>± 50</td>
<td>± 2.6 KHz.</td>
</tr>
<tr>
<td>± 0.0015</td>
<td>± 15</td>
<td>± 15</td>
<td>± 2.19 KHz.</td>
</tr>
<tr>
<td>± 0.001</td>
<td>± 10</td>
<td>± 10</td>
<td>± 1.46 KHz.</td>
</tr>
<tr>
<td>± 0.0005</td>
<td>± 5</td>
<td>± 5</td>
<td>± 0.73 KHz.</td>
</tr>
</tbody>
</table>

Table 2 — A comparison showing the relationship between three ways of quoting tolerances on the frequency of a crystal, and also showing what these mean in terms of Hz. or KHz. at 52 and 144 MHz. Actual variation (in Hz.) equals actual frequency (in MHz.) multiplied by p.p.m. Actual variation (in KHz.) equals actual frequency (in MHz.) multiplied by (p.p.m. divided by 1,000).

Amateur Radio, May, 1971
bands start with even number frequencies, then, provided the chosen i.f.
begins with an even number, a 2.000 MHz marker signal would always pro-
vide the correct harmonics.

The principal problem arising with this scheme is the relative strengths
of the marker signal at the i.f. and the v.h.f./u.h.f. The widely differing order
of harmonics will have widely differing signal strengths—the higher the
order of the harmonic, the weaker it will be—and thus, in practice, some
method of enhancing a particular harmonic may be required. Otherwise, the
weaker harmonic will be swamped by the stronger and any beat note may not
be detected aurally. A diode frequency multiplier, followed by appropriate tun-
ed circuits, is one possible solution.

CONCLUSION
Where optimum performance of Car-
phones is required, or the full poten-
tial of direct frequency readout on
modern h.f. and v.h.f./u.h.f. receiving
systems is to be realised, then careful
attention must be paid to the specifi-
cations for the frequency determining
crystals. Oscillator circuits in such
equipment should not be modified un-
less the user is fully aware of all the
implications such modifications may
have. Where the circuits are standard,
reference to the manufacturers’ hand-
book should help the user to fully
specify the crystals correctly.

Digital circuitry and techniques are
starting to appear in the Amateur lit-
erature, and it is probably only a ques-
tion of time before the “average”
receiver comes equipped with digital
readout of frequency. The resolution
will be mainly limited by the number
of readout tubes and gating times used,
but fine resolution will be useless with-
out corresponding accuracy—the fre-
quency accuracy of the crystals in the
system. Thus, the requirement for care
in the specification of the operating
conditions for the crystal looks like
it is with us to stay, and in fact the
degree of precision will increase as
more exotic devices become available.

BIBLIOGRAPHY
1. “Radio Communication Handbook”, 4th Edi-
tion 1968, R.S.G.B. (U.K.), chapter 1, page 32.
tion 1967, A.R.R.L. (U.S.A.), chapter 2,
page 52.
Crystals”, “Amateur Radio”, March 1967,
pages 2 and May 1967, page 5.

Table 4.—Examples of a marker crystal frequency suitable for zeroing a v.h.f./u.h.f. converter to assure direct frequency readout on the tunable i.f. Note that
the examples chosen are to illustrate this point and are not necessarily recommended as good v.h.f./u.h.f. receiver practice.
When considering material for a lecture on Amplitude Modulation the following article from the "Aerovox Research Worker," Vol. 14, No. 6, was examined and found to be so fluent and written that it is reproduced in full.

The term "tube" is used in the text for vacuum-tube or valve.

Additional material is by the lecturer.

The three common methods of superimposing an audio-frequency component upon a radio-frequency carrier wave are termed frequency modulation, phase modulation, and amplitude modulation. Radio telephony and some forms of telegraphy are made possible by modulation processes.

In amplitude modulation, the carrier frequency is maintained constant while the carrier amplitude is varied at the audio rate. Neither frequency nor phase is more than slightly disturbed in efficiently operated systems.

Amplitude modulation is widely used in broadcasting. Each of the standard broadcast stations and a few of the radio telephone communication stations now in operation employ this method. Moreover, amplitude-modulated signal generators are used to align and test several million of the receivers in current use.

The appearance of an amplitude modulated carrier is shown in Fig. 1. This illustration shows the carrier voltage and current wave before and after application of the modulating component.

It is seen that both carrier and audio voltages are alternating components of widely different frequency. When the two are combined in the process of amplitude modulation, the amplitudes of successive positive and negative carrier peaks are alternated in accordance with the "moulded" carrier traces out an envelope corresponding to the frequency and relative voltage of the audio component. The relationship of carrier and modulating voltages or currents and frequencies of these components is shown in Fig. 2. A radio-frequency carrier before modulation is shown in Fig. 2A, the modulating voltage wave in 2B and the completely modulated carrier in 2C.

In order to combine the audio and carrier components in the modulation process, the alternating a.f. voltage is actually superimposed upon one of the d.c. operating voltages of the r.f. amplifier or oscillator, generally the plate or grid voltage. Accordingly, the a.c. and d.c. voltages add on one half-cycle of audio voltage and buck on the other half-cycle. This results in an increase in the normal d.c. voltage in the first instance and a reduction in the second case.

In consequence of this action, a variable d.c. voltage is applied to one of the carrier components in the process of modulation, the alternating r.f. voltage is either increased or decreased with respect to each other. This is evident that lower values of M than shown would fail to raise the carrier amplitude to an instantaneous value of twice its unmodulated carrier amplitude and reduced to a minimum value of zero.

In the conventional system operating ideally, both positive and negative carrier peaks are affected by the same amount, and the carrier frequency and phase remain unaltered.

In Fig. 2C, C is the unmodulated carrier amplitude and M the amplitude of the modulating voltage. The diagram shows the condition of complete modulation, i.e. M = C, and X = 2C. From the relationship shown, it is evident that lower values of M than shown would fail to raise the carrier amplitude to an instantaneous value of twice its unmodulated value on positive peaks of modulating voltage, or to reduce it entirely to zero on negative peaks of modulating voltage. Similarly, higher values of M would raise amplitude C to a level more than twice its unmodulated value while completely cutting off the carrier for brief intervals during the negative modulation swing. The carrier would disappear completely at the zero line, the negative modulation peaks being lost. Consequently, the dimension D is useful for indicating the extent of the process, or modulation depth.

The degree of modulation is useful information. The effective value of amplitude-modulated current increases with modulation depth. In practice, the depth of modulation is determined conveniently from the ratio of modulated to unmodulated carrier amplitudes. This ratio is known as the modulation factor.

From the diagram of Fig. 2, the modulation factor may be expressed as M/C. However, when measurements are made of successive modulated and unmodulated amplitudes, as with an oscilloscope, it is more convenient to measure each of these amplitudes with reference to the zero line rather than with respect to each other. This is because the original carrier amplitude disappears from the screen (or meter scale) during modulation. When measurements are made from zero, M is equal to the difference between the modulated and unmodulated carrier amplitudes, and the equation for modulation factor becomes:

\[ \text{Modulation Factor} = \frac{X}{C} \] (1)

These amplitude values are determined by means of a peak-reading vacuum-tube voltmeter connected across an appropriate tuned circuit, resonant to the carrier frequency, or they may be taken directly from an oscilloscope screen in any desirable linear units of measurement.

In complete modulation, the modulation factor is 1.0. This follows from the requirement that the completely modulated carrier amplitude be exactly twice its unmodulated value, its ratio being unity. The percentage of modulation, common term for expressing modulation depth, may be obtained by multiplying the modulation factor by 100:

\[ \% \text{Modulation} = \frac{X - C}{C} \times 100 \] (2)
What's 16 and versatile all over?

16 hand picked high performance transistors—
from the largest range available in Australia

Fairchild MAY

- Versatility of application
- Availability
- Wide range
- Data
- Lower Prices (lower still when purchased in kit-form)—all hand selected from the largest range of Epoxy/Plastic transistors available in Australia.

N.P.N. Products
2N3563 R.F. Amp. and High Speed Switch
2N3564 Low Noise Wideband R.F. Amp.
2N3565 High Gain Audio Amp.
BC208 High Gain Audio Amp.
2N3566 High Gain High Current Audio Amp.
2N3568 General Purpose High Voltage
High Current Amp. and Switch
2N3643 General Purpose Amp. and
High Current Switch
2N3646 High Speed Saturated Switch

P.N.P. Products
2N3693 General Purpose Low Noise R.F. Amp.
SE5030A Low Capacitance Video I.F. Amp.

N.P.P. Products
2N3638 High Current Switch
2N3638A General Purpose Audio Amp. and High
Current Switch
2N4354 Low Level Low Noise Amp. and High
Current Switch
2N4258 Ultra High Speed Switch
2N4121 R.F. Amp. and High Speed Switch


420 Mt. Dandenong Road
CROYDON. Victoria, 3136

Page 10
Amateur Radio, May, 1971
Several degrees of modulation depth are shown in Fig. 3. Fig. 3A corresponds to complete, or 100% modulation, Fig. 3B to incomplete (approximately 50%) modulation, and Fig. 3C to over-modulation (somewhat greater than 100%). Note from these voltage or current curves that the maximum and minimum modulated amplitudes are equal respectively to twice the unmodulated value and zero for 100% modulation, less than twice carrier and higher than zero for incomplete modulation, and greater than twice carrier for over-modulation. Observe also that by-products of overmodulation are the cut-off periods along the zero line.

In a completely modulated transmitter, the instantaneous antenna current or voltage is raised to twice its normal value by positive modulation peaks and decreased to zero by negative modulation peaks. The antenna resistance remains constant as long as the carrier frequency is not shifted; so the power in the modulated wave is directly proportional to the square of the modulated carrier voltage or current \( P = E^2 \) (or \( I^2R \)). In any carrier that is modulated 100% by the amplitude method, the instantaneous peak power is therefore four times the unmodulated carrier power. The completely modulated amplifier or oscillator must be capable of supplying this increased peak power output.

**ADVANTAGES OF COMPLETE MODULATION**

The audio-frequency voltage and power delivered by the detector in a radio receiver is proportional to the amplitude of the modulating voltage. This voltage is equivalent in magnitude and frequency to the modulation envelope. In order to obtain the largest undistorted detector output for a given carrier, the largest permissible modulation voltage must be employed in the modulation process—which is another way of stating that the highest permissible values of modulation depth, modulation factor, or modulation percentage give the highest undistorted detector output levels.

100% modulation is the maximum permissible depth which may be applied to any carrier wave, since this percentage allows the carrier amplitude to be swung between zero and twice its normal value, the maximum safe limits. Higher percentages of modulation have already been shown to introduce cut-off periods (Fig. 3C), which because of the high damping in these cut-off periods, cause broad tuning. Frequency distortion, resulting from loss of the negative modulating voltage peaks and deviation of the carrier frequency during modulation, are also by-products of excessive modulation depth.

Complete modulation of a transmitter reduces heterodyne interference at distant points, improves the signal strength (and signal-to-noise ratio) in receivers in the service area, and affords a better increase in the station's service area than might be gained by reason of the lower side-frequency voltages, resulting from loss of the negative modulating voltage peaks and deviation of the carrier frequency during modulation. Overmodulation, however, produces corresponding variations in the side bands of the r.f. wave. The total current thus remains constant through the action of the rector L, which are in the proper direction with respect to \( E_r \), to maintain the supply current steady. When the modulator plate current increases, the amplifier plate current must decrease, and vice versa. The total current thus remains constant through the action of the rector, while audio-frequency variations in the plate current or the r.f. tube produce corresponding variations in the carrier.

For 100% modulation, the r.f. amplitude is modulated between twice its resting value and zero, in order to secure complete modulation. In order to accomplish this in the Heising circuit, several modulator tubes would need to be connected in parallel to reduce the modulator plate resistance. (Actually, in order to secure complete modulation, the plate resistance would have to be reduced to zero.) Or the modulator plate must be operated at a higher

The channel width of an amplitude modulated emission is fixed by the separation of the upper and lower side frequencies and is the total width of the side bands so delineated. The channel width is thus twice the frequency of the modulating voltage. When the latter contains several frequencies, as in speech or music modulation, the highest frequency in the complex group determines the maximum side band width.

**AMPLITUDE MODULATION CIRCUITS**

Fig. 5 shows various circuits for amplitude modulation. Fig. 5A and 5B are arranged for plate modulation of the r.f. tube; Fig. 5C for grid-bias modulation; Fig. 5D, cathode modulation; and Fig. 5E, suppressor modulation. Plate modulation may be constant current or constant voltage in type. In the former case, the modulator delivers audio-frequency power to the r.f. tube. In the constant voltage system, the modulator may be considered equivalent to an audio operated resistor in series with the d.c. plate voltage of the r.f. tube.

**Heising Modulation**

Fig. 5A is the Heising or constant current circuit. In this arrangement, d.c. power is supplied to both r.f. and modulator tubes through the iron-core reactor L by the common source \( E_r \). The modulator plate current is maintained by the d.c. grid voltage of the modulator at the same value as the r.f. plate current. Variations in the modulator grid voltage (produced by excitation from the audio amplifier) cause corresponding changes in the modulator plate current, negative going, causing a reduction in plate current, while a reduction in the negative value (or positive grid swing) causes the plate current to rise. These plate current variations give rise to induced voltages in the reactor L, which are in the proper direction with respect to \( E_r \) to maintain the supply current steady. When the modulator plate current increases, the amplifier plate current must decrease, and vice versa. The total current thus remains constant through the action of the reactor, while audio-frequency variations in the plate current of the r.f. tube produce corresponding variations in the carrier.
Voltage than that of the r.f. tube. The latter method is most common and is accomplished by the series dropping resistor R which is shunted by the capacitor C, the function of the latter being to pass the audio voltage.

**Plate Modulation**

Fig. 5B shows plate modulation employing a coupling transformer. The modulator may be a class A, class B or class AB amplifier of sufficient power capability. Here the a.f. power is superimposed upon the d.c. plate power input to the r.f. tube by means of the transformer. The audio voltage is thus effectively in series with the d.c. plate power input to the r.f. tube. The voltage required for complete modulation depends upon the a.f. voltage in the transformer primary, the turns ratio of the transformer, and the maximum d.c. power input to the plate of the r.f. tube. When the a.f. power output is sufficient, complete modulation with low distortion and good linearity is obtained when the impedances of modulator and r.f. tube plate circuits are matched through the coupling transformer.

In plate-modulated systems, the audio power which must be supplied by the modulator is equal to one-half the d.c. plate power input to the r.f. stage. It is clear from the foregoing explanations that since the instantaneous plate voltage of an r.f. tube under 100% modulation will be increased to twice its normal value, the tube must dissipate a detrimental amount of power unless its "resting" plate voltage is reduced to a safe value. For this reason tube tables indicate a lower value of plate voltage for telephony and modulated telegraphy than for unmodulated services.

**Grid Modulation**

Fig. 5C shows a grid-bias modulation circuit. Here, audio frequencies are introduced into the grid circuit of the r.f. tube through the coupling transformer T. This system utilizes variations in the grid-bias of the r.f. tube to secure amplitude modulation of the carrier. The peak grid voltage is varied by varying the d.c. bias at the audio frequency rate, and the average power output is increased by the modulation process, although the d.c. plate power input remains constant. Operating voltages and currents must be maintained at specific values in order to obtain good linearity of modulation. Especially important is the location along the grid characteristic at which the tube is operated. These values are such that the plate circuit efficiency of a grid-modulated stage is reduced to approximately one-half that of a plate-modulated stage. 35% is usual with grid modulation. Both excitation and bias voltages are set considerably lower than corresponding characteristics in class C operation.

The carrier efficiency in a grid-bias modulated system is highest at the modulation peak. The carrier must be maintained at a value which is equal to half of its peak voltage, the modulated values being then swung up and down about this particular value. The carrier efficiency is accordingly termed one-half the theoretical possible efficiency. Actually, however, the efficiency of grid-modulated r.f. amplifiers is approximately 35%. An advantage of the system is its low a.f. and r.f. power requirements. Very small audio levels will completely modulate the amplifier, while the actual r.f. excitation power reaching the grid need be sufficient only to overcome the grid losses.

**Cathode Modulation**

A typical cathode-modulated amplifier is shown in Fig. 5D. In this circuit, the audio voltage is impressed across the cathode circuit. The cathode-modulated circuit may be considered to divide the modulation between plate and grid, the carrier efficiency being, as a result, intermediate between the two and usually 45%. Variations occur in both grid-bias and plate voltage during modulation.

Since the presence of a small amount of grid-bias modulation in this system tends to make the circuit behave somewhat as a grid-bias-modulated stage, the output will not be so high as with plate modulation. Grid modulation is purposely kept small to increase the carrier efficiency. The percentage of grid modulation may be controlled by adjustment of the grid leaks, or of the position of the grid return along the tapped secondary of the cathode modulation transformer.

As the percentage of plate modulation is increased, the required audio power (from the modulator) and r.f. excitation power (from the amplifier) both of these requirements will be small as compared to those of plate modulation circuits.

**Suppressor Modulation**

Fig. 5E shows the circuit for suppressor modulation of r.f. pentodes. Here, the audio-frequency component is introduced through the coupling transformer in the plate of the r.f. tube, while the d.c. suppressor bias. An extremely small amount of audio power is required to modulate an amplifier in this fashion, but the carrier efficiency, as in grid-bias modulation, is only about 35%, and distortion increases above 80% modulation.

The preceding material from Aerovox has shown how Amplitude Modulation is accomplished, however, there are several modes of transmission of this type of modulation.

In the above discussion we have seen that there is a radio frequency carrier and two symmetrical sidebands. This is the type of signal which is transmitted by broadcasting stations and many other stations using amplitude modulation. However, it is possible to transmit variations for special purposes.

**DOUBLE SIDEBAND SUPPRESSED CARRIER (D.S.B.S.C. or D.S.B.)**

During or after the modulation process the carrier is removed and only the sidebands are transmitted. These will be centred on the carrier frequency. The main advantage of this and other suppressed carrier systems is that there is no carrier to produce audible interference beats in receivers. However, there is an artificial carrier to be inserted in the receiver. This carrier must be very close in frequency to the original or to the receiver i.f. frequency, if a super heterodyne type, also it must be reasonably accurately phased and must be of the same level or ratio to the sidebands, as existed in the transmitter.

The disadvantages outweigh the advantages for broadcasting, but the system is used in Amateur and some Commercial systems.

**SINGLE SIDEBAND SUPPRESSED CARRIER (S.S.B.S.C. or S.S.B.)**

There are several methods of doing this, but all start off with amplitude modulation. The two most popular methods of obtaining S.S.B. are the Filter method and the Phasing method.

In the filter method the radio frequency carrier is amplitude modulated, then either during the modulation process, or afterwards, the carrier is removed as in d.s.b. One of the sidebands is then passed through a filter whose selectivity curve has very steep sides.
and a flat top. The advantages of this type of transmission are that interference is minimised because of the absence of the carrier and also there is a considerable saving in spectrum space as only one sideband is transmitted.

In the phasing system the r.f. carrier and the a.f. signals are split and phased in such a manner that the carrier cancels itself and one of the sidebands is cancelled, leaving a single sideband with suppressed carrier.

The disadvantages are similar to that of d.s.b. It is interesting to note that in the early days of broadcasting in U.S.A. serious consideration was given to standardising all broadcasting stations to use single sideband suppressed carrier transmission. However, this proposal failed because of the difficulty in making satisfactory receivers.

In recent years great advances have been made in receiver design and with a modern receiver the tuning in of an s.s.b. signal is nearly as easy as with tuning a normal receiver to a broadcasting station.

The great savings to be obtained in the use of the shortwave portion of the spectrum, through the use of s.s.b., have resulted in changes to be made in the Australian short wave radio.

Gradually all radio telephony transmissions in Australia, except Amateur stations in remote broadcasting areas, use s.s.b. in the s.w. and v.h.f. bands in place of existing a.m. systems except where angle modulation is the preferred method.

COMPATIBLE SINGLE SIDEBAND

This is a very intricate method of transmitting high quality speech and music from a medium frequency broadcasting station. One sideband and the carrier are transmitted so that the signal can be received with an ordinary domestic receiver. The system has been used experimentally. Its only advantage is the saving in spectrum space because use is only made of one sideband.

There is a slight disadvantage in that the receiver tuning is a little bit different.

TELEVISION

The vision portion of a television signal is amplitude modulated by one of the methods outlined earlier to produce a double sideband and full carrier signal. Then either by de-tuning methods or the use of a vestigial sideband filter, most of one sideband is removed. The resultant t.v. signal then comprises the full carrier, one sideband and a small amount of the other sideband.

Again spectrum space is saved and receivers are easy to tune.

INDEPENDENT SIDEBAND

Essentially this is a method of transmitting a double sideband signal, but as distinct from d.s.b. described earlier, the individual sidebands contain different intelligence.

As has been shown, there are several methods of obtaining amplitude modulation and the method used will depend on many factors, which in the commercial field may involve patents.

If a very wide-band modulating signal is to be used, such as the vision signals in television, then it is usual to use a plate modulated class C r.f. amplifier, the output of which is modulated by an audio-frequency signal supplied by a class B a.f. amplifier, usually known as a class B modulator.

Class B a.f. and class C r.f. amplifiers were defined in Lecture No. 10 dealing with Harmonics.

The class C modulated amplifier of a typical m.f. broadcasting transmitter operates as follows:

- D.C. Plate Voltage: 3000 V.
- D.C. Plate Current: 10 A.
- D.C. Plate Input: 3 kW.
- R.F. Output: 2.220 KW.
- Plate Efficiency: 72%.

In contrast to many services where the maximum licensed power is that taken by the final r.f. amplifier stage it is required in a.m. broadcasting stations in Australia for a particular power into the actual aerial system under conditions of no modulation.

For the transmitter just mentioned, the licensed aerial power is 2000 watts and the difference between this and the transmitter output (220 watts) is the power lost in the transmission line and the aerial coupling unit.

The Australian Broadcasting Control Board, in its Standards for Technical Operation of Medium Frequency Broadcasting Stations, second edition, requires that the aerial input power measured at the aerial driving point shall not exceed the licensed aerial power.

In these circumstances the aerial input power measured at the aerial driving point shall not exceed 2000 watts and it must not vary at any time by more than ±10% of the authorised power for an omnidirectional aerial.

In the case of directional aerials it is virtually impossible to make accurate impedance measurements of each element of the whole aerial system whilst it is in operation because any attempt to make such a measurement will upset the aerial adjustments. The impedance of the elements may vary greatly when energised from that which exists when they are not energised.

For instance, the measured impedance of the 3CS East point (shall not be disregarded) is 107 ohms + J124 at 1130 KHz. with the West aerial open circuited.

If the West aerial is earthed, the East aerial figures become 96 ohms + J120 at 1130 KHz.

However, when the aerial array is energised the impedance of the East mast changes to 50 ohms ± 10 at 1130 KHz. This is a calculated figure, not measured.

Because of these difficulties with a directional aerial system, the A.B.C.B. permits the measured power at the input of the common driving point to be less than the authorised power and it must not vary at any time more than +15.5% or -5.5%.

In these circumstances the aerial power is deemed to be ±10% of the authorised power.

ANTENNA FOR 160 METRES

In practice little surface wave radiation can be produced by a horizontal antenna on 160 metres [60 dB. down as compared with a vertical has been suggested (Ref. 2)]. A horizontal antenna can be used inadvertently to produce vertical polarisation as pointed out in the section on "Vertical versus Horizontal for Receiving", which accounts for why some apparently horizontal antennas signal are received locally at good strength. Also, horizontal antennas can produce considerable sky wave propagation at night which can be received locally with some fading.

(Note.—A horizontal antenna can produce satisfactory surface propagation only if both the receiving antenna and transmitting antenna are several wavelengths above the ground, see impossibility on 160 metres—or if the receiving antenna is only several wavelengths from the transmitter. In practical cases horizontal polarisation is unsuitable for surface wave propagation beyond the 100 miles.)

REFERENCES

1. The use of the terms effective length, form factor and some of the symbols were taken from "Admiralty Handbook of Wireless Telegraphy," 1938. Sections R10, R11 and R22. The term effective length is also referred to as radiation length or radiation height.

2. R.S.G.B. Handbook 1968, diagram, Fig. 12B.

AWARDS

FIRST INTERNATIONAL ROSE SHOW AWARDS—NOVEMBER 1971

The Award is sponsored by the Hamilton Radio Club Branch 12 of N.Z.A.R.T. in accordance with the following rules:

1. Overseas Stations: To QSO 10 Hamilton stations on any band or mode.
2. Copies of log giving date, time, frequency, your call sign and call sign of station QSOed and any other information which may be required only confirmation required.
3. Enter Award from 1st July, 1971, and closes 30th November, 1971, both days being inclusive for Award.

Cost of Award: Overseas stations, 8 IRCs.

Requests for Award must be sent to Award Committee via Branch 12 of Hamilton Radio Club, P.O. Box 88, Hamilton, New Zealand.

VK SOUTH-WEST CERTIFICATE

Due to the popularity of the South West Certificate, commemorating the Captain Cook Bi-Centenary and the Wagga Wagga Centenary, we are going to re-issue, on a continuous basis, a further series of attractive certificates.

These certificates will be awarded to any Amateur who contacts seven South West Area stations on any band or mode, after the 1st April, 1971.

To receive the award, please send your logs to the Secretary, South West Area, P.O. Box 551, Wagga Wagga, N.S.W., 2650.

LICENCED AMATEURS IN VK

DECEMBER 1970

<table>
<thead>
<tr>
<th>Region</th>
<th>Full</th>
<th>Lim</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK0</td>
<td>11</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>VK1</td>
<td>1602</td>
<td>457</td>
<td>1059</td>
</tr>
<tr>
<td>VK2</td>
<td>1318</td>
<td>650</td>
<td>1968</td>
</tr>
<tr>
<td>VK3</td>
<td>555</td>
<td>196</td>
<td>751</td>
</tr>
<tr>
<td>VK4</td>
<td>518</td>
<td>236</td>
<td>754</td>
</tr>
<tr>
<td>VK5</td>
<td>36</td>
<td>12</td>
<td>48</td>
</tr>
<tr>
<td>VK6</td>
<td>164</td>
<td>68</td>
<td>232</td>
</tr>
<tr>
<td>VK7</td>
<td>37</td>
<td>12</td>
<td>49</td>
</tr>
<tr>
<td>VK8</td>
<td>89</td>
<td>7</td>
<td>96</td>
</tr>
</tbody>
</table>

VK0 11 1 12
VK1 1602 457 1059
VK2 1318 650 1968
VK3 555 196 751
VK4 518 236 754
VK6 36 12 48
VK8 89 7 96

Total 4508 1793 6301

Grand Total
SIDEBAND ELECTRONICS ENGINEERING

VAESU MUSEN:
The latest model FT-200 Transceivers, with external VFO provisions, in beautiful black finish now, all sets corrected for key-clicks, together with extra-heavy duty AC supply-speaker unit in matching cabinet, Midland PTT dynamic microphone, the package $410.

Yaesu MUSEN units, FT-DX-400 Transceivers, FL-2000 B Linears, FL-DX-400 Transmitters, Speakers, Filters, 5 and 2 Metre Solid-State Converters at the usual competitive prices.

ANTENNAS:
Stocks of Hy-Gain TH9XXX, Hy-Quad, 1A4VO, Verticals, MOSLEY: Models 1A3JR and MUSTANG, the presently cheapest full-power tri-band Yagi beams for $130. Also Webster Bandpassers and MARK Halicrafters, with swivel mounts and springs.

FILTERS:
Kokusaiki Mechanical Filters, CW type 500 cycles 455 KHz., with input and output matching transformers, $20.
Yaesu MUSEN 3180 KHz. Crystal Filters, 2400 cycles, as used in the FT-DX-400 Transceivers, $30.
Yaesu MUSEN 3180 KHz. CW Filters for the FT-DX-400, complete kits with miniature relays, PCB and instructions, $35 per kit.
Sets of six matched FT-241 Crystals, including two BFO Crystals. 375
Kokusai Mechanical Filters, CW type 500 cycles 455 KHz., with input and output matching transformers, $85.
Yaesu MUSEN 3180 KHz. Crystal Filters, 2400 cycles, as used in the FT-DX-400 Transceivers, $30.
Yaesu MUSEN 3180 KHz. CW Filters for the FT-DX-400, complete kits with miniature relays, PCB and instructions, $35 per kit.
Sets of six matched FT-241 Crystals, including two BFO Crystals. 375

ELECTRONIC KEYERS:
KATSUMI, Model EK26, with built-in monitor. 240v. AC operation, keying paddle attached, fully or semi-automatic operation, with switching transistor and keying relay, speeds up to 65 w.p.m., $60.
Yaesu MUSEN 3180 KHz. Crystal Filters, 2400 cycles, as used in the FT-DX-400 Transceivers, $30.
Yaesu MUSEN 3180 KHz. CW Filters for the FT-DX-400, complete kits with miniature relays, PCB and instructions, $35 per kit.
Sets of six matched FT-241 Crystals, including two BFO Crystals. 375

VALVES AND TUBES:
Caslon 24-hour, date and day of the week. 240v., S25, post paid.

DIGITAL CLOCKS:
Yaesu Musen 3180 KHz. CW Filters for the FT-DX-400. complete kits with Yaesu Musen 3180 KHz. Crystal Filters. 2400 cycles, as used in the
The same FT-200 set with a kit of heavy duty power supply components, Caslon 24-hour, date and day of the week. 240v., S25, post paid.

MIDLAND PRODUCTS:
Type 12-710 one-watt Transceivers, now on 27.240 or 27.880 MHz., also crystals for 27.085 MHz. available; 3 channels, call signal, excellent for CW operation, with eight penlite batteries, earphone, carrying case, audio squelch control, battery voltage meter, each still only ......... $37.50
Type 23-136 Field Strength Meter, with five ranges, tunable from 1 to 300 MHz., with telescoping whip .......... $10
Type 23-136 SWR - Power Meter, dual meters 100 micro-amp, very sensitive for low power but good for 1 kw. maximum, up to 175 MHz., reads forward and reflected power simultane
ously, 52 ohm impedance .......... $20
Type 23-126 SWR Transmitter, standard single meter type, 52 ohm impedan
ce, with whip for field strength metering .......... $12
PTT Dynamic Hand Microphone, steel case, 50K ohm impedance, excellent voice quality, no rocking armature type, with coiled cord and mobile use clip .......... $10
Table Model Dynamic Microphone, with PTT bar or lock switch, 50K ohm impedance, a quality bargain at .......... $15
Same Table Microphone with built-in two stage pre-amplifier, adjustable for up to 50 dB. amplification .......... $25
Co-ax Connectors, Midland types PL-259, SO-239 females with or without flanges, PL-258 double-ended female; per conn, each $0.75
Co-ax Connectors for PL-259 for thinner co-ax. cable .......... each $0.20
Expected soon—Midland 5-watt Base Station Transceivers, eight-channels, 240v. AC, fully P.M.G. approved for 27.880 MHz. operation. With 5 meter and power-output metering, including PTT microphone, with switch to be used as 3-watt public address amplifier into separate speaker(s). Target price, all inclusive, only .......... each $100

COLLINS KWM-2 with PM-2 AC Supply, $700. Excellent bargain.

All prices quoted are net, cash with order. Springfield, N.S.W., subject to alteration without prior notice, sales tax included in all cases.

SIDEBAND ELECTRONICS ENGINEERING
P.O. BOX 23, SPRINGWOOD, N.S.W., 2777

BRIGHT STAR CRYSTALS
FOR ACCURACY, STABILITY, ACTIVITY AND OUTPUT

SPECIAL OFFER—
STANDARD AMATEUR CRYSTALS
STYLE HC6U HOLDER, FREQUENCY RANGE 6 TO 15 MHz.
0.01% $4.25
0.005% $5.50
Prices Include Sales Tax and Postage

COMMERCIAL CRYSTALS
IN HC6U HOLDER, 0.005% TOLERANCE, FREQUENCY RANGE 6 TO 15 MHz.
$6.00 plus Sales Tax and Postage

Write for list of other tolerances and frequencies available.

COMPREHENSIVE PRICE LIST NOW AVAILABLE—WRITE FOR YOUR COPY

New Zealand Representatives: Messrs. Carrell & Carrell, Box 2102, Auckland
Contractors to Federal and State Government Departments

BRIGHT STAR CRYSTALS PTY. LTD.
LOT 6, EILEEN ROAD, CLAYTON, VIC., 3168
Phone 546-5076

With the co-operation of our overseas associates our crystal manufacturing methods are the latest

DURALUMIN
ALUMINIUM ALLOY TUBING
IDEAL FOR BEAM AERIALS AND T.V.
★ LIGHT ★ STRONG ★ NON-CORROSIVE

Stocks now available for Immediate Delivery

ALL DIAMETERS — 1/4" TO 3"
Price List on Request

STOCKISTS OF SHEETS—ALL SIZES AND GAUGES

GUNNERSEN ALLEN METALS
PTY. LTD.
SALMON STREET, PORT MELB’NE, VIC.
Phone 64-3351 (10 lines)
T’grams: "Metals" Melb.

HANSON ROAD, WINGFIELD, S.A.
Phone 45-6221 (4 lines)
T’grams: "Metals" Adel.
FREQUENCY MEASURING EQUIPMENT

The following is a copy of a letter from the Director-General, P.M.G. Radio Branch, to the Federal Secretary, W.I.A.,

Amateur Radio Operators
Requirement to Possess Frequency Measuring Equipment

Dear Mr. Williams,

As you know, Wireless Telegraphy Regulation 59 and Section 54 of the Amateur Handbook state that an Amateur licensee is required to have available at his station frequency measuring equipment capable of verifying that emissions are within authorised Amateur frequency bands.

This requirement was recently reviewed and it has now been decided that the conditions governing the licensing and operation of Amateur radio stations should not make it mandatory for the licensee of any such station, or for an applicant for a licence for any such station, to possess a specific piece of frequency measuring equipment. The view is now held that it is sufficient to provide that the licensee must ensure that emissions from his station are within the limit of the Amateur frequency band in which he is operating.

It is proposed to amend the Wireless Telegraphy Regulations, the Amateur Handbook and other appropriate documents as soon as practicable. The new policy, however, will be adopted forthwith and licensees of Amateur stations may be informed accordingly.

—Director-General,
P.M.G. Radio Branch.

WHEN VISITING AUCKLAND, N.Z.

Federal Secretary, W.I.A.,
Dear OM,

As the Secretary of the Auckland Regional Co-ordinating Committee (a group comprising representatives of the various Branches of N.Z.A.R.T. here in Auckland), I have been requested to write to you on the following matters:

On many occasions overseas Amateurs visiting our two countries do not know how to go about meeting local Amateurs and we should like to have the names and addresses (with telephone numbers) of an Amateur in both Sydney and Melbourne to whom we could direct overseas Amateurs (visiting Auckland and N.Z.) en route to Australia.

At 24 hours' notice recently we were able to arrange a gathering of about 40 Amateurs when Brian Armstrong, G3EDD, Executive Vice-President of R.S.G.B. was in Auckland for a few days and he told us of his meeting with officers of your Institute.

The following information is provided in the event of your knowing of prospective visitors to Auckland:

Mr. W. S. Chester, ZL1OD,
404 Mt. Albert Road,
Mt. Roskill, Auckland.
(Telephone 699-855)

or—
Mr. M. H. Churton, ZL1TB,
15 Grassways Avenue,
Pakuranga, Auckland.
(Telephone 577-859)

Thanking you in anticipation for your attention to this request,

Mark H. Churton, ZL1TB.

PREDICTION CHARTS FOR MAY 1971

(Prediction Charts by courtesy of Ionospheric Prediction Service)
CONTEST RESULTS:

1971 John Moyle Memorial National Field Day

**SIX-HOUR DIVISION**

<table>
<thead>
<tr>
<th>VK2RJ/P</th>
<th>144 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK3ZA/P</td>
<td>773</td>
</tr>
<tr>
<td>3BBC/P</td>
<td>737</td>
</tr>
<tr>
<td>3AGF/P</td>
<td>547</td>
</tr>
<tr>
<td>3EV/P</td>
<td>317</td>
</tr>
<tr>
<td>3AV/P</td>
<td>236</td>
</tr>
<tr>
<td>3NX/P</td>
<td>208</td>
</tr>
<tr>
<td>3ZQC/P</td>
<td>91</td>
</tr>
<tr>
<td>3NR/P</td>
<td>36</td>
</tr>
<tr>
<td>VK4GT/P</td>
<td>713</td>
</tr>
<tr>
<td>4XV/P</td>
<td>483</td>
</tr>
<tr>
<td>4PI/P</td>
<td>222</td>
</tr>
<tr>
<td>VK5WC/P</td>
<td>600</td>
</tr>
<tr>
<td>5ZCR/P</td>
<td>170</td>
</tr>
<tr>
<td>5LP/P</td>
<td>135</td>
</tr>
<tr>
<td>5DZ/P</td>
<td>90</td>
</tr>
<tr>
<td>VK6AB/P</td>
<td>693</td>
</tr>
</tbody>
</table>

**24-HOUR DIVISION**

| VK22CT/P | 116 points |
| 3BBB/P | 1144 |
| VK42Q/P | 1803 |
| 4IE/P | 1222 |
| 4AL/P | 965 |
| VK6VB/P | 655 |
| 6MM/P | 24 |

**Section B:**

No entry.

**Section C:**

| VK2YB/P | 121 points |
| 2JM/P | 109 |

**Section D:**

| VK3X/B | 605 points |
| 3AUN | 305 |
| 3KR | 165 |
| VK4PV | 125 |
| VK6AJ | 310 |
| VK9GA | 180 |

**Section E:**

| VK4ZFB | 2276 points |
| 1VP/P | 2233 |
| VK2WG/P | 1985 |
| 2ATZ/P | 855 |
| VK3APC/P | 6010 |
| 3ATO/P | 4456 |
| 3ATL/P | 2578 |
| 3AM/P | 2048 |
| 3XK/P | 1914 |
| VK5WW/P | 2653 |
| 5LP/P | 1575 |
| VK6VF/P | 606 |

**Section F:**

| L4018—G. Thorpe | 395 points |
| VK4—C. Andrews | 190 |
| L5096—R. Everett | 180 |
| L5088—M. Bosma | 850 points |

**Ross Hull Memorial V.h.f. Contest, 1970-71**

**TROPHY WINNER**

**VK4ZFB—D. F. BLANCH**

**INDIVIDUAL RESULTS**

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>7-Day Score</th>
<th>48-Hour Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VK12MR</td>
<td>1132</td>
<td>561</td>
</tr>
<tr>
<td>VK1VP</td>
<td>715</td>
<td>340</td>
</tr>
<tr>
<td>VK2ZFB</td>
<td>1227</td>
<td>291</td>
</tr>
<tr>
<td>VK2BHL</td>
<td>733</td>
<td>326</td>
</tr>
<tr>
<td>VK22QJ</td>
<td>636</td>
<td>240</td>
</tr>
<tr>
<td>VK2IHZ</td>
<td>550</td>
<td>270</td>
</tr>
<tr>
<td>VK2BMX</td>
<td>492</td>
<td></td>
</tr>
<tr>
<td>VK22TQ</td>
<td>234</td>
<td>80</td>
</tr>
<tr>
<td>VK22MV</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>VK3TN</td>
<td>1777</td>
<td>538</td>
</tr>
<tr>
<td>VK3AKC</td>
<td>1314</td>
<td>348</td>
</tr>
<tr>
<td>VK3ASV</td>
<td>1087</td>
<td>308</td>
</tr>
<tr>
<td>VK3ZKN</td>
<td>1023</td>
<td></td>
</tr>
<tr>
<td>VK3BDA</td>
<td>883</td>
<td>357</td>
</tr>
<tr>
<td>VK3AOT</td>
<td>891</td>
<td>371</td>
</tr>
<tr>
<td>VK3YB</td>
<td>625</td>
<td>253</td>
</tr>
<tr>
<td>VK3YEJ</td>
<td>555</td>
<td>160</td>
</tr>
<tr>
<td>VK3BBB</td>
<td>529</td>
<td></td>
</tr>
</tbody>
</table>

**LISTENERS**

| L2074 | J. Hillard | 618 |
| L2259 | B. Vernon | 396 |
| L5988 | S. Ruediger | 1405 |

**NEW TERMINOLOGY**

**Editor "A.R."

Dear Sir,

Being an old tube man from way back, I find myself becoming ever more deeply imbedded in the quicksands of solid state terminology. There seems to be a conspiracy amongst the solid state toffins to keep us oldies and many of the youngsters out of the higher echelons of solid state simply by the production of an entirely new vocabulary for which no comprehensive dictionary exists.

It would appear that any device, be it a simple RC circuit or some more complex device, is referred to as a "Decoder Driver", concerned with a computer or similar device becomes a "Logic" element. Fair enough.

I also concede that abbreviations are in order if text and device descriptions are not to become too unwieldy, hence an RC circuit can be called RCL, a device using two diodes can be DDL, mixtures of diodes and transistors DTL and so on. But what, for instance, is the difference between a "Decoder Driver" and a "Decoder Driver"?

I can wind my way through most circuits using discrete devices, but when it comes to ICS, brother! am I in trouble. I find that the information sheets put out by the makers do not help very much either, most of them show an illustration of a little black box with sundry leads projecting therefrom and some, to me, incomprehensible data, relating to temperature rise plus some suggested external connections, but very little information regarding what goes on within said little black box.

So, Sir, how about having some of the knowledgable fellows pitch in and produce some explanations and perhaps a glossary of terms, to help us oldie bottics.

When it comes to DDL, TTL, DTL, etc., perhaps I should have remained a BCL.

—B. L. McCubbin, VK3SO.

P.S.—Solid-state engineers please note, BCL equals Broadcast Listener. (Mr. McCubbin is not alone with this problem, so how about it you solid-state engineers?)

**IPS-H5 HANDBOOK**

**FOR USE WITH IONOSPHERIC PREDICTION SERVICES**

We have been advised by the Ionospheric Prediction Service that the copies of this Handbook have been made available to all Divisions of the Institute, the Darwin Radio Club and the Canberra Radio Society.

The Handbook contains a considerable amount of information on the preparation and use of Prediction Charts and those of our readers who make regular use of the charts which we reproduce will find the book of considerable interest, whilst others will find much to interest them in the descriptions of the various atmospheric phenomena which can influence radio propagation.

A number of copies have been supplied to each Division for library use, and you should apply to them for a loan of this publication.

Please DO NOT ask the Prediction Service for a copy as the Assistant Director of I.P.S. has already indicated that it is impossible to send copies to individuals.

**GREAT CIRCLE MAPS**

Several maps have been returned by the postal authorities because the labels with names and addresses fell off. It is requested that anybody who has not received their map will write a brief note stating the fact to Secretary, W.I.A., P.O. Box 36, East Melbourne, Vic., 3002, and the maps will be reposted.
Australian Standards for Electro-Magnetic Interference

R Day R

E.M.I. Terminology (Doc. 1679)

The need for standard terms, definitions and symbols. If standard terms were meaningless, without standard terms, they cannot guarantee understanding of the meaning. However, a committee on Radio Interference and, in particular, the draft standards now out for public review.

Electronics Industry Standards Committee, for

M.E.I. Terminology (Doc. 1679)

The need for standard terms, definitions and symbols would be meaningless, without standard terms, we cannot guarantee understanding of the meaning. Without such a document on Radio Interference and, in particular, the

Electro-Magnetic Standards (Doc. 1696)

This draft proposes limits for the amount of radiated interference produced by low-current consumer electronics components, including a range of new lines, slide potentiometers, miniature and trim potentiometers, trimmers, power capacitors, ceramic discs, and an economy range of tantalum capacitors. Further information can be obtained from Soanar Electronics Pty. Ltd., 30-32 Lenton Rd., Box Hill, Vic., 3128, or their interstate offices.

SOANAR CATALOGUE

Soanar Electronics Pty. Ltd. have issued their new 1971 components catalogue containing 20 pages of information on hundreds of electronic components, including a range of new lines, slide potentiometers, miniature and trim potentiometers, trimmers, power capacitors, ceramic discs, and an economy range of tantalum capacitors. Further information can be obtained from Soanar Electronics Pty. Ltd., 30-32 Lenton Rd., Box Hill, Vic., 3128, or their interstate offices.

FINAL SMOOTHED SUNSPOT NUMBERS

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean Sunspot Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1969</td>
<td>0.1</td>
</tr>
<tr>
<td>August 1969</td>
<td>0.2</td>
</tr>
<tr>
<td>September 1969</td>
<td>0.3</td>
</tr>
<tr>
<td>October 1969</td>
<td>0.4</td>
</tr>
<tr>
<td>November 1969</td>
<td>0.5</td>
</tr>
<tr>
<td>December 1969</td>
<td>0.6</td>
</tr>
<tr>
<td>January 1970</td>
<td>0.7</td>
</tr>
<tr>
<td>February 1970</td>
<td>0.8</td>
</tr>
<tr>
<td>March 1970</td>
<td>0.9</td>
</tr>
<tr>
<td>April 1970</td>
<td>1.0</td>
</tr>
<tr>
<td>May 1970</td>
<td>1.1</td>
</tr>
<tr>
<td>June 1970</td>
<td>1.2</td>
</tr>
</tbody>
</table>

PROVISIONAL SUNSPOT NUMBERS

<table>
<thead>
<tr>
<th>Month</th>
<th>Sunspot Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1971</td>
<td>100.5</td>
</tr>
<tr>
<td>February 1971</td>
<td>100.6</td>
</tr>
<tr>
<td>March 1971</td>
<td>100.8</td>
</tr>
<tr>
<td>April 1971</td>
<td>100.9</td>
</tr>
<tr>
<td>May 1971</td>
<td>101.0</td>
</tr>
<tr>
<td>June 1971</td>
<td>101.1</td>
</tr>
</tbody>
</table>

Mean equals 77.9.
Bring in the whole wide world

REALISTICALLY

with the

REALISTIC DX 150
Communications Receiver

Transistorised. All solid-state
4 Bands .535 to 30 MHz
( includes Broadcast)
240V AC or 12V DC operation

This is the BIG performance set that obsoletes tube receivers...a professional-looking set that appeals to amateurs and short wave listeners alike. The DX 150 gives long-range, world-wide realistic reception on 4 bands, including Broadcast. Fully transistorised—all solid state—no warm-up delays; the DX 150 will run on dry cells if current fails or is not available; will operate from a car's cigarette lighter or any 12V DC service. A 240V AC power supply is also built in. Over 30 semiconductors—product detector for SSB/CW, plus fast and slow AVC—variable pitch BFO—illuminated electrical bandspread, fully calibrated for amateur bands—cascade RF stage—ANL for RF and AF—zener stabilised—OTL audio—illuminated "S" meter—built-in monitor speaker plus front panel jack for external (optional) matching speaker.

Realistic Performance
Realistic Price
$229.50

Attractive silver extruded front panel, solid metal knobs, grey metal cabinet, size 141" x 91" x 61".

CONSULT YOUR LOCAL RADIO DEALER, OR
MAIL THIS COUPON today

Please forward free illustrated literature and specifications on Realistic.

Name

Address

(A unit of Jacoby Mitchell Holdings Ltd.)
376 EASTERN VALLEY WAY, ROSEVILLE, 2069,
Cables and Telegraphic Address: WSTELEC
Sydney, Phone: 40 1312

LOW DRIFT CRYSTALS

1.6 Mc. to 10 Mc.,
0.005% Tolerance, $5

10 Mc. to 18 Mc.,
0.005% Tolerance, $6

Regrinds $3

THESE PRICES ARE SUBJECT TO SALES TAX

SPECIAL CRYSTALS:
PRICES ON APPLICATION

MAXWELL HOWDEN
15 CLAREMONT CRENS.,
CANTERBURY,
VIC., 3126
Phone 83-5090

LOG BOOK

AVAILABLE IN TWO TYPES—VERTICAL OR HORIZONTAL
Larger, spiral-bound pages with more writing space.

Price 75c each
plus 25 Cents Post and Wrapping

Obtainable from your Divisional Secretary,
or W.I.A., P.O. Box 36, East Melbourne,
Vic., 3002

Amateur Radio, May, 1971
The Wireless Institute of Australia—Federal Executive

REPORT TO FEDERAL COUNCIL [1971]

Gentlemen,

It is my pleasure to present the Report on the activities of the Wireless Institute of Australia during the year 1971. The Report covers a wide range of activities, from the technical feasibility of frequency sharing to the unrestrained right to use the Amateur Service. It is a comprehensive account of the Institute's progress and its challenges.

1. **OVERSEAS VISITS**

   In June of 1970 I had the opportunity to travel to the United States for a series of meetings related to the Institute's activities. I was invited to visit a number of prestigious institutions, including A.R.R.L., the American Radio Relay League, and the CCIR, the International Telecommunication Union. These visits were an opportunity to learn about the technical and organizational aspects of Amateur Radio worldwide.

   First, I went to Newington, Connecticut, where I met and conferred with the President of R.E.F., Claude Laiderau. During four days of discussions, we explored the Institute's role in the 1971 WARC, which was to be held in Geneva.

   Next, I attended a State Convention at Jackson Street, where I talked with Ron Vaughan, the Manager of R.S.G.B. and John Baptiste, the Secretary-General of the I.A.R.U. and the Secretary-General of the I.T.U. It is perhaps appropriate that I should summarily note the progress which I sent back to the Institute's policy will be reviewed in the light of the events which have occurred.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 5850, 10,000-10,500 MHz bands are such that some countries are reluctant to permit the Amateur Service the unrestricted right to use such frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.

   The pressures on Amateur frequencies in the 28-29.7 and 144-146 MHz bands are such that some countries are reluctant to permit the Amateur Service the privilege of using these valuable frequencies. The Australian proposals provide for the unrestricted right to use such frequencies and, according to the U.S.A. the Australian proposals have been given copies of all submissions made to the C.C.I.R. The U.S.A. document forwarded to the I.T.U. proposes the extension of the Australian proposals to the other services which operate on these frequencies. The final decision will be made at the 1971 WARC, which will be held in Geneva.
would like to offer certain comments in this report from the Federal Executive. The adoption of the Interim Constitution, in my view, is of vital importance. I feel it is important that this Association can fulfill the Conference of the Association to be held here in a few days' time, as I write, will mark the turn of the tide for the Australian Institute and the I.A.R.U. W.I.A. In particular, I wish to acknowledge the help and support of Mr. Jim Wilkinson, the Assistant Director-General, Radio; Mr. H. Young, Conference Secretary; Mr. A. Cochrane, Section; and Mr. Eddie Sandbach, the Chairman of the Conference of the Australian Proposals for Space Conference. To these officers, for their highly fair approach, I express our heartfelt thanks.

**NEW FEDERAL COMPANY**

It is proposed that the Manager to be employed in the interim by the Victorian Division will assume the role of Federal Manager following the expiration of the interim arrangements at the end of the present calendar year.

**ADMINISTRATION**

In my last Report to the Federal Convention I referred to the enormous work-load imposed on the Federal Executive. This has persisted throughout the present year.

The problem of finding people able and willing to undertake further duties during 1970 when Ken Pincock, the Editor of "Amateur Radio", indicated his wish to resign. It was not possible to replace him as a part-time volunteer and the Victorian Division and the South Wales Division and the Victorian Division met in October to jointly discuss the proposed replacement. The Federal Executive—the Federal Secretary—was present at both meetings. That joint meeting recognised that it was impractical for any one Division to publish a contract for the continued publication of "Amateur Radio" without first having been circulated to the other Divisions. A series of choices has had to be made as to priorities. A representative of the Federal Executive referred the matter to the Federal Council in relation to licence fees was published an advertisement for the position of a paid staff. In the case mentioned, intervening must be times when work and family commitments to take priority. Nor do I apologise for the need for the paid staff. In the case mentioned, intervening

**LIAISON—AUSTRALIAN POST OFFICE**

I have already referred in some detail to our discussions with the Postmaster-General's Department during the last Council. In 1970 the Postmaster-General's Department the contract for the continued publication of the call book and numerous other A.R.I. matters with a member of I.A.R.U. This has not occurred because the two Societies claim membership of the Region III Association. It will, therefore, be the responsibility of the Conference to and in Japan in Tokyo in the middle of March 1971 (in a personal tour of South East Asia, and myself). The Conference of the Association to be held in a band is absolute and that this further requirement to this area.

The problem of finding people able and willing to undertake further duties during 1970 when Ken Pincock, the Editor of "Amateur Radio", indicated his wish to resign. It was not possible to replace him as a part-time volunteer and the Victorian Division and the South Wales Division and the Victorian Division met in October to jointly discuss the proposed replacement. The Federal Executive—the Federal Secretary—was present at both meetings. That joint meeting recognised that it was impractical for any one Division to publish a contract for the continued publication of "Amateur Radio" without first having been circulated to the other Divisions. A series of choices has had to be made as to priorities. A representative of the Federal Executive referred the matter to the Federal Council in relation to licence fees was published an advertisement for the position of a paid staff. In the case mentioned, intervening must be times when work and family commitments to take priority. Nor do I apologise for the need for the paid staff. In the case mentioned, intervening

**I.T.U. FUND**

The following amounts were to be contributed by each of the Divisions to establish the Fund:

- New South Wales Division: 2000
- Queensland Division: 1660
- South Australian Division: 1200
- Western Australian Division: 450
- Tasmanian Division: 400

At this time a total of $6,435 is held in the Fund, with all Divisions except the N.S.W. Division having attained their quota. The N.S.W. Division balance has been depleted by $350 contributed to the Australian Post Office in the hope that the N.S.W. Division will be able to contribute to the Federal Executive $1,659.

The 1971 Federal Convention will discuss in detail the future of the Federal body. It will determine whether this arrangement will be continued following the expiration of the interim arrangements at the end of the present calendar year.
MEMBERSHIP

In the last Report of Federal Executive a total of 12,570, was published. Hereewith is a table dating those figures to 30th December, 1970.

<table>
<thead>
<tr>
<th>Membership as at 31st December, 1970</th>
<th>(1969 figures in brackets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK2 1872</td>
<td>105 (56)</td>
</tr>
<tr>
<td>VK3 1968</td>
<td>1025 (52)</td>
</tr>
<tr>
<td>VK4 1984</td>
<td>280 (30)</td>
</tr>
<tr>
<td>VK5 1983</td>
<td>304 (43)</td>
</tr>
<tr>
<td>VK6 1977</td>
<td>295 (60)</td>
</tr>
<tr>
<td>VK7 1968</td>
<td>260 (55)</td>
</tr>
<tr>
<td>Total</td>
<td>3328 (572)</td>
</tr>
</tbody>
</table>

The movement since last year is interesting. The smaller Divisions appear to have lost ground—apparently failing to keep up with the increasing number of licensees. It is very disappointing that our overall position (licensees as against members) has dropped by 2%.

AMATEUR RADIO

No note of the Federal Executive would be complete without reference to the work of Ken Pin coil, the Editor of "Amateur Radio". The monthly publication through the whole of the period even though under enormous pressure at work and at home. The magazine has continued to maintain a high standard and I am sure that I speak on behalf of the whole membership in saying to Ken simply and sincerely "thank-you".

AUSTRALIA

At the 1970 Convention the Federal Council resolved to support the A.Q.B. Project. The response to the call for space hardware involved in the project was envisaged at some $5,000, but current estimates put the figure as almost double this and it must be remembered that this amount has already been expended or committed. In detail matters relating to Australia for the Group were reported on by the Federal Executive. Those matters are, however, two matters upon which I would wish to comment.

Firstly, to all the Federal Councillors I express my gratitude for the confidence and support they have shown us. Without their support and understanding we would have been, on many occasions, lost. I would also like to record my deep appreciation of the work of all the co-opted Federal officers, particularly the Awards Manager (Geoff Wilson), VK6KZD, and the Publicity Manager (Peter Williams), VK6ZDK and the various other officers and teams who have given so unstintingly of their time.

I am conscious that this report is unreasonable long; despite this, it deals only briefly with the topics or items of which the Federal Executive is an executive.

Finally, to all the Federal Councillors I express the Federal Executive's sincere thanks. Without their support and understanding we would have been, on many occasions, lost. I would also like to record my deep appreciation of the work of all the co-opted Federal officers, particularly the Awards Manager (Geoff Wilson), VK6KZD, and the Publicity Manager (Peter Williams), VK6ZDK and the various other officers and teams who have given so unstintingly of their time.

I find it hard to express in words my feelings toward the staff. They are like a family again, I have relied time and time again on the dedication and hard work of our Assistant Manager, W. R. D. Rankin, on the advice and understanding of our Secretary, R. J. G. Penfold, VK6ZDK and the various other officers and teams who have been privileged to be a member of this team.

I believe that the Federal Executive is an excellent team, bringing a breadth of experience and knowledge and indeed this year most of us have been privileged to be a member of this team.

As we enter the new year, following the 1971 Federal Convention, I believe we can look to the future with confidence that we have found—recognizing the need to employ top level staff to
20-PAGE STOCK CATALOGUE!

New extended range of ELNA electrolytic and tantalum capacitors.

New range of TYK ceramic capacitors.

New ELNA-FOX C.C. resistors.

New NOBLE slide miniature trim potentiometers.

New car radio suppressors.

Send for your copy NOW!

SOANAR ELECTRONICS Pty. Ltd.

Hy-Q Electronics Pty. Ltd., Australia's largest facility devoted exclusively to the development and production of Quartz Crystals and related products, have greatly expanded their production capacity to provide even better service for Australian equipment manufacturers.

Hy-Q's new fully air-conditioned plant provides application engineering, design and testing facilities in addition to a large production capacity for low frequency and high frequency crystals in glass, cold weld or solder seal holders, crystal filters, discriminators and crystal oscillators.

These facilities are available to all equipment manufacturers and crystal users. Hy-Q Electronics do not manufacture equipment, nor are they affiliated with any other manufacturer so that you may discuss your problems and requirements in complete confidence.

Write, Phone or Telex us any time.

Hy-Q Electronics Pty. Ltd.

1-10-12 Rosella Street,
P.O. Box 256, Frankston, Victoria, 3199
Telephone: 783-9611. Area Code 03.
**Amateur Radio**, May, 1971

---

**WIND OF CHANGE**

Brief Report on 25th Federal Convention held in Brisbane, Easter 1971

Yes, there is a wind of change blowing through the W.I.A. This evidenced itself in this Convention in many ways. There were changes in the organisation, administration and in the thinking of the Delegates. This is the first Convention with a paid Secretary/Manager. For the first time Delegates had received the Annual Report. Amışing developments and recommendations. One of the Observers had even travelled down from far away Townsville and will take back with him a comprehensive knowledge of the affairs of the W.I.A., which will assist in the thinking of the Delegates at all levels, both inside and outside the conference hall.

There were eight formal conference sessions totalling 31 hours' work. The Working Groups included in one way or another most of the Delegates, most of the Observers and all of the Federal Executive officers. On each of the four nights of the conference, very few rolled into bed before the early hours of the morning since the Working Groups had no other time available in which to consider their recommendations and recommendations. One of the Observers had even travelled down from far away Townsville and will take back with him a comprehensive knowledge of the affairs of the W.I.A., which will assist in the thinking of the Delegates at all levels, both inside and outside the conference hall.

John also displayed the printed board and multi-module chassis which is designed to incorporate multi-channel transceivers and multi-switching. He explained that the designs and construction are in accord with the current state of the art. He went on to say that the recent articles in "A.R." by Les Jenkins, VK3AT and Robert Hepburn, VK3FQ, showed the way in which Amateurs can get on this "band wagon". John brought everybody up to date and answered, to the best of his ability, a barrage of questions on all aspects of the Project. One reaction, among many enthusiastic responses, was the immediate donation of a sum of money to aid the Project. Judging by the reactions, there is now every prospect that AO6 will achieve success.

Once again much time was devoted to consideration of measures aimed at the protection of our frequencies and their usage. I.A.R.U Region III. Associate Reports on the conference in Tokyo last month, at which the W.I.A. was represented by the Federal President and Air-Commodore George Pittner, VK3VX (at his own expense), highlighted our problems. In July there is the World Radio Administration Conference of the I.T.U. in Geneva, and the Tokyo I.A.R.U Conference decided it was desirable to send a Region III. Observer to Geneva. This will be paid for out of Region III. funds and the positions on this matter were debated and adopted. Another aspect is Repeaters which arose from the very interesting report from the Repeater Secretariat.

On contests, the management now moves from VK6 to VK4 and will be under the able direction of keen organisers in Brisbane. Time precludes further comment at this stage, but the 'winds of change' are more than a breeze.

---

**RECOVERY OF STOLEN VK2 INSTITUTE PROPERTY**

During February 1971, Sydney police recovered the majority of the communications equipment that was stolen during October and November 1969 from the Institute stations VK2WI (Dural) and VK2AWI (Atchison St.). So far none of the publications or store items (resistors, semiconductors, etc.) have been located. It is understood that they also recovered a lot of electronic and other items which had been stolen from around Sydney. The police have charged a person in connection with this offence.
Base, Antarctica, QSL to J.A.R.L., both calls

Antarctic, QSL to LA3CC; 8J1RL from Showa to South Georgia in February, with QSLs to JY1B was operating on 21358 s.s.b. Falkland Is. 3Y3CC Audun is on from the operating from Halley Bay, scheduled to QSY he will be there until the end of the year. to his home QTH, also K6AZD/KB6 who says 14225 at 0600z and 1500-1700z, with QSLs going mediatory for overdue QSLs, as he is in regular

Coronie, PZ4 Saramacca, PZ5 for reciprocal Paramaribo and Surinane, PZ6 Para, PZ7 Brokopondo, PZ8 Com-
Overseas Magazine Review
Compiled by Svd Clark, VK3ASC and R. L. Gunther, VK1RG

"BREAK-IN"
December 1970—
Batt Valley Branch 18 N.Z.A.R.T., ZL2BBT. Phone 3347.
Phone Monitor, ZL2AWF. Untuned device consisting of a choke, diode, bypass and decoupling capacitors. Stated to be quite effective for phones.

"Variable Transformer" Frequency Meter, ZL2NA. Describes a homemade BC231, using six Penalty transformers, then connected up monoly available parts. The dial mechanism was taken from a "TU" tuning unit where it was originally used.

Franklin Oscillator using FETs, ZL2APC. A tried and true circuit which does not seem to be as popular as it should be. Has the advantage of using an untrapped coil.

Modifications to Creed Teleprinters Type 2B, ZL2AWL. These modifications make your Creed set fully automatic.

"HAM RADIO"
February 1971—
Editorial—Concerning inductances substituted in microwaves, ZL2AWL. Riched-Inductance Bandpass Filters and Filter Pre-amplifiers for 50 and 144 MHz., W5KHT. A tried and true circuit which does not seem to be as popular as it should be. Has the advantage of using an untrapped coil.

Field Effect Transistor Transmitters, Z2BBL. Low cost yet high performance, narrow bandwidth, interdigital filters and bandpass pre-amplifiers are ideal for those who wish to save space and cannot afford to build expensive equipment. A very valuable resource.

Improving the Motorola F35 Series, WB2AEB. "Add these modifications and you'll have a transceiver with high performance, ZL2AWL. De Luxe MOSFET Converters for Six and Twelve Volt Power Supplies, WB2AEB. Featuring gate-protected MOSFET devices and simple construction. Very nice!

Small Battery Transmitter, G3OGR. 2 x 1T4 plus 2 x 3V4. 160/80 metre phone. Better Bideck Reception, G3KHC. Improving standard receiver circuits. PSG 2 with external rear, ZL2AMJ. Two FETs and a tuned circuit. Design of Pi Yank Circuits, G5EJJ. Read this and re-design your own.

The Dual Gate Transistor for UHF Applications, The Editor, Recent MOSFETs. December 1970—

clean-up circuit for X-ray equipment, ZL2AWL and a tuned circuit. Design of Pi Yank Circuits, G5EJJ. Read this and re-design your own.

"DX MAGAZINE"
February 1971—
New Approach for the Metal Locator, by W8HDM. A clever idea. Two i-f. oscillators producing a radio beat frequency received by a tuned circuit and frequency of one of the oscillators is determined by magnetic induction from nearby metal objects.

Practical Circuit Applications using the Variacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.

A Class AFSK Unit, W6FMP. A frequency shift oscillator incorporated into the microphone jack of an s.s.b. transceiver. Uses two ICs.

Build an 8 Transistor Code Oscillator with a wide tuning range, W2TJ. An 8-Terminal Oscillator, ZL2AMJ. Two tubes and a tuned circuit.

Practical Circuit Application using the Varyacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.

A Class AFSK Unit, W6FMP. A frequency shift oscillator incorporated into the microphone jack of an s.s.b. transceiver. Uses two ICs.

Build an 8 Transistor Code Oscillator with a wide tuning range, W2TJ. An 8-Terminal Oscillator, ZL2AMJ. Two tubes and a tuned circuit.

Practical Circuit Application using the Varyacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.

A Class AFSK Unit, W6FMP. A frequency shift oscillator incorporated into the microphone jack of an s.s.b. transceiver. Uses two ICs.

Build an 8 Transistor Code Oscillator with a wide tuning range, W2TJ. An 8-Terminal Oscillator, ZL2AMJ. Two tubes and a tuned circuit.

Practical Circuit Application using the Varyacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.

A Class AFSK Unit, W6FMP. A frequency shift oscillator incorporated into the microphone jack of an s.s.b. transceiver. Uses two ICs.

Build an 8 Transistor Code Oscillator with a wide tuning range, W2TJ. An 8-Terminal Oscillator, ZL2AMJ. Two tubes and a tuned circuit.

Practical Circuit Application using the Varyacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.

A Class AFSK Unit, W6FMP. A frequency shift oscillator incorporated into the microphone jack of an s.s.b. transceiver. Uses two ICs.

Build an 8 Transistor Code Oscillator with a wide tuning range, W2TJ. An 8-Terminal Oscillator, ZL2AMJ. Two tubes and a tuned circuit.

Practical Circuit Application using the Varyacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.

A Class AFSK Unit, W6FMP. A frequency shift oscillator incorporated into the microphone jack of an s.s.b. transceiver. Uses two ICs.

Build an 8 Transistor Code Oscillator with a wide tuning range, W2TJ. An 8-Terminal Oscillator, ZL2AMJ. Two tubes and a tuned circuit.

Practical Circuit Application using the Varyacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.

A Class AFSK Unit, W6FMP. A frequency shift oscillator incorporated into the microphone jack of an s.s.b. transceiver. Uses two ICs.

Build an 8 Transistor Code Oscillator with a wide tuning range, W2TJ. An 8-Terminal Oscillator, ZL2AMJ. Two tubes and a tuned circuit.

Practical Circuit Application using the Varyacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.

A Class AFSK Unit, W6FMP. A frequency shift oscillator incorporated into the microphone jack of an s.s.b. transceiver. Uses two ICs.

Build an 8 Transistor Code Oscillator with a wide tuning range, W2TJ. An 8-Terminal Oscillator, ZL2AMJ. Two tubes and a tuned circuit.

Practical Circuit Application using the Varyacs, B. Mangel. The simple theory and practical application of voltage variable-capacitance devices, frequency multiplication, tuning, and a.f.c.
Sub-Editor: ERIC JAMESON, VK5LP

AMATEUR BAND BEACONS

VK3 53.544 VK5GR, Antarctica.
VK3 144.700 VK3VY, Vermont.
VK5 53.000 VK3VY, Mt. Lofty.
VK6 144.500 VK3QJ, Mt. Lofty.
VK6 53.000 VK3QJ, Mt. Lofty.
VK7J 52.500 VK3TIS, Carnarvon.
VK7R 144.250 VK3XT, Stuart Hill.
VK8 145.010 VK5ZQA, Yongala (arrangement).
VK3 144.900 VK5PO, Devonport.
VK9 144.650 VK3PO, Christmas Island.
3ZL 144.750 VK3PO, Wellington.
ZL3 145.000 ZL3VHF, Chirstchurch.
ZL8 144.760 VK5CLP, Melbourne.
W 50.091 WB9KRJ, U.S.A.
HL 50.100 HL3WI, South Korea.

Note the frequency of VK6VF has been corrected to 47.920 MHz. He was earlier listed as VK5GQ.

A HISTORY OF DX ACROSS AUSTRALIA

Hello, VK6VE may be a beacon at pre-repeater!

Mt. Gambier contented himself by working all this rush with Bemie, David VK5ZOO in 3ZKN and Bob VK3AOT. Most signal reports remained good for shorter distances on the 3ZWF almost made it two-way with a JA3 on 21/20 MHz. VK6VE almost made it two-way with a JA3 on 21/20 MHz.

George VK7AOR, Kermit VK2HBA, and VK2SA continued with their conditions on the 3ZWF almost made it two-way with a JA3 on 21/20 MHz. VK6VE almost made it two-way with a JA3 on 21/20 MHz.

The 7th Annual Radio Convention is to be held in Mt. Gambier over the Queen's Birthday week-end, 12th and 13th June. This year the programme will include for the first time an extension of the 800 MHz fox hunt, so you hams and phasers will be able to show off your mobile receiver and d.f. loop. There will be plenty of things for v.h.f'ers to interest themselves if the years gone by are any guide.

A HISTORY OF DX ACROSS AUSTRALIA

Thanking to that mighty beacon near Albany on 144.500, VK6VE giving advice of suitable conditions prevailing, contacts are being made constantly, to say nothing of the 3ZWF almost made it two-way with a JA3 on 21/20 MHz. VK6VE almost made it two-way with a JA3 on 21/20 MHz.

A HISTORY OF DX ACROSS AUSTRALIA

Hello, VK6VE may be a beacon at pre-repeater!

Mt. Gambier contented himself by working all this rush with Bemie, David VK5ZOO in 3ZKN and Bob VK3AOT. Most signal reports remained good for shorter distances on the 3ZWF almost made it two-way with a JA3 on 21/20 MHz. VK6VE almost made it two-way with a JA3 on 21/20 MHz.

George VK7AOR, Kermit VK2HBA, and VK2SA continued with their conditions on the 3ZWF almost made it two-way with a JA3 on 21/20 MHz. VK6VE almost made it two-way with a JA3 on 21/20 MHz.
Yaesu Musen FTV-650

Six MHz Transverter

Takes a 28-30 MHz signal and transverts to the six meter band in two ranges

Transmitter: Input frequency range, 28-30 MHz; output frequency range, 50-75 MHz; output power: 40 dB.; Bandspread: 50 MHz.

Valves used: Two 6CB6s, one 6AW8A, one 600v 150mA d.c., one 300v 50mA d.c., necessary in the transverter (except for 150v a.c. where the driving set has a 12.6v. filament supply to the p.a. tubes of the latter Yaesu H.F. equipment). Price: $160

Servicing: Instructions for servicing are included in the hands-on manual supplied with the unit. It is advisable to have a working knowledge of the Yaesu H.F. equipment and the A.R.R.L. Transmitter and Receiver Handbook before attempting to service the FTV-650. It is possible to perform most routine maintenance and repair work on the unit, but it is recommended that the unit be returned to the factory for major repairs or parts replacement.

The transverter is primarily designed to be used in conjunction with one of the Yaesu H.F. receivers or transmitter-receiver units, from which it derives the necessary power and low level drive.

The accessory socket on the rear panel of the transverter provides a 28-30 MHz input for connecting the transverter to the receiver. When the input is connected, the transverter converts the received signal to 50-75 MHz and the output is connected to the receiver. The transverter also provides a 28-30 MHz output for connecting to external equipment, such as a second receiver or recorder.

The transverter is designed to operate with a Yaesu H.F. receiver, and it is necessary to have a Yaesu H.F. receiver to use the transverter. The transverter is not designed to be used with a Yaesu H.F. transmitter, and it is not possible to connect the transverter directly to a Yaesu H.F. transmitter.

The transverter is designed to operate with a 28-30 MHz input signal, and it is necessary to have a 28-30 MHz signal available to use the transverter. The transverter is not designed to be used with a 50-75 MHz signal, and it is not possible to connect the transverter directly to a 50-75 MHz signal.

The transverter is designed to operate with a Yaesu H.F. receiver, and it is necessary to have a Yaesu H.F. receiver to use the transverter. The transverter is not designed to be used with a Yaesu H.F. transmitter, and it is not possible to connect the transverter directly to a Yaesu H.F. transmitter.

The transverter is designed to operate with a 28-30 MHz input signal, and it is necessary to have a 28-30 MHz signal available to use the transverter. The transverter is not designed to be used with a 50-75 MHz signal, and it is not possible to connect the transverter directly to a 50-75 MHz signal.

The transverter is designed to operate with a Yaesu H.F. receiver, and it is necessary to have a Yaesu H.F. receiver to use the transverter. The transverter is not designed to be used with a Yaesu H.F. transmitter, and it is not possible to connect the transverter directly to a Yaesu H.F. transmitter.

The transverter is designed to operate with a 28-30 MHz input signal, and it is necessary to have a 28-30 MHz signal available to use the transverter. The transverter is not designed to be used with a 50-75 MHz signal, and it is not possible to connect the transverter directly to a 50-75 MHz signal.

The transverter is designed to operate with a Yaesu H.F. receiver, and it is necessary to have a Yaesu H.F. receiver to use the transverter. The transverter is not designed to be used with a Yaesu H.F. transmitter, and it is not possible to connect the transverter directly to a Yaesu H.F. transmitter.

The transverter is designed to operate with a 28-30 MHz input signal, and it is necessary to have a 28-30 MHz signal available to use the transverter. The transverter is not designed to be used with a 50-75 MHz signal, and it is not possible to connect the transverter directly to a 50-75 MHz signal.

The transverter is designed to operate with a Yaesu H.F. receiver, and it is necessary to have a Yaesu H.F. receiver to use the transverter. The transverter is not designed to be used with a Yaesu H.F. transmitter, and it is not possible to connect the transverter directly to a Yaesu H.F. transmitte
NEW CALL SIGNS

DECEMBER 1970

VK1DZ—H. R. de Zwart, 28 Atherton St.,
        rings of the month and remittance must
VK2DJ—J. Lovell, Dept. Civil Aviation Bldg.,
        2602, by 5th of the month and remittance must
VK10H—Lord Howard, 176 Shepards Hill Rd.,
        must accompany the advertisement.
VK2ZTH—M. A. Atkinson, 63 Woolcock St.,
        V.F. O., 807s in final, fully metered, grid modulated,
VK3ZMD—B. J. G. Johnston, 10 Dalrymple St.,
        New price $2.000. Phone (Meib.)
VK2ZT—R. A. Taylor. Transferred to Vic.
VK2ZG—L. A. Reynolds, 1/30 Alexandra St.,
        VK2ZGC—A. W. Reynolds, 1/30 Alexandra St.,
VK2ZNO—B. J. G. Johnston, 10 Dalrymple St.,
        VK4ZJH—B. J. G. Johnston, 10 Dalrymple St.,
VK1ZK—R. E. Durrant. Transferred to Vic.
VK4ZG—J. G. Reed. Deceased.
VK2ZI—R. A. Taylor. Transferred to Vic.
VK2ZIO—R. E. Durrant. Transferred to Vic.
VK2ZIV—J. D. Holt. Now VK2BBZ.
VK2ZBD—J. D. F. Mowat. Now VK2ASY.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLP—F. A. Pollock. Now VK2AGT.
VK2ZLC—J. D. C. Tovey. Now VK2AOR.
VK2ZLD—M. T. Scott. Now VK2ZRF.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
VK2ZLB—R. C. Pollock. Now VK2ACX.
VK2ZL—R. C. Pollock. Now VK2ACX.
VK2ZJN—J. C. Power. Now VK2BMR.
VK2ZLJ—R. C. Pollock. Now VK2ACX.
3 WAYS to get BETTER CONTEST RESULTS

1. ROTATE Your Antenna AUTOMATICALLY —
   Beam “spot-on” with ease and efficiency . . . no more guess work.
   • A low priced Antenna Rotor for lightweight beams (55 lbs. max.).
   • Simple to install. • Fingertip control right there in your shack.

2. CONTACTS Come In LOUD & CLEAR
   On an EDDYSTONE Communications Receiver. There is a model to suit your requirements — right through to the VHF/UHF bands.
   Log those hard-to-get contacts with an EDDYSTONE, DOW-KEY, STOLLE combination.

3. ANTENNA Switching . . .
   SEND - RECEIVE . . . SEND - RECEIVE. Quick and efficient antenna switching ensures rapid “send - receive” operation. A boon when contest fevers are running high. Use DOW-KEY High Performance Relays for complete dependability.

CO-AX RELAYS

These are the HEADPHONES you can wear ALL DAY — Sennheiser Model HD 414.
   • Very lightweight. • They let your ears breathe — you can hear the phone ring or the XYL calling. • You do not have that “shut in” feeling. • Removable sponge ear pads.

SENNHEISER HD 414 Stereo Headphones

For prices and full particulars of the items listed here please write to:

Australian Representatives:

VIC.  608 COLLINS STREET, MELBOURNE, 3000. PHONE: 61 2464.
N.S.W. 64 ALFRED ST., MILSONS POINT, 2061. PHONE: 929 8066.
QLD.  L.E. BOUGHEN & CO., 30 GRIMES STREET, AUCHENFLOWER, 4066. PHONE: 70 8097.
W.A.  34 WOLYA WAY, BALGA, 6061. PHONE: 49 4919.

R.H. Cunningham PTY. LTD.
TELEX, MELB. 31447: SYDNEY 21707
Distributors for Australian and International Manufacturers...

**TEST EQUIPMENT:**
- RAPAR - BWD
- SWE-CHECK - HORWOOD

**SEMI-CONDUCORS:**
- TEXAS INSTRUMENTS
- FAIRCHILD AUSTRALIA
- PHILIPS - DELCO
- ANODEON
  and other famous brands

Write for illustrated catalogue

☆ Stockists of a wide range of Components, Valves, Wiring Cables, etc., TV and Radio Spare Parts for Amateurs and Servicemen.

- 'RAPAR' MODULAR HI-FI STEREO KITS
  - Fully imported matched kits with latest type record changer.
  - Call and see our extensive range.

radio parts

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!
AMERICAN RECORDING TAPE
(New, in sealed boxes)
1500 feet, 7-inch, Acetate, 1/2 mill. ....... $3.50
1200 feet, 7-inch, Acetate, 1 mill. ........ $2.50
1200 feet, 7-inch, Mylar, 1/2 mill. ......... $3.00
1200 feet, 51/4-inch, Mylar, 1 mill. ......... $2.20
1200 feet, 51/4-inch, Mylar, 1 mill. ......... $2.50
Postage 10c.

CASSETTE TAPES
Type C120 .................... $1.50
Type C90 ............... New. Postage 10c.

NEW HEADPHONES AND MIKE
Phones 8 ohms, Mike 23 ohms
Price $17.75

BARGAIN ITEMS
Type PS64—240 volts to 6 or 8 volts, 300 mA. $12.50
Type PS62—240 volts to 6 or 8 volts, 100 mA. $8.50
Postage 30c.

C60 CASSETTE TAPES
Price 80c each

EXTENSION SPEAKERS
Type TS30 Tubular Extension Speakers, 8 ohms.
New. Complete with lead and two plugs 2.5 and
3.5 mm. Price $4.30. Postage 20c.

TELEPHONE INTER-COM. SETS
Telephone Inter-communication Set with signal
bulf, two U2 batteries. Ideal for children.
Price $6.75. Postage 30c.

EGG INSULATORS
For your Aerial. 8c each.

VARIABLE CONDENSERS

RESISTORS
1/2 watt 8c each; 1 watt 10c each.

VERNIER DIALS
Ratio 8 to 1 reduction, scale 0-10.
Type T 501 1/2 inch diameter .......... $2.00
Type T 502 2 inch diameter ............ $2.75
Type T 503 3 inch diameter ............. $3.30

LOW PASS FILTERS
A "Cobena" Low Pass Filter will fix T.V.I. Cut-off
frequency: 10 KHz., attenuation at 80 KHz.
better than 30 dB.; insertion loss, negligible.
Impedance 50-72 ohms.
Price $11.50. Postage 10c.

SOLID STATE STEREO AMPLIFIER
8 watts r.m.s. per channel. Input for magnetic,
crystal and ceramic type microphone. P.V. carti-
ridge, tape recorder input and output, tuner in-
put, stereo headphone jack.
Reduced to $33.00. Postage $1.00.

FIVE-CORE CABLE
5 x 5/0076. Ideal for intercoms, telephones, etc.
New. 100 yd. roll, $17 (postage 75c), or 20c yd.

STEREO HEADPHONES
Professional quality (well known brand). Large
teraps, standard stereo plug, 8 ft. lead.
Price $6.75. Postage 50c.

CRYSTAL CALIBRATOR No. 10
Nominal range: 500 KHz. to 30 MHz. 500 KHz.
tal and 250 KHz./500 KHz. BFD. Provides hetero-
dyne output in steps of 1 KHz. Dial driven by
crystal and 250 KHz./500 KHz. BFO. Provides hetero-
dyne output in steps of 1 KHz. Dial driven by
machine cut strip gears, calibrated in 2 KHz. div.
Easily read to 250 cycles. Output "spiked" approx.
1 sec. intervals. Identifies beat note. Power re-
quirements: 12v. DC at 0.3 amp., 250 volts at
15 mA. This is a precision instrument. Complete
with crystal.
Price $23.50

HAM RADIO SUPPLIERS
323 ELIZABETH STREET, MELBOURNE, VIC., 3000
Phones: 67-7329, 67-4286 All Mail to be addressed to above address
Our Disposals Store at 104 HIGHETT ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 10.30 a.m. to 5.0 p.m.,
and on Saturdays to midday.
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.
CONTENTS

Technical Articles:—

A Solid State F.M. Transceiver—Some After-Thoughts ........................................ 9
Australis Balloon Flights—A Preliminary Report .................................................... 17
Home Station Antenna for 160 Metres—Part Two: Vertical Polarised Antennas ........... 3
The Class C Radio Frequency Amplifier—Lecture No. 13 ........................................ 10

General:—

Announcing a Special Call and Prefix ........................................................................ 18
Australian 2 Metre F.M. Repeater Directory .................................................................. 13
Cook BI-Centenary Award .......................................................................................... 28
Correspondence ......................................................................................................... 7
"CQ" Awards .............................................................................................................. 28
DX .............................................................................................................................. 25
Federal Comment: Novice Licensing—Again ...................................................................... 2
I.A.R.U. Region 3 Association Conference, Toyko, 1971 .................................................. 21
Key Section .............................................................................................................. 18
May I Talk to You About the 35th Federal Convention In Brisbane ............................... 19
New Call Signs ........................................................................................................... 13
Norfolk Island DX-pedition ......................................................................................... 28
Overseas Magazine Review .......................................................................................... 26
Prediction Charts for June 1971 .................................................................................... 18
VHF ............................................................................................................................ 23
W.I.A. D.X.C.C. ........................................................................................................ 11
W.I.A. V.H.F.C.C. ...................................................................................................... 28
W.I.A. 52 MHz. W.A.S. Award .................................................................................... 28

Contests:—

VK-ZL-Oceania DX Contest, 1970 Results .................................................................. 14
VK2 Mid-Winter V.H.F.-U.H.F. Contest ...................................................................... 22

COVER STORY

The Eddystone model EC990S is a modern fully transistorised UHF receiver for AM/FM operation in the range 230-870 MHz. Designed for fixed or mobile operation, this unit has applications in meteorological service, radio astronomy, aerial investigation and in radio laboratories. In addition to audio and video outputs, a low impedance output at the i.f. of 36.5 MHz is provided to drive ancillary equipment. Further information is available from R. H. Cunningham Pty. Ltd.
The Federal Council at the 1970 Federal Convention divided equally on the question of whether or not the Wireless Institute of Australia should press for the introduction of some form of "Novice" licence in Australia. The Federal Council did, however, direct that the Federal Executive seek further information to be embodied in a report so that the question could be considered further. The Federal Executive sought the assistance of the New South Wales Division and accordingly a committee of that Division, under the chairmanship of Mr. Rex Black, VK2YA, was formed. The report of the committee was received by the Federal Executive on 1st April, 1971, copied and posted to all Federal Councillors on 2nd April—that is exactly one week before the Federal Council met in Brisbane for the 1971 Federal Convention. The report has received universal praise; indeed the Federal Council formally recorded its deep appreciation of the work of the committee.

Yet, the Federal Council decided to defer decision on the matter. I know that very many people were interested in this question. Perhaps some will regret the decision to make no decision at this time. Perhaps it could be seen by a few as evidence of a thoroughly negative attitude. To draw such an inference is, however, to be less than fair. First, let us look at the report. It raises, I believe, all the issues relevant to Novice licensing clearly and succinctly. In requesting such a report, the Federal Council was seeking as much factual evidence as possible upon which a decision could be based. The report provides this information. I have found this report most helpful on one of the most complex and difficult topics that have been considered in recent years.

In brief, the report recommends that the W.I.A. should seek the introduction of a "Novice" type of licence in Australia. This is necessarily an act of judgment. There is no single fact that points unequivocally one way or the other. For example, the two countries with the highest ratio of Amateurs per head of population in the world are the United States of America and New Zealand. One has—the other does not have—Novice licensees.

The report suggested, for discussion, that a Novice licence should be sought on the following basis:

1. A lower standard theory examination than that required for A.O.C.P. and A.O.L.C.P.
2. The same standard regulation examination as is required for the A.O.C.P.-A.O.L.C.P.
3. A five words per minute Morse test.
4. That the Novice licensee will use: (a) A crystal controlled transmitter. (b) Not more than 10 watts d.c. input. (c) C.W. only.
5. The same age limit would be imposed as is imposed for A.O.C.P. and A.O.L.C.P.
6. A limited term licence only would be issued.
7. The licence would take with it the right to operate fixed, mobile or portable.
8. Special call sign would be allotted to Novice licensees.
9. A character reference would be required before a Novice licence is issued.
10. The Novice licencee would be permitted to operate on the following bands:—
   - 1800 - 1860 KHz.
   - 21030 - 21150 KHz.
   - 28040 - 28200 KHz.

In addition, a number of other proposals were suggested. I have no doubt that this report will provoke spirited discussion. That is exactly what it should do. The report is printed as Appendix E to the Minutes of the Federal Convention. Your Federal Councillor has a number of copies. Please approach him for further details and please discuss the matter and express your view to your Federal Councillor and Divisional Councillors.

At the outset, I stressed the date the report was received by the Executive and circulated to the Federal Councillors. The committee, under Mr. Black, was appointed towards the end of 1970. It sought the views of many people and engaged in a volume of correspondence described by one Federal Councillor as "fantastic". That the committee achieved its object of producing a report prior to the Federal Convention is no mean feat. Perhaps, however, it is reasonable to ask whether the fact that a decision was deferred means that this effort was wasted. Emphatically, no. Formally, and particularly informally, the Federal Council engaged in a spirited and very deep discussion of the many issues involved. Had that report not been received in time for the Convention one of the most useful discussions that have taken place in recent years would just not have occurred.

The introduction of a Novice licence system raises many issues fundamental to our hobby—the very purpose of the Amateur Service, the relationship of one type of licence with another, the virtues of quality as against the virtues of quantity are all relevant. Then, what do we set out to achieve with a Novice licence? How do we best do it? Do we take any different view of the two types of licence we already have? These are all equally relevant questions before we finally decide—if we decide to seek a Novice type licence and, even if we do so decide, the conditions of issue of such a licence raise question after question. No, the deferring of a decision was not evidence of negative thinking—rather it was a tribute to a magnificent report that deserves the fullest consideration and appreciation of the depth of a problem that, whilst in the past has been contentious, has not before been considered so completely. The deferring of the decision also gives each member the opportunity to reconsider his views and to take part in the formulation of one aspect of the Institute's policy that will undoubtedly and fundamentally affect our hobby for the future—whichever way the decision goes.

Finally, the matter does not have to wait another year. Your Federal Councillors are in regular communication with one another and with the Federal Executive. A decision can be made prior to the next Federal Convention if it appears that the pendulum previously finely balanced between "for" and "against" moves clearly in one direction or the other, thus answering the question "whether". If the answer is "for" then the question "what?" (an equally complex question) must be answered. If it were, too, that given is a consensus, that question, should it arise, can also be answered prior to the next Convention.

Mr. Black and his committee have made the way open for our organisation to make an informed decision on a topic that has troubled many people. A snap judgment would have pleased some, displeased others, depending which way it went. A considered judgment will, whichever way it goes, justify the enormous amount of work of the committee and that effort is such that must fundamentally affect the future of our hobby. Please make sure that your voice is heard.

—MICHAEL J. OWEN, VK3KI
Federal President, W.I.A.
Part Two—Vertical Polarised Antennas

Marconi) and the half wave vertical. These are the quarter wave vertical (or Marconi) and the half wave vertical. An antenna having a better radiation in the horizontal direction is the five-eighth wave vertical, this being like half an extended double zep. Both quarter wave and half wave verticals present a pure resistance load at the base. The quarter wave has a definite resistance of about 40 ohms which can be obtained from the formula. The half wave has a high resistance feed point at the ground. An antenna length other than a quarter wave or half wave has some reactive and some resistive component. The equivalent circuits of the loads of these antennas are shown in Fig. 3. In this article we are mainly considering antennas with a pole or leg length of less than a quarter wave and only verticals which are base fed against ground.

The quarter wave antenna when fed in series with the ground will be resistive only. For a short antenna the load can be looked on as a capacitance in series with a resistance. As the antenna is shortened the resistance will become smaller and the capacitive reactance will become larger (smaller capacitance). Because the effective series reactance becomes higher, the load requires a higher driving voltage, this voltage being largely out of phase with the current. In other words the load has a poor power factor.

This effective series reactance can be tuned with a variable series inductance, and when this is done the resistance of the load is presented to the transmitter, the value of which is equal to the radiation resistance plus the loss resistance. For a short antenna the radiation resistance reduces with the square of the length of the antenna.

The distribution of current on a vertical antenna is shown in Fig. 4. The effective lengths of the antenna for the purpose of approximate calculation are also shown. Fig. 4a shows the distribution for a quarter wave antenna, the distribution being approximately sinusoidal (Ref. 3). Fig. 4b shows the position for a short vertical. It will be noted that this distribution is approximately "triangular".

As pointed out already, a short antenna will necessarily have a low feed point resistance and therefore a large current. The driving voltage will also be high due to the high series reactance. An equivalent series circuit of a complete tuned short antenna is shown in Fig. 5. The constants are considered lumped. From the circuit it is obvious that if the losses are to be minimal the radiation resistance should be high and steps should be taken to reduce losses. In the antenna in Fig. 4b the current will be maximum at the bottom and zero at the top. As a result, current at the feed point is twice the average current and therefore the radiation resistance is low, also a large base loading inductance is required to tune the antenna.

A much better distribution of current is achieved by "top loading", shown in Figs. 4c, d, and e. The top load can be made large enough so that the current in the vertical section is practically constant over the length considered. In fact the top can be made large enough so that the antenna will resonate.

Large capacitive top loading has the following advantages:
1. The current distribution in the radiating section is optimum, resulting in maximum radiation resistance.
2. Minimum tuning inductance is required.
3. The large capacitive top ensures minimum voltage stress to produce the necessary electrostatic field, hence minimum tendency to corona.

![Fig. 3.—Showing the antenna together with the equivalent series and parallel circuit of the load when the antenna is fed in series with the ground.](Image)

![Fig. 4.—Showing the current distribution on some vertical antennas. (a) and (b) are used in the text to indicate electrical lengths of the component parts. L is the actual length of the radiating section. The effective length and the "form factor" are shown for some cases.](Image)

![Fig. 5.—Showing a series equivalent circuit of the whole antenna. The main parts are shown lumped.](Image)
### WAYNE COMMUNICATION ELECTRONICS

Catering specially for the Amateur with Components, Receivers, Transmitters, Test Equipment. Everything from Resistors to 100 MHz. Frequency Counters

**ALL AT UNBEATABLE PRICES**

- **COLLINS ART13 AUTO-TUNE TRANSMITTER.** 2-18.1 MHz. AM or CW. 813 PA, 2 x 811 Modulators. Complete with all tubes. In good condition. $30 each. Freight forward.
- **COMPUTER BOARDS.** Removed from functional equipment. Contain 4 VHF transistors, 12 high speed switching diodes, 2% metal oxide resistors. **$1.50 each.**
- **CERAMIC 1625 SOCKETS.** Suit also 3AP1 CRO tube. **15c each.**
- **POWER SUPPLIES.** 230v. 50 Hz. input, 300v. 100 mA. DC output. Manufactured by A & R. Brand new. **$10 each.**
- **WIRE WOUND RESISTORS.** Range: 1.8 to 620 ohms. 6 watt. New. **5c each.**
- **SPECIAL! TRANSFORMERS:** Primary 230v. 50 Hz., Secondary 27v. 3 amp. This month only. **$3.00 each.**

Come and inspect the full range of equipment and components at

**WAYNE COMMUNICATION ELECTRONICS**

757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122

Phone 81-2818

---

### SIDEWABD ELECTRONICS ENGINEERING

**YAESU MUSEN REDUCED PRICES!!!**
The latest model FT-200 Transceiver, with external VFO provisions, in beautiful black finish, corrected for key clicks, together with extra heavy duty AC supply-speaker unit in matching cabinet and Midland dynamic microphone, the lot for **$330**

FT-DX-400 Transceiver, with microphone ..... ..... $425
FL-2000-B Linear with American Cetron 572-Bs ..... $350
6 or 2 metre solid state Converters, output 28-30 MHz. ..... $25
FT-101 Transceiver, latest model ..... ..... $500

**HY-GAIN**
TH6DXX 6 element triband Master Yagi Beam ..... **$220**
Hy-Quad tribund Cubical Quad with gamma matching sections, one feed line **$130**
14AVO four-band Vertical, 10 to 40 metres ..... **$52**

**MOSLEY**
TA33JR 3 element triband Junior Yagi Beam ..... **$105**
Mustang 3 element triband Beam for up to 1 kw. power ..... **$130**

**NEWTRONICS:** 4-BTV four-band Vertical, 10 to 40 metres ..... **$60**

**MOBILE WHIPS AND MOUNTS**
Webster Bandspanner or set of Mark Helical Whips ..... **$55**
Swivel body-mount and spring ..... **$10**

**BALUNS:** Local product, exact electrical copy of the BN-65. **$12.50**

**DIGITAL CLOCKS:** 24 hours, date and day of the week, post paid **$25**

**CRYSTALS**
FT-241 type, 375 to 515 KHz.; per box of 80 crystals **$15**
Sets of six matched FT-241 Crystals including matched BFO/Carrier Crystals, 375 to 450 and 465 to 515 KHz. Sorry, NOT on 455 KHz.!! **$8.50**

**POWER TRANSFORMER**
Universal Anoden type, 200/250 watt, two 100/110/120 primaries, two 6.3 v. secondaries, one 220-110-0-110-220 volt secondary, can be used 110/240 step-up or step-down transformer, etc. **$5 each.**

12 lbs. weight.

**MIDLAND PRODUCTS:**
Type 13-710 one-watt Transceivers, now on 27.240 or 27.860 MHz., also crystals for 27.085 MHz. available; 3 channels, call signal, excellent for CW operation, with eight penlite batteries, earphone, carrying case, audio squelch control, battery voltage meter, each still only **$37.50**
Type 23-135B Field Strength Meter, with five ranges, tunable from 1 to 300 MHz., with telescoping whip **$10**
Type 23-136 SWR-Power Meter, dual meters 100 micro-amp., very sensitive for low power but good for 1 kw. maximum, up to 175 MHz., reads forward and reflected power simultaneously, 50 ohm impedance **$20**
Type 23-126 SWR Meter, standard single meter type, 50 ohm impedance, with whip for field strength metering **$12**

**PTT Dynamic Hand Microphone, steel case, 50K ohm Impedance, excellent voice quality, no rocking armature type, with collared cord and mobile use clip **$10**

Table Model Dynamic Microphone, with PTT bar or lock switch, 50K ohm impedance, a quality bargain at **$15**

Same Table Microphone with built-in two-stage pre-amplifier, adjustable for up to 50 dB. amplification **$25**

Co-ax Connectors, Midland types PL-259, SO-239 female with or without flanges. PL-259 double-ended female; per conn. each **$0.75**

Expected soon—Midland 5-watt Base Station Transceivers, eight channels, 240v. AC, fully P.M.G. approved for 27.800 MHz. operation, with 5 meter and power output metering, including PTT microphone, with switch to be used as 3-watt public address amplifier into separate speaker(s). Target price, all Inclusive, only **$100**

**COLLINS KWM-2 with PM-2 AC Supply.** $700. Excellent bargain.

**SIDEBAND ELECTRONICS ENGINEERING**

Proprietor: ARIE BLES

Telephone: Springwood (STD 047) 511-394, not part of the Sydney telephone exchange

P.O. BOX 23, SPRINGWOOD, N.S.W., 2777
Initially in this discussion the top is considered to be symmetrical and therefore would radiate very little since currents flow in opposite directions and produce a largely cancelled field. A symmetrical antenna with a straight wire top is very ancient and goes under the name of "T". The top load, however, can take several other forms, e.g. an umbrella, several horizontal radials, a flat disk, an inductively loaded whip, a cylinder or a sphere. An antenna with a single top wire at right angles is known as an "inverted L". A "sloping antenna" is also a vertical and these will be dealt with in a separate section. The top loading will have an effect on the antenna like an extra length of wire vertically (non-radiating). This equivalent effective vertical is shown as length "a" in Figs. 4c, d and e, and the vertical radiating section is shown as length "b". The current distribution over the real and virtual part of the antenna in all cases except Fig. 4f is close to sinusoidal (Ref. 3). The shortening effect of a tapering antenna is only illustrated here and is not analysed.

**CALCULATIONS FOR VERTICAL ANTENNAS**

Radiation resistance of a vertical antenna when fed in series with the ground is given by—

$$R_a = \frac{1580 \ L_a^2}{\lambda^2} \quad \ldots \ldots (1)$$

where \(L_a = \) the effective length of the antenna.

\(\lambda = \) wavelength.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Metres</th>
<th>(\lambda)</th>
<th>(\lambda/4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td>166.7</td>
<td>546.8</td>
<td>136.7</td>
</tr>
<tr>
<td>1.825</td>
<td>164.4</td>
<td>539.3</td>
<td>134.8</td>
</tr>
<tr>
<td>1.85</td>
<td>162.2</td>
<td>532.0</td>
<td>133.0</td>
</tr>
</tbody>
</table>

Since we are considering the vertical component only any horizontal radiation resistance can be considered part of the loss. This value is usually small. In the graphs where the electrical length of the antenna is taken as \(\lambda/4 = 1\). This was considered to be simpler for calculation than \(\lambda/4 = 90^\circ\). If calculations are made from tables, angular lengths would have to be used. In the examples given here no reference is made to velocity factor or end effect as these values should make a small difference only.

The effective length of the antenna and the form factor of the current distribution are as defined earlier.

$$F = \frac{L_a}{L} + L \quad \ldots \ldots \ldots (2)$$

where \(F = \) form factor.

\(L = \) actual length over which the current distribution is being considered.

The vertical component of the antenna, the length over which the vertical current distribution is considered, is usually the gap between the top load and the ground. Also—

$$F = \frac{\text{Average Current}}{\text{Base Current}} \quad \ldots \ldots (3)$$

**Average Current = Area under Current Distribution Graph \ldots \ldots (4) / L**

In the case of a triangular distribution of current (Fig. 4b), the average current must be half that of the base current. Therefore it would radiate the same power as a wire of half the length carrying a constant current equal to the base current \((F = \frac{1}{2})\). In the case of Fig. 4d, the effective length is equal to the actual length \((F = \frac{1}{1})\).

The form factor for a quarter wave is \(2 + \pi\), as shown in Fig. 4a. The true form factor for a radiating section of wire is given below.

From equations 3 and 4:

$$F = \int_{x=0}^{x=L} \frac{i}{L} \ dx$$

where \(i = \) current at distance \(x\) from the end of the antenna.

\(L = \) length of the radiating section being considered.

\(I = \) base current.

\[ \text{Example for a simple quarter wave vertical:} \]

\[ R_a = 98.75 \times (1 \times 0.636^2) = 39.9 \]

It must be pointed out that this method of calculating radiation resistance is a simplified method and is only correct if the radiating section of the antenna is short. If it is near a quarter wavelength or longer the radiation resistance will be less by a small amount, however the results given by the formulae and graphs shown here should be sufficiently accurate within the range shown.

According to the formula, as the antenna approaches a half wavelength the radiation resistance approaches infinity. This is obviously erroneous. If the total electrical length of the antenna is more than \(1.4\) of a leg length of a quarter wave, the formulae should not be used. The radiation resistance at the base of a half wave vertical cannot be accurately calculated but would be in the order of several thousand ohms.

A choice of methods for determining the form factor of current distribution on an antenna has been given and these are summarised as follows:

1. If the current distribution conforms nearly to the standard forms shown in Fig. 4, these may be applied. \(F\) for a short vertical = \(0.5\) and \(F\) for a heavily loaded vertical = \(1\), the latter may not be sufficiently accurate on 160 metres.

2. If the current distribution curve is known, equations 3 and 4 can be applied and the areas under the current curve determined graphically or by measurement.

3. By application of the graphs or equation 5.

**Effective Electrical Length of Top Load**

This matter created some discussion as some authorities state that in the case of a "T" the effective length is equal to half the length of the top, that of an "inverted L" section only and other authorities seem to leave the matter open.

The following would appear to be correct (Ref. 4):

1. With an "inverted L" the effective electrical length of the top is equal to the actual electrical length.

2. The electrical distance of the point being considered on the antenna from the current or voltage point (virtual or otherwise) is dependent upon the reactance component at that point.

3. The antenna can be considered as a wire with approximately 600 ohms characteristic impedance.

Amateur Radio, June, 1971
4. The no-load reactance curve for an unloaded 600 ohm line is near enough to correct except close to the voltage loop.

5. At the junction of the "T" the reactance load of each half will add in parallel to produce a reactance of half that of the individual line.

![Diagram of a T antenna]

**Worked Example**

A "T" antenna is 45 feet high and has a 66 ft. flat top. With 100 watts input to the final the antenna current is 1.8 amps.

- **Electrical length of half top**
  \[
  \frac{\lambda}{4} = 1
  \]
  \[
  = 0.245
  \]

- **Equivalent electrical length of top** (Fig. 10)
  \[
  = 0.43
  \]

- **Electrical length of vertical section**
  \[
  = 0.332
  \]

- **Form factor (Fig. 7)**
  \[
  = 0.86
  \]

From equation 6

\[
R_s = 98.75 \times (0.86 \times 0.332)^4
\]

\[
= 8.0 \text{ ohms.}
\]

From equation 7

\[
R = 100 \times 0.7
\]

\[
= 13.2 \text{ ohms}
\]

Efficiency of antenna

\[
\text{Efficiency of antenna} = \frac{8 + 21.2}{21.2} = 0.38 \text{ or } 38\%
\]

probably mainly ground resistance.

**THE CENTRE LOADED VERTICAL**

The effect of an inductance in a vertical is to increase the capacitance loading of the top from the point of view of the bottom, Fig. 4. In other words, the top is made to look larger. The top carries maximum voltage to provide the electrostatic field whereas the bottom section carries maximum current to provide the magnetic field. As well as a top whip the loading coil can be placed below any other form of top of small dimension.

The method has its main application where space is limited and the top is small. It is not as satisfactory as a large capacitive top load. While it does make the current and voltage distribution on the antenna more satisfactory (resulting in a higher radiation resistance), it does add extra loss into the circuit. The tendency to corona is increased.

The inductance of the coil will be much greater to tune the antenna to resonance at the centre of the base and therefore the coil will be more lossy. Care should be taken not to tune the antenna over resonance or the coil may become very lossy. The best compromise is some centre loading and some base loading. Modern practice appears to be to keep the centre loading coil long and thin to reduce common mode radiation loss. For idealised cases of current distribution, the radiation resistance can be calculated from equations 3, 4 and 6.

The centre loaded whip as well as the helical whip have their main application to portable and mobile, but these applications are not discussed here.

**Worked Example**

Example 1.—A centre loaded whip has a total height of 35 ft. The distance from the base to the coil is 25 ft. and from the coil to the tip of the whip is 10 ft. Current was measured at the base of the antenna as 1.5 amps. and at the junction between the lower part
and the coil as 1.0 amp. What is the radiation resistance?
From equations 3 and 4

\[ F = \frac{1 + 1.5}{2} \times 25 + \frac{1 \times 10}{2} \]

\[ = 0.69 \]

Total electrical height = 0.259.

From equation 6

\[ R_n = 98.75 \times (0.259 \times 0.69)^2 = 3.17 \text{ ohms}. \]

In the above the current distribution curves were taken as straight lines. If you don’t believe that the ammeter can be inserted between the vertical section and the coil, then consider this problem.

Example 2.—In the antenna in Example 1, it was found impossible to insert the ammeter two-thirds of the way up, but it was observed that 38 microhénries were required at the base to bring the antenna to resonance. What is the radiation resistance? (Solution at some future date if requested.)

METHODS OF FEEDING

When the antenna is series fed, methods of tuning the antenna depend upon the type of load expected. For efficiency it is desirable to use the minimum tuning circuit possible and this is usually a single variable inductance in series with the antenna capacitance. When the antenna is tuned by a series circuit the effective series resistance of the antenna will be presented as a load to the transmitter.

Circuit Fig. 11a is used where the antenna is shorter than a quarter wavelength. Since a short antenna has a low resistance, the tuning circuit of the transmitter must be adequate to handle this. The coupling capacitor of the pi of the final tuning should be large to prevent overcoupling between the two tuned circuits. Overcoupling could result in harmonic radiation and makes tuning difficult. Circuit Fig. 11c is used where the antenna is over resonant—effectively more than a quarter wavelength. Where the antenna is close to resonant it may be either slightly inductive or capacitive. If the antenna is slightly capacitive this is simply tuned by only a few turns of inductance, but if the load is slightly inductive a small capacitive reactance is required and hence a very large capacitor. The circuit of Fig. 11b is probably the best to use here. Also, circuit Fig. 11b may be used where no variable inductance is available.

Figs. 11d and 11e are parallel tuned circuits in which the antenna load is effectively in parallel with the tuned circuit. To understand this it is best to consider the effective parallel circuit of the load, Fig. 3. Here the effective parallel resistance is high and the coil behaves as a matching transformer. (It should be realised that there are several ways of looking at these circuits and whether you consider it as a circuit with low series resistance or with a high parallel resistance is a matter of convenience.)

These circuits are particularly applicable where the antenna tuning unit is remote from the transmitter and/or where it is necessary to match into a line. Other arrangements such as pi coupling may also be applicable.

Shunt feeding the lower end of the antenna has some application where the antenna is permanently connected to the ground, Fig. 11f. The antenna is fed with something like a gamma or a half delta match. It is suggested that this method, while satisfactory with a near resonant antenna, could be difficult with a shortened antenna. Large circulating currents would be present in the closed loop of a non resonant antenna which would reduce efficiency and make tuning difficult.

EARTHING AND COUNTERPOISING

The most lossy part of a short vertical antenna is the ground. Ground resistance can be reduced by the use of buried earth radials. Unless these are extensive, they are nowhere near as effective as a counterpoise. If we consider the antenna top load as one plate of a capacitor and the ground as another, by using a counterpoise we replace the ground plate with a copper wire.

The counterpoise can be a large web of wire insulated from the ground, but a simple "T" wire directly beneath the top load will produce considerable improvement. If the counterpoise is connected directly to the aerial, a large Earth current will probably drop, indicating a loss rather than an improvement. The counterpoise must be used (Figs. 12a and 12b).

A counterpoise can be tuned by a variable inductance or variometer in series with the counterpoise and ground and in this mode it will be parasitic. The loading coils for the aerial and counterpoise must be adjusted alternately to obtain a maximum aerial current. When correctly adjusted, the earth current should be small and the aerial current and counterpoise current similar. In practice an ammeter in the ground and counterpoise is necessary. Some other methods of tuning are shown in Figs. 12c and 12d which, when tuned correctly, should give zero ground current. These circuits were also most useful to tune to the parasitic counterpoise.

REFERENCES

Correspondence

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

MUNICH OLYMPIC DIPLOMA (M.O.D.)

The rules for which are as follows:

"All contacts with stations in Munich from January 1, 1970, 0000 GMT to 2400 GMT the day of the official closing of the Olympic Games 1972, except Ama-"

For DL/DJ/DK Europe DX phone: 4 pts. 8 pts. 12 pts.
FCC/RTTY 4 pts. 8 pts. 12 pts.
Class I, 250 points; Class II, 200 points; Class III, 100 points.
Mode: cw/phone/mixed. Bands: 160, 80, 40, 20, 15, 10, single band or mixed. The same station may be worked once per band and year. Fees U.S. $1.00 or 10 IRCs. Send a list of the QSO details certified by two licensed and in E. Europe. Contact: DJ8ZU, 10 Munich 12, C. Keuslinstr. 41.
If DX operators who are interested in working for this award pass details of their call signs and anticipated operating times, days or dates to M. Misera, DJ8ZU, 10 Munchen 13, Keuslinstr. 6."

If DX operators who are interested in working for this award pass details of their call signs and anticipated operating times, days or dates to M. Misera, DJ8ZU, 10 Munchen 13, Keuslinstr. 6.

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

MUNICH OLYMPIC DIPLOMA (M.O.D.)

Editor "A.R.,” Dear Sir,
I have been asked by Heiner DJ4KU and Maxie DJ4YL Ballinger, of Munich, West Germany, to pass on information about a certificate called the Munich Olympic Diploma (M.O.D.). The rules for which are as follows:

"All contacts with stations in Munich from January 1, 1970, 0000 GMT to 2400 GMT the day of the official closing of the Olympic Games 1972, except Ama-"

For DL/DJ/DK Europe DX phone: 4 pts. 8 pts. 12 pts.
FCC/RTTY 4 pts. 8 pts. 12 pts.
Class I, 250 points; Class II, 200 points; Class III, 100 points.
Mode: cw/phone/mixed. Bands: 160, 80, 40, 20, 15, 10, single band or mixed. The same station may be worked once per band and year. Fees U.S. $1.00 or 10 IRCs. Send a list of the QSO details certified by two licensed and in E. Europe. Contact: DJ8ZU, 10 Munich 12, C. Keuslinstr. 41.
If DX operators who are interested in working for this award pass details of their call signs and anticipated operating times, days or dates to M. Misera, DJ8ZU, 10 Munchen 13, Keuslinstr. 6.

Incidentally, DJ4KU is blind, and as a consequence he finds a great deal of fun from Amateur Radio.”

—S. T. Clark, VK3ASC
Get the zip without the zap.

We've got what it takes to get your solid state design moving with high frequency power transistors... ruggedness to take the load... gains without gremlins... higher power at higher frequencies and for once without a dismal failure rate.

With our unique new silicon transistors we'll put you into solid state transmitters with all the small size, low power consumption and inherent reliability advantages intact. They are designed through our own advanced technology with integral ballasting resistors to prevent "hot spot" formation (no Zap).

Available at both 12 and 28V supply coverage... covering all the main frequency ranges... in the RF area from 50 to 500 MHz... plus 1 GHz and above for microwave users. All in stripline ceramic packages for optimum operation. At remarkably low cost.

Varian PTY LTD
electron tube and device group
38 oxley street/crows nest/nsw 2065/tel: 43 0673
679 springvale road/north springvale/vic 3171/tel: 560 7133
339 coronation drive/toowong/queensland 4066/tel: 71 3277
10 stirling highway/nedlands/wa 6009/tel: 86 6930
A SOLID STATE F.M. TRANSCEIVER—SOME AFTER-THOUGHTS

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

Since the publication of an f.m. receiver design in the March 1971 issue of "A.R." and that for a companion transmitter in the April 1971 issue, some developments have taken place which may be of interest to readers.

ALTERNATIVE POWER TRANSISTORS

The transmitter design specified the use of a Motorola 2N5589 in the driver section and a Motorola 2N5590 in the p.a.

Varian P/L. of 679 Springvale Road, North Springvale, Vic., 3171 (and 38 Oxley Street, Crows Nest, N.S.W., 2065) suggested that their range of C.T.C. power devices made by the Eimac division of Varian in the U.S.A. might operate well in the circuit. Varian kindly provided a set of devices for trial.

A C.T.C. B3/12 was used in the driver section instead of a 2N5589 and gave somewhat better results. No changes were necessary either to board layout or component values. Used as an output stage on its own, the B3/12 gave well over 2 watts of output power for 70 mW. of drive. It would appear that the B3/12 can be used in the circuit as a direct replacement.

A C.T.C. B12/12 was used in place of the 2N5580 in the p.a. proper, but some component values needed changing. These changes are detailed below.

Referring to Fig. 9, the following component changes are necessary to use the C.T.C. B12/12 in place of the 2N5580:

(a) Cut the h.t. line between the crystal oscillator and audio sections and bridge the cut with a 0.1Ω 1W resistor.
(b) The 22 pF. capacitor between the input end of L110 and earth is reduced to 10 pF.
(c) L110 is increased from 13 turns to 24 turns.
(d) RFC8 is changed to 6 turns of No. 20 tinned copper wire, ½ i.d. and 1 ½ long.
(e) L111 is changed to 3† turns.
(f) The 330 ohm load resistor across RFC8 is not needed.
(g) The total fixed output capacitance of 44 pF. (2-22 pF. capacitors) is raised to 36 pF. (2-18 pF. capacitors).

The only physical difference between the devices is that the Motorola transistors have a 5/16" diameter case, while the C.T.C. transistors have a 3/8” diameter case. Connections are the same.

As a further experiment a C.T.C. B3/12 was driven by the complete transmitter and gave 30 watts of output at 146 MHz. The layout was the same as the existing p.a. but component values were different.

CRYSTAL SPECIFICATIONS

Both transmitter and receiver use crystals in the series mode. With the transmitter especially, it should be noted that the trimming capacitor (and the variations in capacity brought about by the modulating process) are effectively in series with the crystal. When ordering transmitting crystals therefore, the supplier should be advised that they are for use in a series resonant circuit and that they should be calibrated with 25 pF. in SERIES with the crystal and NOT (as is more normal) in parallel with the crystal.

INCREASING EXCITER D.C. EFFICIENCY

As presented, the current drain of the exciter centres around 70 mA. with perhaps ±10 mA. variation, depending on the spread of characteristics of the devices used.

This d.c. drain can be reduced to a mean value of 45 mA. for a constant r.f. output by some very minor modifications.

Firstly, the oscillator is removed from zener control and given the benefit of full supply voltage. Zener control is retained on the whole modulator section. The effect of this change is to increase the drive from the crystal oscillator. In turn, this increased drive causes the first two MPF121 doublers to saturate and “flat top”.

Accordingly, the 47 ohm resistors in the sources of the MPF121 doublers need to be raised to around 330 ohms to bias back the MPF121s into an unsaturated condition. The exact value of source resistors for any individual case must be found by experiment. The simplest indication of arrival at the correct value is when the tuned circuits associated with each device tune sharply, there is a reduction in total current drain, and the output power remains constant. However the centre value of 330 ohms in each source suggested above will achieve a significant decrease in d.c. power requirements even if the maximum decrease is not achieved.

So far as the transmitter circuit board is concerned physical changes necessary are—

(a) Cut the h.t. line between the crystal oscillator and audio sections and bridge the cut with a 0.1Ω 1W resistor.
(b) Remove the original 300 ohm zener dropping resistor and replace with an RFC made by threading a single wire through a Neosid F29 slug.
(c) Transfer the zener diode to a position alongside the 22K modulator trimpot.

TRIMPOTS

The 1.5K and 22K trimpots used are the P.M.D. type made by Plessey/Ducon. They are obtainable from Radio Parts in Melbourne.

The mounting method favoured is to put three circuit board pins in the p.c.b. where the presence of the trimpot is required. The “legs” of the trimpot are bent back at an angle of about 45° and then soldered to the three pins in the board. The legs are bent in such a direction that the adjusting screw of the trimpot will face upward when the trimpot is mounted on the circuit board pins.

TRANSMITTER BASE CHOKES

The “lossy” ferrite rod specified for the base chokes of the driver and p.a. are made by modifying 2½ turn RFCS marketed by the Philips organisation and having the type number 43/2020/36700. As supplied, these chokes consist of 2½ turns of thin tinned copper wire wound through holes in a cylindrical bit of ferrite. The choke is modified so that it consists of two single strands of wire. One strand of wire through each of two holes.

Additional holes are drilled in the printed circuit board about 1/8” away from the choke mounting holes already indicated on the p.c.b. The (four) wire ends of the modified chokes are threaded through the p.c.b., the choke body being carefully soldered into place.

CIRCUIT BOARD PREPARATION

Several instances have come to the notice of the authors where the printed circuit board, after drilling, has not been cleaned and protected against...

(Continued on Page 12)
The class C amplifier is used extensively in radio transmission and a good knowledge of its operation is essential.

By definition this is an amplifier in which the grid bias is appreciably greater than the cut-off value so that the valve plate current is zero when no alternating grid voltage is applied, therefore the plate current in a specific valve flows for appreciably less than one half of each cycle when an alternating grid voltage is applied.

The characteristics of a class C amplifier are high plate circuit efficiency and high power output.

Because the plate current flows only over a portion of each cycle of the exciting grid voltage, the plate current takes the form of pulses as described in Lecture 10 on Harmonics, the plate output contains considerable distortion.

Class C amplifiers are not used for audio frequency amplification, but when used as radio frequency amplifiers the plate current pulses are converted into sine waves in the amplifier's output circuit if it is properly designed. This action is known as the "flywheel" effect.

In the discussion which follows, it is assumed that the grid and plate circuits of a class C r.f. amplifier are in resonance and are proportioned so that the radio frequency output of the amplifier will have minimum harmonics.

Also it is assumed that the amplifier has been neutralised if necessary, so that it is stable in operation.

Fig. 1 shows both the various voltage and current relationships which exist within the class C amplifier.

This drawing represents the various voltages and currents which exist within a class C amplifier. Note differences in symbols such as $E_g$ and $E_p$, $E_c$ and $E_b$.

The following nomenclature is used:
- $E_b$—d.c. plate voltage.
- $E_c$—grid bias voltage.
- $E_g$—input grid wave (exciting grid voltage).
- $I_g$—peak r.f. grid current.
- $E_p$—voltage across output load circuit (tank circuit).
- $I_p$—peak r.f. plate current.
- $E_{p\text{min}}$—minimum plate voltage ($E_b - E_p$).
- $E_{g\text{max}}$—maximum positive grid voltage ($E_g - E_c$).
- $\theta$—plate operating angle.
- $\theta_g$—grid operating angle.

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.

BIAS

In Fig. 1A $E_g$ is the input voltage, assumed for purposes of simplicity to be a sine wave. This sine wave is impressed on the grid of the valve (between grid and cathode) along with the negative d.c. bias, $E_c$. This bias will be at least twice the value required for d.c. plate current cut-off. This bias may be obtained from a battery or other constant voltage source, from a grid leak, by the use of a resistor in the cathode of the class C amplifier valve or a combination of these methods.

In a communications continuous wave transmitter it is common to use a constant bias source and to key the transmitter in an earlier stage, thus the class C amplifier valve plate current will be cut-off during key-up conditions of signalling.

The class C circuit may be explained as follows: For ease in understanding this, assume that the output "tank" circuit of the amplifier must have a large circulating current (r.f.) and to obtain this it is necessary to have a tank circuit with the proper $Q$ or ratio of k.v.a. to k.w., that is the ratio of volt-amperes in the tank circuit to the d.c. plate power input.

To convert these pulses to sine waves the output or "tank" circuit of the amplifier must have a large circulating current (r.f.) and to obtain this it is necessary to have a tank circuit with the proper $Q$ or ratio of k.v.a. to k.w., that is the ratio of volt-amperes in the tank circuit to the d.c. plate power input.

For a sine wave input to the grid the signal in the plate circuit will be in the form of pulses.

This is shown in Fig. 1B which illustrates the relative magnitudes and angles of currents flowing in the circuit. This figure should be studied carefully.

As mentioned earlier, the pulses in the plate circuit will produce a considerable number of harmonics.

To convert these pulses to sine waves the output or "tank" circuit of the amplifier must have a large circulating current (r.f.) and to obtain this it is necessary to have a tank circuit with the proper $Q$ or ratio of k.v.a. to k.w., that is the ratio of volt-amperes in the tank circuit to the d.c. plate power input.

"FLYWHEEL" ACTION

The "flywheel" action of the tank circuit may be explained as follows:

For ease in understanding this, assume that the output "tank" circuit is in the form of a simple parallel tuned circuit.

When the a.c. exciting grid voltage ($E_g$) goes positive, plate current ($I_p$) flows in the "tank" circuit, being superimposed on the d.c. plate current, if the grid bias is at the negative d.c. bias for the "tank" condenser, because in our dis
cussion we are dealing with radio frequencies, not audio frequencies.

Remember, too, from elementary theory that when current flows in a circuit it will produce a voltage across that circuit.

At the moment that the exciting a.c. voltage (Eg) starts to go negative, the condenser of the “tank” circuit starts to discharge towards the plate or anode end of the “tank” circuit to charge the other side of the “tank” condenser through the “tank” inductance.

When the exciting a.c. voltage (Eg) is negative no a.c. plate current (Ip) flows because the valve is cut off, but the “tank” condenser continues to discharge in the opposite direction through the “tank” inductance to charge the other side of the “tank” condenser.

This completes one cycle of the r.f. output and explains how an r.f. pulse in the anode circuit becomes a sine wave in the “tank” circuit.

This explains why it is possible to use a single valve or paralleled valves as an r.f. amplifier in either class C or class B and obtain a sine wave output.

This cannot be done with audio frequencies.

Fig. 2 shows the wave forms of the voltages and currents in a class C amplifier, both unmodulated and modulated. These have been drawn to approximate the conditions which exist in class C output stage of a 2 kw. broadcast transmitter, but are typical of all class C amplifiers.

RATINGS OF VALVE

In working with class C amplifiers it is desirable to operate within the conditions set down by the valve manufacturer. Any attempt to exceed the published ratings will usually result in short valve life.

Usually two sets of ratings are published—the first known as C.C.S. means Continuous Commercial Service and is the data used for the design of transmitters which operate more or less continuously. I.C.A.S. is the term used for the second set of ratings and means Intermittent Commercial and Amateur Service. These ratings have been devised on the basis that in I.C.A.S. the users will take a long period of time to obtain the same use or life from a valve that is obtained by a user under the C.C.S. rating and this is the reason that the I.C.A.S. ratings are higher than for C.C.S.

To illustrate this, here is some data taken from an R.C.A. valve data sheet for valve type 833A:

Service: R.f. power amplifier or oscillator, for class C telegraphy or class C f.m. telephony. Forced air cooling.

Typical Operation: C.C.S. I.C.A.S.

D.c. plate voltage 4,000 4,000 V.
D.c. grid voltage —300 —325 V.
Peak r.f. grid voltage 375 415 V.
D.c. plate current 415 450 mA.
Power output (approx.) 1,440 1,600 W.

If a class C r.f. amplifier is to be modulated then it is necessary to reduce the ratings from those shown above to prevent damage to the valve.

Service: As a plate modulated r.f. amplifier for class C telephony, the data becomes (forced air cooling):

Typical Operation: C.C.S. I.C.A.S.

D.c. plate voltage 3,000 4,000 V.
D.c. grid voltage 300 —325 V.
D.c. plate current 415 450 mA.
Power output (approx.) 1,000 1,500 W.

The ratings for natural air cooling are considerably reduced from those for forced air cooling.

The above data shows that for C.C.S. class C plate modulated telephony the d.c. plate voltage has been reduced from 4,000 volts to 3,000 volts and the approximate power output drops from 1,500 watts to 1,000 watts. Also notice that the frequency modulation of the C.C.S. power output is approx. 1,440 watts.

This is because for f.m. the carrier power output is reduced whereas for a.m. it varies with modulation as explained previously.

Here at 3CS we operate our class C modulated amplifier with four 833A valves in parallel, under C.C.S. ratings.

Examining the valve life charts, recorded over 15 years, shows that the average life of an 833A valve is 10,000 hours. This includes failures from all causes. The manufacturers guarantee valve life is 1,500 hours.

In many cases the valves are withdrawn between 10,000 and 12,000 hours use because the harmonic distortion at 3 KHz. to 5 KHz. increases to the allowable line. is or because emission of the cathode falls off so that full modulation is not possible on positive peaks (lack of positive peak emission), resulting in asymmetrical modulation.

This falling off of positive peak emission is detected with an amplitude modulation meter and a low distortion audio frequency oscillator, usually long before the modulated amplifier plate current meter shows a reduction of plate current brought about by severe loss of emission.
oxidation. The effect of these omissions has been to lead to suspect soldered joints and the near impossibility at any later stage to change components, or in any way carry out modifications or repair work.

It is strongly urged therefore that any printed circuit board be cleaned and protected before any soldering work is carried out. This comment does not, of course, apply to boards which have been solder rolled during manufacture.

The simplest way to clean copper circuits boards after drilling is to polish with fine steel wool such as "Jex". The thin film of lacquer can be soldered in this way by the writers are still been solders during manufacture. Boards treated with the one recommended is the "metal finish clear" "Spray Pak" put out by Balm Paints under the "Dulux" trade mark.

It is quick drying and (provided a heavy application has not been given) the thin film of lacquer can be soldered through with impunity. Boards treated in this way by the writers are still clean and unoxidised after two years service and still accept solder as well as the original clean copper.

TUNING UP THE EXCITER
As an alternative to the procedure set out in the April 1971 "A.R." for tuning up the oscillator and doubler stages of the exciter, the following simplified procedure is offered.

It is based on the fact that as the crystal comes into oscillation drive will be applied to the first MPF121 doubler, causing its operating current to rise. As the first doubler starts to put drive into the second doubler, it, in turn, will draw more current. In both doublers there is a by-passed source resistor, the voltage drop across which will rise as drive increases.

Thus the alternative tuning procedure consists simply of putting a high resistance voltmeter or V.T.V.M. on, say, the 5-volt range, across the source resistor of the first MPF121 and adjusting the slugs of L101 and L102 for maximum voltage indication. The process is repeated with the voltmeter across the source resistor of the second MPF121 doubler, this time adjusting the slugs of L103 and L104 for maximum indication.

It is still necessary to use some form of power meter or r.f. indicator to tune up the MPF121 amplifier.

SIGNAL SOURCE FOR RECEIVER LINE UP

The performance of the receiver is such that to obtain best results the signal level used for final lining up must be very low. Large signals (i.e. 2-3 microvolts or more) cannot successfully be used for final lining up since they cause the whole receiver to saturate.

In the absence of a signal generator with an accurate low level attenuator capable of going down to 0.2/0.3 microvolts, then the simple signal source described by Ron Higginbotham, VK-3RN in the December 1970 issue of "A.R." is recommended. Several people in the Melbourne area have made up this device using transmit crystals from existing earphones to provide the correct frequency.

If the coupling capacitor between the "High" and "Low" outputs is removed the amount of signal available from the "Low" output terminal appears to be suitable for final lining up of the receiver described.

F.M. TRANSCEIVER
(Continued from Page 9)
The Australian development of f.m. repeaters has been along the agreed two-channel principle on Channel 1 (148.1 in and 145.6 out) and Channel 4 (148.6 and 145.9 out). The simplex operation is National Channel B (146.0), Channel A (145.854) and Channel C (146.146). The system is based upon a 80 KHz. channel spacing with ±15 KHz. deviation.

OPERATIONAL REPEATERS
New South Wales:
Sydney—Channel 4, VK2BWI/R1, at Dural. Tx STC base, 40 watts output to ground plane at 57 feet. Rx AWA MR20B, ground plane at 57 feet. Separation 250 feet. Coverage approx. 50 miles.

Central West (Orange)—Channel 1, VK2AOA/R1, at Mt. Canobolas. Note: Output is currently on 145.854 but this will be changed to 145.6 later this year. Tx AWA base 50 watts output to ground plane, both 20 feet high, ground plane, 200 yards separation. Coverage 100 miles.

Victoria
Melbourne—Channel 1, VK3WI/R1, at Carlton. Tx STC 128 base, 50 watts output. Rx is solid state STC 131 with equipment to prevent tx lock-up in event of tx failure. Both antennas are 45° ground planes, 250 feet high with a separation of 600 feet. Coverage approx. 25 m.

Geelong — Channel 4, VK3BGL/R2 located at Gnarwarre. Solid state home-brew equipment. Power output 25 watts. Tx antenna is a folded dipole (temporary) 50 feet up, and receiving is four stacked dipoles 100 feet high. Both antennas are half wave dipoles, receiving 50 feet high, transmitting 35 feet high.

Queensland
Gold Coast—Channel 1, VK4EJ/R2, at Mt. Tamborine. Solid state rx, tx home-brew equipment. Antenna 5 x 6 half wave collinear at 40 feet for tx and rx, 250 yards separation. Coverage 50 miles.

South Australia
Adelaide—Channel 4, VK5WI/R1, at Cranfer. Tx TCA 1680 solid state 15 watts, rx TCA 1675/77 solid state. Antenna ground plane with small vertical separation. Coverage appears good.

REPEATER APPLICATIONS PENDING
VK2—Newcastle, Mt. Sugarloaf, Ch. 4.
VK6—South Eastern (Albany), Mt. Barker, Ch. 4.
VK7—Northern Tas., Mt. Barrow, Ch. 4. Hobart, Mt. Wellington, Ch. 1 or Ch. 3.

PLANNING STAGES
VK2—Central Coast, Gosford, Ch. 1.
South Coast, Wollongong, Ch. 1.
Murrumbidgee, Wagga, Ch. 1.
Murray, Albury, Ch. 4.
VK3—North West, Mildura, Ch. 4.
Central—Bendigo, Ch. 4.
VK4—Brisbane, Mt. Cootha, Ch. 4.
VK6—Perth, Tuart Hill, Ch. 4.

CHANNEL ALLOCATIONS FOR POSSIBLE FUTURE DEVELOPMENT
VK1—Canberra, Ch. 4.
VK2—North West, Mt. Kaputar/Narra-bri, Ch. 1.
Far West, Cobar, Ch. 1.
Warrumbungle, Coonabarabran, Ch. 4.
Riverina, Griffith, Ch. 4.
Snowy Mts., Far South Coast, Ch. 4.
Mid North Coast, Port Macquarie, Ch. 1.
Far North Coast, Grafton, Ch. 4.
VK3—Western, Hamilton/Horsham, Ch. 1.
Northern — Shepparton/Wangaratta, Ch. 1.
VK4—No details known, Ch. 1.
VK5—No further plans at the moment.
VK6—At this stage all possible sites will use Ngarogin/Wagin; Bunbury/Busselton.
VK7—North West, Burnie/Devonport, same channel as finally used by Hobart.

PROJECT AUSTRALIS EXPERIMENTAL REPEATERS
The Australis experimental systems which have the blessing of the P.M.G. Department have been under the experimental project under the overall repeater plan. It is possible that similar equipment may be horizontal by the time this goes to press.

POSSIBLE FUTURE DEVELOPMENT
One experimental repeater is located at Mt. Dandenong (Vic.). The input frequency is 147.76 MHz. and the output frequency is 145.76 MHz. and the output power is 10 watts. Both antennas are quarter wave dipoles about 20 feet high and transmitting 35 feet high.

PROJECT AUSTRALIS
The project is under review by the P.M.G. Department for its future development. The equipment in preparation for A06. It is emphasised that this is not part of the overall repeater plan.

CANCELLATIONS
VK1JRF—J. R. Watson, Not renewed.
VK7ZAB—G. F. Russell, Not renewed.
VK1ZEB—E. J. Barnes, Not renewed.
VK7MIF—P. M. Huys, Not renewed.
VK2AP—J. M. Burrow, Not renewed.
VK7BSP—S. P. Pet'son, Deceased.
VK7CMR—S. J. Kneebone, Not renewed.
VK3ZHI—G. A. Puckett, Not renewed.
VK7ZT—R. M. Ranft, 10 Lansdown Cres., Darwin, 5590.
VK4ZHE—J. W. Heares, 233 Chapel Hill Rd., West Hobart, 7000.
VK4ZDJ—D. J. McWilliam, 2 Rosemary Ave., West Midland, 6056.
VK4ZGD—G. E. Millward, 4506.
VK5BIS—L. W. Bridge, 22 Princess St., Croydon, 5008.
VK5WS—W. D. Mouton, 18 Stanley St., Plympton, 5038.
VK5ZJL—C. J. Merry, 26 Davidson Rd., Eliza-beth, 5051.
VK5ZJQ—B. D. Norman, Station: Yahi, via Mt. Gambier, 5290, Postal: P.O. Box 177, Mt. Gambier, 5290.
VK6EM—S. C. Harrison, Flat 7, Mitchell Court, Mordialloc, 3185.
VK6ND—N. D. Stephen, 18 Leila St., Cannington, 6107.
VK6NW—L. W. Bridge, 109 Sign, Eqn, Vincent St., Leederville, 6007.
VK6ZCK—P. Caravan, 55 Grand Promenade, Bayswater, 6053.
VK6ZJW—J. J. Wade, Station: O.T.C. (A), Mordialloc, Postal: P.O. Box 98, Mordialloc, 6701.
VK7EBR—G. M. Ranft, 10 Lansdown Cres., Darwin, 5590.
VK7RL—J. L. Hester, 84 Stanley Cres., Alice Springs, 5750.
VK7SW—R. H. Wellburn, Esplanade Hotel, Esplanade, Darwin, 5700.

NEW CALL SIGNS

JANUARY 1971

VK2ZJF—J. C. Foster, 26 Avenue Rd., Mosman, 2038.
VK2ZUD—G. O. King, 15 Darnley St., East Gordon, 2072.
VK2ZII—N. Flora, 6 Pamela Pde., Emu Plains, 2750.
VK2ZIU—J. C. Foster, 48 Arthur St., Randwick, 2031.
VK2ZUN—E. L. Lukeby, 1 Bienes Hil, Glenbrook, 2750.
VK2ZUI—R. C. Ecclestone, 2 Valerie St., Mt. Dandenong, 3125.
VK2ZII—R. Carr, 273 Main Rd., Toukley, 2263.
VK2ZUK—D. J. Turner, 52 Amor St., Hornsby, 2077.
VK2ZIJ—R. G. Swadling, 3 Grafton St., Lawnton, 4077.
VK2ZUM—G. H. Wilson, 99 River St., Kemptown, 2500.
VK2ZUU—D. J. Turner, 52 Amor St., Hornsby, 2077.
VK2ZIW—M. V. de Weyer, 101 Francis St, Bondi, 2028.
VK2ZVH/T—W. E. C. Bennett, 5 Hurn St, New Lambton, 3206.
VK3ASV—O. W. Guy, 34 Peter St., Box Hill, Melbourne, 3128.
VK3FC—P. G. Walz, 210 Lansdown Cres., West Hobart, 7000.
VK3FF—J. C. Buckley, 1/8 Carmichael St., West Midland, 6056.
VK3GL—J. C. Cawley, 2441.
VK3H—P. G. Walz, 10 Lansdown Cres., Alice Springs, 5750.
VK3I—R. M. Ranft, 10 Lansdown Cres., Darwin, 5590.
VK3L—D. J. Turner, 52 Amor St., Hornsby, 2077.
VK3R—M. V. de Weyer, 101 Francis St, Bondi, 2028.
VK3S—J. C. Foster, 48 Arthur St., Randwick, 2031.
VK3T—J. C. Foster, 48 Arthur St., Randwick, 2031.
### VK-ZL-OCEANIA DX CONTEST, 1970 RESULTS

#### AUSTRALIA

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AX6ID</td>
<td>00 40 20 15 10</td>
<td>475</td>
<td>4435</td>
</tr>
<tr>
<td>AX6V</td>
<td>00 50 15 10 5</td>
<td>1150</td>
<td>6055</td>
</tr>
<tr>
<td>AX6VP</td>
<td>00 80 15 10 5</td>
<td>1350</td>
<td>6055</td>
</tr>
<tr>
<td>AX6XK</td>
<td>00 40 15 10 5</td>
<td>900</td>
<td>4120</td>
</tr>
<tr>
<td>AX6XU</td>
<td>00 40 15 10 5</td>
<td>900</td>
<td>2715</td>
</tr>
<tr>
<td>AX6XV</td>
<td>00 40 15 10 5</td>
<td>900</td>
<td>2715</td>
</tr>
<tr>
<td>AX6XW</td>
<td>00 40 15 10 5</td>
<td>900</td>
<td>2715</td>
</tr>
<tr>
<td>AX6XX</td>
<td>00 40 15 10 5</td>
<td>900</td>
<td>2715</td>
</tr>
<tr>
<td>AX6Z</td>
<td>00 40 15 10 5</td>
<td>900</td>
<td>2715</td>
</tr>
</tbody>
</table>

#### NEW ZEALAND

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z6MVX</td>
<td>00 40 20 15 10</td>
<td>350</td>
<td>1750</td>
</tr>
<tr>
<td>Z6MVXF</td>
<td>00 40 20 15 10</td>
<td>350</td>
<td>1750</td>
</tr>
<tr>
<td>Z6MVY</td>
<td>00 40 20 15 10</td>
<td>350</td>
<td>1750</td>
</tr>
<tr>
<td>Z6MVZ</td>
<td>00 40 20 15 10</td>
<td>350</td>
<td>1750</td>
</tr>
</tbody>
</table>

#### C.W. Section

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z6MCA</td>
<td>00 40 20 15 10</td>
<td>350</td>
<td>1750</td>
</tr>
<tr>
<td>Z6MCAH</td>
<td>00 40 20 15 10</td>
<td>350</td>
<td>1750</td>
</tr>
<tr>
<td>Z6MCAK</td>
<td>00 40 20 15 10</td>
<td>350</td>
<td>1750</td>
</tr>
<tr>
<td>Z6MCAK</td>
<td>00 40 20 15 10</td>
<td>350</td>
<td>1750</td>
</tr>
</tbody>
</table>

#### OVERSEAS

<table>
<thead>
<tr>
<th>Phone Section</th>
<th>Phone</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>DQ6JF</td>
<td>1265</td>
<td>Africa</td>
</tr>
<tr>
<td>KH8GM</td>
<td>1050</td>
<td>Africa</td>
</tr>
<tr>
<td>KH8H</td>
<td>1050</td>
<td>Africa</td>
</tr>
<tr>
<td>KH8H</td>
<td>1050</td>
<td>Africa</td>
</tr>
</tbody>
</table>

#### Asia (excluding Japan)

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP6B0</td>
<td>00 40 20 15 10</td>
<td>450</td>
<td>2250</td>
</tr>
<tr>
<td>EP6BD</td>
<td>00 40 20 15 10</td>
<td>450</td>
<td>2250</td>
</tr>
<tr>
<td>EP6BD</td>
<td>00 40 20 15 10</td>
<td>450</td>
<td>2250</td>
</tr>
<tr>
<td>EP6BD</td>
<td>00 40 20 15 10</td>
<td>450</td>
<td>2250</td>
</tr>
</tbody>
</table>

#### North and South America

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W10KG</td>
<td>00 40 20 15 10</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>W10KG</td>
<td>00 40 20 15 10</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>W10KG</td>
<td>00 40 20 15 10</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>W10KG</td>
<td>00 40 20 15 10</td>
<td>100</td>
<td>500</td>
</tr>
</tbody>
</table>

#### Europe

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>C8LNM</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>C8LNM</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>C8LNM</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>C8LNM</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
</tbody>
</table>

#### Africa

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>UV0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>UV0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>UV0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
</tbody>
</table>

#### U.S.R.

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>UA1AA</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>UA1AA</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>UA1AA</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>UA1AA</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
</tbody>
</table>

#### Europe

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>DL0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>DL0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>DL0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
</tbody>
</table>

#### C.W. Section

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Phone Section</th>
<th>Phone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>DL0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>DL0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
<tr>
<td>DL0AD</td>
<td>00 40 20 15 10</td>
<td>250</td>
<td>1250</td>
</tr>
</tbody>
</table>
C.W. Section—Europe (continued)

<table>
<thead>
<tr>
<th>Call</th>
<th>Callsign</th>
<th>Date</th>
<th>Frequency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2ACJ</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>H2AKL</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>H2AMZ</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>H2ANX</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>H2AOA</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>H2APL</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>H2ASL</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>H2ATL</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>H2AVL</td>
<td>32</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
</tbody>
</table>

**Overseas S.W.I. Section**

<table>
<thead>
<tr>
<th>Call</th>
<th>Callsign</th>
<th>Date</th>
<th>Frequency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRS-5268</td>
<td>5268</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>BRS-5269</td>
<td>5269</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>BRS-5270</td>
<td>5270</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>BRS-5271</td>
<td>5271</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>BRS-5272</td>
<td>5272</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>BRS-5273</td>
<td>5273</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>BRS-5274</td>
<td>5274</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>BRS-5275</td>
<td>5275</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
</tbody>
</table>

**CHECK LOGS**

<table>
<thead>
<tr>
<th>Call</th>
<th>Callsign</th>
<th>Date</th>
<th>Frequency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0JGJ</td>
<td>5001</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>A0JGI</td>
<td>5002</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>A0JGJ</td>
<td>5003</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>A0JGJ</td>
<td>5004</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
<tr>
<td>A0JGJ</td>
<td>5005</td>
<td>1971-06-21</td>
<td>00.00 kHz</td>
<td></td>
</tr>
</tbody>
</table>

**CALL BOOK**

1971 EDITION NOW AVAILABLE

Plus 23c postage and packing from Divisions and leading booksellers

**Hy-Q**

CRYSTALS FOR AMATEUR USE

A full range of high quality close tolerance crystals especially made for Amateur use is now available.

These crystals are made on the same equipment, with the same care, and subjected to the same exacting tests as those manufactured by us for Military and Industrial applications.

**Hy-Q**

Electronics Pty. Ltd.

10-12 Rosella Street, Frankston, Vic., 3199
P.O. Box 256
Telephone 763-9611, Area Code 03.
Cables: Hyque Melboume. Telex 316301.

**AGENTS**

N.S.W.: General Equiments Pty. Ltd., Artarmon.

The above prices are Nett Amateur to which should be added Sales Tax if applicable at the rate of 27½% for Receiver use, or 15% for Transmitter or Transceiver use.

**Hy-Q**

Electronics Pty. Ltd.
TRIO
9R-59DS

COMMUNICATIONS
RECEIVER

Price: For/FRA Sydney: $178.50

4 BANDS COVERING 540 Kcs. to 30
Mcs.
TWO MECHANICAL FILTERS ENSURE
MAXIMUM SELECTIVITY.
PRODUCT DETECTOR FOR S.S.B. RE-
CEPTION.
AUTOMATIC NOISE LIMITER.
LARGE TUNING AND BANDSPREAD
DIALS FOR ACCURATE TUNING.
CALIBRATED ELECTRICAL BANDSPREAD.
"S" METER AND B.F.O.
2 MICROVOLTS SENSITIVITY FOR 10
dB S/N RATIO.

Weston electronics
PITT LTD
(A unit of Jeeves Mitchell Holdings Ltd)
376 EASTERN VALLEY WAY, ROSEVILLE, 2069.
Cables and Telegraphic Address: 'WESTELEC;
Sydney. Phone: 49 1212
Please forward free illustrated literature
and specifications on Trio equipment.

Name:

Address:

Only $3.00 for a subscription to—
"BREAK-IN"
OFFICIAL JOURNAL OF N.Z.A.R.T.
Send a cheque to the—
Federal Subscription Manager, W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

SUPPORT PROJECT AUSTRALIS!
The Popular

GREAT CIRCLE BEARING MAPS
60c Post Free
Printed on heavy paper 20" x 30", Great Circle Map 16" diameter.
Invaluable for all DXers and S.w.l's. Bearings around circumference
allow precise beam headings to be made.
ALL PROCEEDS TO W.I.A. PROJECT AUSTRALIS
Cheques, etc., to W.I.A., P.O. Box 67, East Melbourne, Vic., 3002
We would again wish to thank all those people who have bought Maps and
who made donations over and above the advertised price.

LOW DRIFT
CRYSTALS

* 1.6 Mc. to 10 Mc.,
0.005% Tolerance, $5

* 10 Mc. to 18 Mc.,
0.005% Tolerance, $6

Regrinds $3

THESE PRICES ARE SUBJECT
TO SALES TAX

SPECIAL CRYSTALS:
PRICES
ON APPLICATION

MAXWELL HOWDÉN
15 CLAREMONT CRES.,
CANTERBURY,
VIC., 3126
Phone 83-5090

LOG BOOK
AVAILABLE IN TWO TYPES—
VERTICAL OR HORIZONTAL
Larger, spiral-bound pages
with more writing space.
Price 75c each
plus 25 Cents Post and Wrapping
Obtainable from your Divisional Secretary,
or W.I.A., P.O. Box 38, East Melbourne.
Vic., 3002

Amateur Radio, June, 1971
This article represents a preliminary report on the results of the recent flights of the Australis translator system on balloon packages. Because all of the tapes and other data from the flights has not yet been analysed, a complete list of the Amateurs who worked through the package, and further details on the results of the flights will be held over until the next issue of "A.R."

The main reasons for conducting the balloon flights with the Australis translator were to demonstrate its operation over relatively long distances and to experiment with antenna systems which could be used on any future flights.

The translator used was a prototype of one of the four channels which, it goes well, will fly on the A-O-B satellite next year. The translator was built by Les Jenkins, VK3ZB. Its input was 460 MHz. (Channel B, f.m.), with the output on 452.30 MHz. The power output was only 500 milliwatts. Prior to the balloon flights, the translator had been operated for several weeks on top of Mt. Dan­denong, near Melbourne, and a considerable amount of interest was shown by Amateurs in this test.

Permission was obtained from the Department of Supply to fly the translator as a "piggyback" experiment on the March-April series of scientific research balloon flights from Mildura, about 350 miles north-west of Melbourne. The balloon series, called HIBAL, consisted, so far as the Australis translator package was concerned, of four flights, to 70,000 (70K), 90,000 (90K), 105,000 (105K) and 120,000 (120K) feet.

The balloons are several hundred feet high when launched and they gradually assume a spherical shape as they rise into the upper atmosphere. The payload or gondola, consists of a tubular steel frame inside which the equipment is located. The gondola is about the size of a small car, and weighs an average of about 500 lbs.—so HIBAL is no mean balloon!

After launch from Mildura airport, the helium-filled balloon rises at a rate of about 1,000 feet per minute until it reaches about 7,000 feet. The time of ascent is about 30 minutes. At the pressure of time that the balloon and its payload float depends on the type of experiment being flown, but two to three hours was the average float time for the four flights and this was approximately the same. However, there was one exception, and that was the height at which the balloon hit a ridge and the payload dropped to 5,000 feet. At the end of the float period, a radio command transmitted to the gondola by the HIBAL control station at Mildura airport separated the gondola from the balloon. The gondola drops into the denser layers of the atmosphere, a parachute opens and lowers the payload to the ground. A chase aircraft follows the gondola’s descent, and radio contact to HIBAL Headquarters, which travels to the landing site and recovers the payload.

George Long, VK3YDB, who prepared the translator for the flights, and I travelled to Mildura before the first flight to test the translator with the HIBAL packages, settle the final flight details with the HIBAL personnel and meet the Amateurs at Mildura who had previously offered their help with the flights. The Amateurs who assisted the project at Mildura included Mike VK3CCX, who was a real tower of strength and who, being a member of the HIBAL crew, was able to give invaluable technical assistance on the four flights; Noel VK3AGF, who did a fine job in communicating with the anxious project at Mildura and the translators, and the three Amateurs on Channel B, 3YEJ, Joan VK3YEK and her OM, Ray VK3ZBN. Without the seemingly tireless help of these people, it would not have been possible to fly the Australis translator on the HIBAL flights.

The four flights were launched at about 7 a.m. on March 27th (70K), March 29th (90K), March 10th (105K), 2nd April (90K) and 5th April (120K). All flights rose to their planned altitudes and the translator worked well on the four trips it took into the stratosphere. The same translator unit was used on each flight and it was recovered undamaged after each flight. Before the flights began, it had been calculated that the Mildura launch site and the planned float altitude of the balloon would be about 130,000 feet. These calculations were proved accurate, and the translator unit was mounted on the top of the HIBAL gondola and on the 105K and 120K flights, the antenna system was mounted on the top of the HIBAL gondola and on the 105K and 120K flights, the antenna system was mounted on the top of the HIBAL gondola and on the 105K and 120K flights, the antenna system was mounted on the top of the HIBAL gondola and on the 105K and 120K flights, the antenna system was mounted on the top of the HIBAL gondola and on the 105K and 120K flights, the antenna system was mounted on the top of the HIBAL gondola and on the 105K and 120K flights.

In the event, Adelaide–Melbourne (and vice versa) QSOs were achieved on all four flights. The copy was unreadable to numerous dBs over S9, probably because of the shadowing effect which the Australis equipment had on the HIBAL equipment and the HIBAL equipment had on the Australis equipment. The propagation was as expected, and the signal fade was as expected. The signal fade was as expected. The signal fade was as expected. The signal fade was as expected. The signal fade was as expected. The signal fade was as expected. The signal fade was as expected.

The sort of distances covered in that flight give some idea of the coverage the translator. However, this is not a complete list and represents only the call signs heard on some of the tapes of the flights. The complete list and more details of each flight will be in July issue of "A.R.

There are probably at least another six VKs who call worked through the translator and a couple of other VK3s as well. It would be a great help if the people who worked through it would drop me a line and give me the date, power output used, antenna used, stations heard, etc. As is usual with projects of this kind, we tend to be enthusiastic about it while the action is there, but a little less when it comes to looking back through the log book and putting pen to paper. An appeal on the VK3 and VK5 Divisional broadcasts yielded only one written report so please sharpen up the pens and send a copy to me.

It was particularly pleasing on the 70K flight, to hear Eddie VK1VP in Canberra, John VK2ZHM at Cootamundra, coming through the translator. The sort of distances covered in that flight give some idea of the coverage which will be possible with the A-O-B satellite. The idea is not a far-fetched one that this could become commonplace on v.h.f.

The co-operation given to the Australis balloon project by Mr. John Hillier and his team at the balloon launching station at Mildura deserves special mention. The Australis translator was flown on a space, weight and power-available basis. While it was originally planned that there would be only one translator flight in the March-April series, because of the shortage of power, George VK3YDB, by going to Mildura and talking with the HIBAL people, was able to arrange that the package flew on four, rather than one, flight. The three calls that were given to the translator were George VK3YDB, by going to Mildura and talking with the HIBAL people, was able to arrange that the package flew on four, rather than one, flight. The three calls that were given to the translator were George VK3YDB, by going to Mildura and talking with the HIBAL people, was able to arrange that the package flew on four, rather than one, flight. The three calls that were given to the translator were George VK3YDB, by going to Mildura and talking with the HIBAL people, was able to arrange that the package flew on four, rather than one, flight. The three calls that were given to the translator were George VK3YDB, by going to Mildura and talking with the HIBAL people, was able to arrange that the package flew on four, rather than one, flight.

The active assistance given by John Hillier and his team in arranging the flights is greatly appreciated by the W.I.A.—Australis group.
KEY SECTION

During the 1930s an active element of Institute affairs was a group known as the Key Section. It appears to have dropped into limbo (with so many other things) in the early 40s, and did not re-appear after the war.

The 1971 Federal Convention in Brisbane agreed to revive the Key Section, and the rules for its operation which were accepted were these:

1. That the Key Section be open to all members who have worked at least 50 different stations by two-way radio contact using A1 or A2 mode. To qualify as a contact significant text should be exchanged, say, 30 words apart from RST; operations during contests are excluded.

2. That the Federal President's Cup, awarded to the Key Section of the W.I.A. in 1930, be revived and mounted and awarded annually with inscription to the member of the section who claims the greatest number of contacts with A1 or A2 mode in that year. No member may hold the cup for more than two successive years.

3. That the W.I.A. make available to overseas Amateurs a certificate or other token for working 20 or more members of the Key Section of the W.I.A.

4. That the W.I.A., through its Key Section, make available certificates of proficiency to members of the Section for successfully receiving and sending using A1 or A2 mode at speeds of 15, 20, 25 and 30 plus words per minute.

5. That the Federal Contest Manager be approached to alter the rules of W.I.A. contests to remove the bias against the use of A1 in contests (because of the lower scoring rates which can be achieved using this mode under contest conditions in Australia), such as by offering a multiplying factor for all contacts using A1 or A2 mode.

6. That every method be used to introduce more A1 or A2 to the v.h.f. bands even to the extent of making operation of v.h.f. part of the requirement for some of the awards associated with the Key Section.

7. That the Key Section be managed by a group consisting of an officer appointed by the Federal Executive and a nominee of each Divisional Council.

8. The nominee of Federal Executive will act as nominal head of the group and report the activities of the Key Section to the Federal Council.

9. The Divisional nominees will be appointed by Divisional Councils and will be known as Divisional Co-ordinators. Appointment will normally be for a period of three years.

10. In the event of a Divisional Co-ordinator resigning, or being replaced as nominee by the Divisional Council, a new nominee will be appointed by the Divisional Council, the tenure dating from the time of the new appointment.

11. The Divisional Co-ordinator may call upon the services of not more than three other persons, whose appointment must be ratified by the Divisional Council, to assist him.

The Federal Executive have appointed Deane Blackman, VK3TX, as Key Section Manager. The appointment of Divisional Co-ordinators, which is the next task in setting up the Section, is in hand.

ANNOUNCING A SPECIAL CALL AND PREFIX

KC0KC will be heard on all bands for the period 1st July, 1971, through to 5th July, 1971. Members of the Mobile Amateur Radio Awards Club Inc. (M.A.R.A.C.) and the Independent County Hunters' Nets meeting in Kansas City through those dates will man the station around the clock.

KC0KC will be on 10, 15 and 20 metres, beginning when the band opens in Kansas City around 1300 GMT until the band closes late in the evening. Activity on 40 and 80 metres will probably begin around 2200 hours GMT until 1300 GMT the following day. However, activity will generally be on any band at any time that band is open.

Activity is planned around the following frequencies:

- CW: 3650, 7260, 21360
- Phone: 14050, 21050, 21280
- 10 MHz: 28050, 28600

Notes:

1. Several times each hour operator will announce and listen 5 or 10 KHz. below the bottom of the U.S. phone band for DX stations.
2. If "pile-ups" develop, operator may listen off his transmitting frequency.

Log all contacts in GMT.

For special QSL send SASE or two IRCs to Shawnee Mission, Kansas, 66201, U.S.A.

PREDICTION CHARTS FOR JUNE 1971

(Prediction Charts by courtesy of Ionospheric Prediction Service)
May I Talk to You About the 35th Federal Convention in Brisbane

In last month's "A.R." the "Wind of Change" was mentioned as if it had been something subtle, by ... breeze have blown eccentric biases have blown for some little while. They have now increased to the point where their influence is doing much to improve the exchange of information in an efficient way at a meeting such as the Convention. Every Divisional Councillor and the many observers at the Convention all commented on this. Your Federal President is largely responsible for this. His overseas trips helped, of course, enormously. The main objective for all of us is communication — effective communication. If this can be achieved more positively with less formality, so much the better. The pendulum could swing too far the other way. This is recognised. But we are dealing with persons, not faceless monsters or remote bodies out of reach and out of touch.

Which brings me back to people. Recognition of problems and genuine attempts to solve them is doing much to improve the exchange of information in an efficient way at a meeting such as the Convention. Every Divisional Councillor and the many observers at the Convention all commented on this. Your Federal President is largely responsible for this. His overseas trips helped, of course, enormously. The main objective for all of us is communication — effective communication. If this can be achieved more positively with less formality, so much the better. The pendulum could swing too far the other way. This is recognised. But we are dealing with persons, not faceless monsters or remote bodies out of reach and out of touch. Right to left: David H. Rankin, VK3QV; Peter D. Williams, VK3IZ; Michael Owen, VK3KI (President); Peter Brown, VK4PJ, is mixed up with it. I'll end about it also. Tom Clarkson, ZL2AZ, was much appreciated not only by the Delegates from the I.A.R.U. Region III, Association Conference in Tokyo and the I.T.U. Space Conference is scheduled for July in Geneva.

The computer can churn out, in seconds, any collection of detail which Federal Executive must resolve them. This is what the Convention is doing much to improve the exchange of information in an efficient way at a meeting such as the Convention. Every Divisional Councillor and the many observers at the Convention all commented on this. Your Federal President is largely responsible for this. His overseas trips helped, of course, enormously. The main objective for all of us is communication — effective communication. If this can be achieved more positively with less formality, so much the better. The pendulum could swing too far the other way. This is recognised. But we are dealing with persons, not faceless monsters or remote bodies out of reach and out of touch. Right to left: David H. Rankin, VK3QV; Peter D. Williams, VK3IZ; Michael Owen, VK3KI (President); Peter Brown, VK4PJ, is mixed up with it. I'll end about it also. Tom Clarkson, ZL2AZ, was much appreciated not only by the Delegates from the I.A.R.U. Region III, Association Conference in Tokyo and the I.T.U. Space Conference is scheduled for July in Geneva.

The computer can churn out, in seconds, any collection of detail which Federal Executive must resolve them. This is what the Convention is doing much to improve the exchange of information in efficient way at a meeting such as the Convention. Every Divisional Councillor and the many observers at the Convention all commented on this. Your Federal President is largely responsible for this. His overseas trips helped, of course, enormously. The main objective for all of us is communication — effective communication. If this can be achieved more positively with less formality, so much the better. The pendulum could swing too far the other way. This is recognised. But we are dealing with persons, not faceless monsters or remote bodies out of reach and out of touch. Right to left: David H. Rankin, VK3QV; Peter D. Williams, VK3IZ; Michael Owen, VK3KI (President); Peter Brown, VK4PJ, is mixed up with it. I'll end about it also. Tom Clarkson, ZL2AZ, was much appreciated not only by the Delegates from the I.A.R.U. Region III, Association Conference in Tokyo and the I.T.U. Space Conference is scheduled for July in Geneva.

The computer can churn out, in seconds, any collection of detail which Federal Executive must resolve them. This is what the Convention is doing much to improve the exchange of information in efficient way at a meeting such as the Convention. Every Divisional Councillor and the many observers at the Convention all commented on this. Your Federal President is largely responsible for this. His overseas trips helped, of course, enormously. The main objective for all of us is communication — effective communication. If this can be achieved more positively with less formality, so much the better. The pendulum could swing too far the other way. This is recognised. But we are dealing with persons, not faceless monsters or remote bodies out of reach and out of touch. Right to left: David H. Rankin, VK3QV; Peter D. Williams, VK3IZ; Michael Owen, VK3KI (President); Peter Brown, VK4PJ, is mixed up with it. I'll end about it also. Tom Clarkson, ZL2AZ, was much appreciated not only by the Delegates from the I.A.R.U. Region III, Association Conference in Tokyo and the I.T.U. Space Conference is scheduled for July in Geneva.

The computer can churn out, in seconds, any collection of detail which Federal Executive must resolve them. This is what the Convention is doing much to improve the exchange of information in efficient way at a meeting such as the Convention. Every Divisional Councillor and the many observers at the Convention all commented on this. Your Federal President is largely responsible for this. His overseas trips helped, of course, enormously. The main objective for all of us is communication — effective communication. If this can be achieved more positively with less formality, so much the better. The pendulum could swing too far the other way. This is recognised. But we are dealing with persons, not faceless monsters or remote bodies out of reach and out of touch. Right to left: David H. Rankin, VK3QV; Peter D. Williams, VK3IZ; Michael Owen, VK3KI (President); Peter Brown, VK4PJ, is mixed up with it. I'll end about it also. Tom Clarkson, ZL2AZ, was much appreciated not only by the Delegates from the I.A.R.U. Region III, Association Conference in Tokyo and the I.T.U. Space Conference is scheduled for July in Geneva.

The computer can churn out, in seconds, any collection of detail which Federal Executive must resolve them. This is what the Convention is doing much to improve the exchange of information in efficient way at a meeting such as the Convention. Every Divisional Councillor and the many observers at the Convention all commented on this. Your Federal President is largely responsible for this. His overseas trips helped, of course, enormously. The main objective for all of us is communication — effective communication. If this can be achieved more positively with less formality, so much the better. The pendulum could swing too far the other way. This is recognised. But we are dealing with persons, not faceless monsters or remote bodies out of reach and out of touch. Right to left: David H. Rankin, VK3QV; Peter D. Williams, VK3IZ; Michael Owen, VK3KI (President); Peter Brown, VK4PJ, is mixed up with it. I'll end about it also. Tom Clarkson, ZL2AZ, was much appreciated not only by the Delegates from the I.A.R.U. Region III, Association Conference in Tokyo and the I.T.U. Space Conference is scheduled for July in Geneva.

The computer can churn out, in seconds, any collection of detail which Federal Executive must resolve them. This is what the Convention is doing much to improve the exchange of information in efficient way at a meeting such as the Convention. Every Divisional Councillor and the many observers at the Convention all commented on this. Your Federal President is largely responsible for this. His overseas trips helped, of course, enormously. The main objective for all of us is communication — effective communication. If this can be achieved more positively with less formality, so much the better. The pendulum could swing too far the other way. This is recognised. But we are dealing with persons, not faceless monsters or remote bodies out of reach and out of touch. Right to left: David H. Rankin, VK3QV; Peter D. Williams, VK3IZ; Michael Owen, VK3KI (President); Peter Brown, VK4PJ, is mixed up with it. I'll end about it also. Tom Clarkson, ZL2AZ, was much appreciated not only by the Delegates from the I.A.R.U. Region III, Association Conference in Tokyo and the I.T.U. Space Conference is scheduled for July in Geneva.
Adjustment of Output and Loading, SSB Transmitters

HEATHKIT SB-610 MONITORSCOPE AND HEATHKIT HN-31 CANTENNA

It is well known that a cathode ray oscilloscope is a valuable aid in checking the operation of a transmitter. The usual CRO is primarily a general purpose instrument for the laboratory or electronics workshop and is not always convenient to use in the Amateur shack on a permanent monitoring basis. The Heathkit SB-610 Monitorscope fills the gap, as it is designed to be connected into a 50-72 ohm antenna feeder line, includes a built-in two-tone audio oscillator, is compact in size, and styled to harmonise with the equipment.

Adjustment of an output pi network of a PA stage requires care in order to obtain the highest possible RF voltage peaks without "flat topping". Some manufacturers give approximate settings of the loading control for each band, which with plate tuning resonance, is intended to assist the operator to reach this objective.

Installation of a Monitorscope enables a "picture" of the PA RF output to be observed, and when tuning up with the aid of the two-tone oscillator coupled to the transmitter microphone input, a regular pattern can be obtained to show the effect of tuning adjustments. It is relatively easy to arrive at adjustments which result in maximum deflection before "flat-topping" occurs.

The SB-610 also has provision for coupling to a receiver to enable visual monitoring of received signals. In addition, the instrument, with its H sweep and V amp., is useful for other CRO testing applications in the Amateur shack. A comprehensive instruction manual describes the various features and installation procedure, and operating instructions include representative screen patterns showing examples of correct and incorrect tuning not only for the SSB mode, but for AM, also keying patterns for CW, RTTY adjustments, etc.

It is recommended that tuning up be carried out with the transmitter output connected to a non-inductive dummy load. The Heathkit HN-31 Cantenna is designed for this purpose.

Brief Details

SB-610, applicable over the range 160 to 6 metres, has standard UHF co-ax sockets for ready connection into co-ax feed line, 3" mu-metal shielded CRT, power requirement 240 V. AC 50 c/s. Size: 6" h. x 10" w. x 11" d.

HN-31 provides 50 ohm non-inductive load with SWR less than 1.5:1 for frequencies from 1.5 to 300 MHz. Co-ax. fitting to transmitter line. Phono jack for relative power measurements. Oil coolant (capacity 1 gallon—oil not included) permits power up to 1 kw.

ENQUIRIES ARE INVITED FOR ANY MODEL OF THE HEATHKIT RANGE OF AMATEUR EQUIPMENT
The Region III Association was formed in March with formal sessions on 17th, 18th and with a preliminary informal one on 16th held at the Fairmont Hotel and the Zenkyoren made arrangements for the Conference to be held at the Prince Park Hotel, Tokyo. The meetings commenced with a preliminary informal one on 16th March, and a concluding one on 21st March.

**LIST OF PARTICIPANTS**

**I.A.R.U.:** WODX, Mr. R. W. Denniston; VK3IX, Mr. A. G. Fithen, New Zealand; VK3AZ, Mr. A. D. Lloyd; ZL2AZ, Mr. T. R. Clarkson.

**Philippines:** DUEA, Mr. E. M. Ariosto, Mr. R. A. Tolentino; DU1CR, Mr. B. P. C. Esquerra; DU1HR, Mr. R. J. Rossen; DU1GJ, Mr. S. A. Ason; DU3EO/1, Mr. E. O. Orbe.

**India:** VU3US, Mr. K. Umroo Singh.

**Hong Kong:** PH2Z, Mr. G. F. Flinner; V86DR, Mr. P. Wight.

**Japan:** JA1AIN, Mr. S. Hara; JA1BK, Mr. K. Inomoto; JA0lia, Mr. K. Kuwazawa.

**Secretary:** VK3IZ, Mr. P. D. Williams.

**ARRANGEMENTS FOR MEETINGS**

After the first meeting was opened by the Secretary-General, Mr. R. W. Denniston, WODX, as delegation (Mr. S. Hara, JA1AIN, President of Japan, and Mr. K. Kuwazawa, JA0lia, Secretary) was welcomed. Mr. R. W. Denniston, WODX, was elected Chairman of the Conference. The J.A.R.L. described the arrangements that had been made to assist the Societies in the practical work involved.

**THE MEMBER SOCIETIES**

Credentials were submitted by the Societies qualified according to the Interim Constitution, and it was agreed that, in addition to existing membership, the Societies of India, Ceylon, New Zealand, New Zealand and Hong Kong would be members and that the Societies of Australia, New Zealand, and New Zealand, and the Societies of Australia, New Zealand, and New Zealand, would be a member, in view of the members it has in Region III.

**STATUS OF CONFERENCE**

In order to clear up some imperfections in the Interim Constitution, and to bring its authority into conformity with the Constitution, the Conference was discussed, and, in agreement with the Interim Constitution, its purpose to affirm that membership in the Region III Association can be done at any time and for any length of time.

**THE CONSTITUTION**

After receiving from the Secretary-General a report on the status of the conference, it was decided to bring the Constitution into conformity with the Interim Constitution, its purpose to affirm that membership in the Region III Association can be done at any time and for any length of time.

2. Each Society will designate a Liaison Officer to be its representative in Association affairs.

3. The inviting Society will be expected to facilitate the efficient and economical running of the Conference, and to assume all the "out-of-pocket" expenses that may be incurred. The cost of travel and accommodation for Delegates will be the responsibility of their Society.

4. The management of the Association will be done by four Directors and a Secretary, who will be appointed by the Conference on a personal basis and be responsible to it. Expenses incurred for the Directors and Secretary to carry out their duties will be the responsibility of the Association.

5. The management of the Association will be done by four Directors and a Secretary, who will be appointed by the Conference on a personal basis and be responsible to it. Expenses incurred for the Directors and Secretary to carry out their duties will be the responsibility of the Association.

6. The management of the Association will be done by four Directors and a Secretary, who will be appointed by the Conference on a personal basis and be responsible to it. Expenses incurred for the Directors and Secretary to carry out their duties will be the responsibility of the Association.

7. The management of the Association will be done by four Directors and a Secretary, who will be appointed by the Conference on a personal basis and be responsible to it. Expenses incurred for the Directors and Secretary to carry out their duties will be the responsibility of the Association.

8. The management of the Association will be done by four Directors and a Secretary, who will be appointed by the Conference on a personal basis and be responsible to it. Expenses incurred for the Directors and Secretary to carry out their duties will be the responsibility of the Association.

WIRELESS INSTITUTE OF AUSTRALIA—FEDERAL EXECUTIVE AMATEUR JOURNALS

The Institute can now offer annual subscriptions to following Amateur Journals:

- "QST"—Associate membership and renewals, $6.40.
- R.S.G.B. "Radio Communication" (ex "The Bulletin") is only sent with membership of Society, $8.80. Send for application form.
- "CO" Magazine, $5.70; Three Years, $13.50.
- "73" Magazine, $5.50; Three Years, $11.50.
- "Ham Radio" Magazine, $5.50; Three Years, $11.50.
- "Ohm" Oriental Ham Magazine, $2.50.

**VK2 MID-WINTER V.H.F.-U.H.F. CONTEST**

**INVITATION**

The Contest Committee of the VK2 V.h.f./ T.v. Group invites all stations in VK2 with V.h.f. and/or U.h.f. equipment to participate in the 1971 Mid-Winter Contest. This will be the first Mid-Winter held in VK2, and the first held in the Queensland area by week-end in June. Awards will be made as stated in Rule 5 and above. The Committee finds that the incoming entries count towards the Annual Chairman's Trophy to be held during the Queen's Birthday week-end in June. Awards will be made as stated in Rule 5 and above.

5. Awards will be made to the winners of the highest scorers in the following bands:
   - 2.3 to 10 GHz.: Home
   - 2.3 to 10 GHz.: Portable/Mobile
   - 21 GHz.: Home
   - 21 GHz.: Portable/Mobile
   - 70 cm. (438) Nets: Home
   - 70 cm >438) Nets: Portable/Mobile
   - 52 and 144 MHz. Tunable: Home
   - 52 and 144 MHz. Tunable: Portable/Mobile
   - 1215 MHz.: Home
   - 1215 MHz.: Portable/Mobile
   - 15 kHz.: Home
   - 15 kHz.: Portable/Mobile
   - 5000 kHz.: Home
   - 2 meter FM: Home
   - 2 meter FM: Portable/Mobile
   - 500 kHz.: Home
   - 500 kHz.: Portable/Mobile
   - 144 MHz.: Home
   - 144 MHz.: Portable/Mobile
   - 438 MHz.: Home
   - 438 MHz.: Portable/Mobile
   - 100 kHz.: Home
   - 100 kHz.: Portable/Mobile

14. Serial Numbers must be exchanged as usual before points may be claimed for a contact. The five or six digit serial number to be exchanged is the final character. Awards will be made by following three digits starting as shown below and increasing by one for each subsequent contact. For all 6 metre QSOs start at 601 for the first contact. For all 2 metre QSOs start at 201 for the first contact. For all other (incl. t.v.) start at 601.

Notes that are not required, but may be sent in with the entry. If requested, they should be sealed in an envelope marked "NOT score in this contest." Entries are to be sent out on the entry form or in the Contest Arrangement's agreed form. The Contest Chairman will ensure that all statistics to be extracted quickly. For cross-band contact, enter QSOs under band transmitted.

17. Entries should be sent to reach the Secretary, V.h.f./T.v. Group, Wireless Institute of Australia, 14 Atkinson St. Crows Nest, N.S.W. 2065, by Friday night, 18th July, 1971.

18. Incentive Rating and Multiplier.—The various classes and operating possibilities have been broken up into categories for the application of an Incentive Rating, from which an operator can derive the multiplier for each contact QSO. To obtain the multiplier for a contact, take the Rating for your station (from the Rating Table, hereafter), add it to the Rating of the station to which you are working, and this sum is called the Multiplier. The same Multiplier therefore applies to both stations in any one contact.

19. The Distance Points are based on the airline distance from the station in VK2 to the station in the other class and it may be at any location. Maritime and airborne mobile score the same as normal mobiles.

20. The Score Calculation for each contact is done by multiplying the distance points by the Multiplier. The score is then calculated as follows:
   - For all 6 metre QSOs: start at 601
   - For all 2 metre QSOs: start at 201

W.I.A. QUEENSLAND DIV.

**STATE CONVENTION**

will be held over the weekend 12th and 13th June, 1971 at

SANDGATE, QLD.

(R.S.I. Memorial Club Hall In Keogh Street)

Registration Fee: Amateur and Listeners, $3.50; X.Vls and Friends, $2.50. Children (under 12), $1.50. The tea will include Saturday night dinner and entertainment.

Registration may be sent to the Secretary, Qld. Div., W.I.A., P.O. Box 638, G.P.O., Brisbane, Qld., 4061.
Finally, it is interesting to note the art of building still comes to the fore in Canberra where a competition for home-brew gear was won by Eddie VK1VF with a line up of varactor triplers and filters, 144 MHz input, 1500 MHz output, and a 576 MHz converter. Second was also in Canberra with a 1906 MHz converter and home-brew dish antenna. Third a two-in-one transmitter made by Graeme VK1CG with 50 and 144 MHz coverage of the same unit with 6/40 final each.

Brian VK7BD/4 writes from Atherton in North Queensland. It appears the paragraph in April "A.R." was incorrect in stating he had worked 5W6ZP. Brian VK7BD has not been active on 6 metres since leaving New Guinea at the end of November. Currently he is using 146 MHz for both voice and trouble seems to be his isolation v.f.h.f.-wise. However, he has been hearing very high points on the south-east edge of the Tablelands operated with a turnstile type v.f.h.f. Contest in May, and is constructing a s-l-a-y beam for the purpose! Brian is hoping to have a couple ofs -l-a-y beams with eyes across the border to other areas.

**RTTY IN VKS**

Further to the above, John has given a lot of thought to the establishment of an r.t.t.y. net. With the increase in interest in this mode still in the minority as yet in JA. The TE starts about 2030 and goes to 2400, and long on 52.200. (This is very pleasing information otherwise it appears there is very little reliable information and further details are awaited—S.L.P.)

Eddie VK1VP with a line up of varactor trip-"sors, working VK3 and VK7 with 50/40 final each.

SOUTH EAST RADIO GROUP OF S.A.

**ANNUAL CONVENTION**

will be held over the week-end

12th and 13th JUNE, 1971 at MT. GAMBIER

Events will include 80 and 2 metre fox hunts, 144 MHz fox hunts, scrambles, plus other novelties.

Hotel and motel accommodation can be arranged with other hunters.

Convention reg $5, includes all meals ex. drinks.

All correspondence regarding registration to: South East Radio Group, P.O. Box 1163, Mt. Gambier, S.A., 5905.

Finally, one new contact was made on 146 MHz, 5 x 4 both ways, 143 miles. On Sunday morning, Kevin VK3CMS and Ed VK3EMK from Deniliquin, has been trying 432 with Ian VK3HAN, but so far no two-way QSO has been achieved. This may be a contact worth looking for by the 432 operators in VK5, giving them a chance to make contact with S.A. stations.

Continuing, Bob reports excellent 2 metre coverage and good activity. Many contacts from Mt. Gambier worked into Melbourne and giving some of the lower powered Melbourne stations a chance to get on the air. QSLs were also sent in to some of these stations and the Gambier station operators would like these to be answered. Also noted that Ron VK3AKC worked Kevin VK7ZAH on 1180 kHz on 3rd April.

As stated earlier, a month or so ago, this autumn was a time to keep a good ear on 21 MHz, and this was proved correct in the following week or so confirmed this. An urgent telephone call from John VK3BDA in Brisbane gave me the first hint that something was going on in Melbourne for the season. The excellent contact was reported to me by John and Colin VK3DK who had contact with VK5 stations. John also noted that Ron VK3AKC worked Kevin VK7ZAH on 1180 kHz on 3rd April.

An interesting situation has arisen during the Easter period, when he advised good signals were being heard in that city seen and heard conditions during early April, when six states stations were worked on 576 MHz., and the period around Easter and the following week or so confirmed this. An urgent telephone call from John VK3BDA in Brisbane gave me the first hint that something was going on in Melbourne for the season. The excellent contact was reported to me by John and Colin VK3DK who had contact with VK5 stations. John also noted that Ron VK3AKC worked Kevin VK7ZAH on 1180 kHz on 3rd April.

An interesting situation has arisen during the Easter period, when he advised good signals were being heard in that city seen and heard conditions during early April, when six states stations were worked on 576 MHz., and the period around Easter and the following week or so confirmed this. An urgent telephone call from John VK3BDA in Brisbane gave me the first hint that something was going on in Melbourne for the season. The excellent contact was reported to me by John and Colin VK3DK who had contact with VK5 stations. John also noted that Ron VK3AKC worked Kevin VK7ZAH on 1180 kHz on 3rd April.
**CAPACITOR CATALOGUE**

A comprehensive range of variable capacitors, well designed electrically and mechanically, and intended to stand up to continuous usage under all reasonable conditions. The types include single-section, split-stator, butterfly and differential capacitors.

**TRANSMITTING VARIABLE CONDENSERS**

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Type</th>
<th>Capacitance (pF.)</th>
<th>Min.</th>
<th>Max.</th>
<th>Proof Voltage</th>
<th>Air Gap (Ins.)</th>
<th>No. of Vanes</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>815</td>
<td>Single Section</td>
<td>7.5</td>
<td>66</td>
<td>1,700</td>
<td>0.048</td>
<td>7</td>
<td>6</td>
<td>$7.90</td>
</tr>
<tr>
<td>816</td>
<td>Single Section</td>
<td>9</td>
<td>122</td>
<td>1,200</td>
<td>0.024</td>
<td>10</td>
<td>9</td>
<td>$8.18</td>
</tr>
<tr>
<td>817</td>
<td>Single Section</td>
<td>10</td>
<td>270</td>
<td>1,100</td>
<td>0.024</td>
<td>14</td>
<td>13</td>
<td>$8.46</td>
</tr>
</tbody>
</table>

**HIGH STABILITY TYPE**


**MINIATURE MICRODENSERS**

Particularly suitable for VHF applications and where space is restricted. Robust construction. Two-hole fitting, using parts supplied.

**SALES TAX NOT INCLUDED**

**AVAILABLE from**

R.H. Cunningham PTY. LTD.

VIC.: 608 COLLINS STREET, MELBOURNE, 3000. Phone 61-2464
N.S.W.: 64 ALFRED STREET, MILSONS POINT, 2061. Phone 929-8086
OLD.: L. E. BOUGHEN & CO., 30 GRIMES STREET, AUCHENFLOWER, 4066 Phone 70-8087
W.A.: 34 WOLYA WAY, BALGA, 6061. Phone 49-4919
Tellex Melb. 31447; Sydney 21707
BREAK-IN

The Christchurch VHF Repeater. All valve blocks are wired in a 'push pull' mode. E.S.G.B. Two Meter MOSSPET Converter. ZL2ATA tells how they made this a V.h.f. Ground Station.

Solid State Quick Check, ZL2AT. Tells the user if the power output is okay or not. Naturally it also checks diodes. In or out of circuit, powered or unpowered.

March 1971—

Direct Reading Capacitance Meter. ZL2ADE. Reading to 0-01 pF, and 0-1 uF. in six ranges with linear scale. Accuracy claimed to be plus or minus 5%. The instrument appears to be a high quality instrument.

ZL2AHP. Identifies the types, silicon or germanium. NPRN or PNP and checks which lead is which.

Teleprinter Equipment Speed Control Data, ZL2BSE. A review of how you can do something from getting your teleprinter operating at the correct speeds.

CQ

November 1970—

Electronic Keyers—W4MKX. Modern IC circuits of simple and tamable keyers for use in keying transmitters. A 2M34A0 transistor is used as the keying element. Stated to be suitable for grid block or cathode keying.

F. M. Transmitter. L. Drumeller, W5JJ. If your transmitter does not have a suitable keyer available, try an Omni-directional v.h.f./u.h.f. antenna. Relay operated by teleprinter keying, by W2AEE. Described as 'a versatile solid state job for operation with a.m., s.s.b. c.w. or r.f. keyer. Is claimed to work with all frequency segments in the range 150 KHz. to 30 MHz."

A Simple D.C. Voltage Dropper, W2FZEC. Useful for testing any equipment in the circuit that requires a voltage that is less than the battery voltage.

Evaluation of the Dexbel, Part 2. KIBZ. The concluding article in a two-part series describing an every-day approach to understanding the Amateur spectrum.

Improving the El33 Transceiver, W3CWS. Some observations on using this popular home-brew transceiver, by W4MKX, so there may be men who are interested. The power supply offers regulated r/x 250 v. h. i. The National Lottery, by NEG. The power supply is similar, but without the regulation.

December 1970—

A Solid State Comm. Receiver, 11TJD. FET front using TISMS, tunable i.f. on 3.5 MHz. followed by mech. filter i.f. on 250 KHz. Uses Command set parts in tunable i.f.

An Inexpensive UHF Antenna for Amateurs, W3SAI. Simple certainly! A Digitally Divided Frequency Standard for Lab. or Receiver, W6HPH/G. A very useful device, and not so difficult to construct a practical and useful version of this equipment. It is willing to accept a wide variety of input frequencies.

A Station Control Unit for the Blind Amateur, ZL2ADE. W2IBI. It seems to be a fairly simple unit using a single transistor and about a dozen other components. Operation is from a 9v. battery. This is a very useful circuit and can be used for a very wide variety of applications.

An Advanced General Coverage Amateur Receiver, W4MKX. A very interesting specification for those who still have stocks of tube type equipment. A 166-80-15 Metre Band Bond Veed Antenna, W2FV, who offers an analysis of how it works. A Hermetic unit using a pair of I.F.'s and a local oscillator using common principle. It is the only amateur who can construct a practical two band version of this equipment, the model is 52-450.

A VFO for 80 Through 10 Metres, Di Ming Lee. Here is an idea article showing how to use a transformer and a bandpass filter to switch a variable frequency oscillator.

A 5-MHz Grounded-Grid Amplifier for medium to high power, W2IBI. It is the only amateur who can construct a practical and useful version of this equipment.

A Station Control Unit for the Blind Amateur, ZL2ADE. A very useful circuit and can be used for a very wide variety of applications.

An Attenuator Box for Audio, W2HIG. Very useful for the measurement of amplifier gain and other audio jobs.

Some Notes on the Design and Construction of a Crystal Oscillator, W3QLA. A very useful and practical design for the amateur who is seeking a modern design should be interested in this one. Finally, the oscillator is of interest to the modern amateur who requires a good square wave of frequency and 5.5 MHz. local oscillator using Command transmitter components. A compact and sensitive version of this equipment is described here.

A Grounded barber-pole, W3QLA. A very useful circuit and can be used for a very wide variety of applications.

A Variometer for a Beginner's Transmitter, W2EYEY. This provides a simple aerial indication of tuning, and also allows the components to be measured without the interference of having to use a meter scale every time a test connection is changed.

February 1971—

An Introduction to VHF FM. D. T. Shand. A very useful description of non-f.m. techniques f.m. offers several significant technical advantages over non-f.m. methods. The author describes the merits of f.m. and the fact that the equipment required to receive and transmit f.m. on the v.h.f. bands. W2QAI, K8STH/5. Feature.

A Calibrated Gamma-ray Spectrometer, VE2AQQX. Describes the Bessel Zero Method of calibration which is used with a scintillation counter. The Calibration Table Tab. Maxi Linear. W6EI. A MEVX00A AT 40, 60 and 20 metres.

OHM—The Oriental Ham Magazine

Nav.-Dec. 1970—

This is a rather lacy magazine which is published in Hong Kong and is usually filled with pictures and jotings about the goings on in Asia generally. This issue carries the news under the rubric, "Bends" that Japan is likely to approve reciprocal licensing in the near future. No doubt this will be the headline image.

Watch These Two C2MAFZ. Discussing the difficulties of getting cards from rare countries and methods of achieving the near impossible. Of course, if you were one of two or three Amateurs in some countries perhaps you might feel a bit of a let-down. Another feature of this issue is given over to stories of various happenings from here and there, mainly in the Orient.

QST

November 1970—

An Advanced General Coverage Amateur Receiver, W4MKX. A very interesting specification for those who still have stocks of tube type equipment.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.

A Wide-spaced Multi-element Tribander, W2IBI. A very useful circuit and can be used for a very wide variety of applications.
May 1971

More Thoughts on Solid State Receiver De­
sign. W1GLS. Some ideas and suggestions.

The Morse-A-Verter, W7GHM/4. This device
uses several f.m. receiving adapters for use
with communications receivers and reviews
valves. The author describes the various
types of Flip-Flop circuits.

Curtis EM-Sim Electronic Keyer, K1PLP.
K1PLP reviews this unit for making c.w.
operators contact with each other or not
you buy the custom memory with it.

Midlatitude Intense Sporadic-E Propagation,
W4IT. Very detailed articles on how Es clouds
are tracked from oblique propagation data
reported by amateur observations. Article
starts out with a discussion of the horizontal
and vertical propagation of Es in Australia.

The ATR-100, K1RPB. Part 1 of a two-part
description of a home made transceiver. Many
different modifications and ideas are discussed.

A 75/80 Metre Vertical Antenna Square Ar­
ray, W6DDB. An index to the coding used in
such antennas is provided.

Digital Frequency Counters, W0LMD. How
to select well fitted coupling of capacitance in
oscillator circuits.

A Field Day AC Power Monitor. K1PLP de­
scribes a simple but effective equipment.

A Solid State SSTV Monitor, W9LUO. A
two part article describing a home made
transceiver for use with communications
receivers. Receiver is essentially a two step
conversion receiver, variation using crystal
mixer after a 455 KHz. i.f. and converts to
500 KHz. to 30 MHz. in bands 160-15 m
(received between 160-15 m.

January 1971—

More Thoughts on Solid State Receiver De­
sign. W1GLS. Some ideas and suggestions.

Recent Equipment: The Drake SPR-4 Re­
ceiver, W1KLK. 500 KHz. to 30 MHz. in bands
500 KHz. wide. Standard in form it covers
the entire amateur v.h.f. bands plus WWV
and provides birdie-free reception by using
two volume controlled r.f. attenuators. A
squelch circuit will silence any of the
segments also. If's are on 545 and 50
KHz.

January 1971—

More Thoughts on Solid State Receiver De­
sign. W1GLS. Some ideas and suggestions.

The Morse-A-Verter, W7GHM/4. This device
can be an excellent way to print characters at
a speed from 5-60 words per minute.

Curtis EM-Sim Electronic Keyer, K1PLP.
K1PLP reviews this unit for making c.w.
operators contact with each other or not
you buy the custom memory with it.

Midlatitude Intense Sporadic-E Propagation,
W4IT. Very detailed articles on how Es clouds
are tracked from oblique propagation data
reported by amateur observations. Article
starts out with a discussion of the horizontal
and vertical propagation of Es in Australia.

The ATR-100, K1RPB. Part 1 of a two-part
description of a home made transceiver. Many
different modifications and ideas are discussed.

A 75/80 Metre Vertical Antenna Square Ar­
ray, W6DDB. An index to the coding used in
such antennas is provided.

Digital Frequency Counters, W0LMD. How
to select well fitted coupling of capacitance in
oscillator circuits.

A Field Day AC Power Monitor. K1PLP de­
scribes a simple but effective equipment.

A Solid State SSTV Monitor, W9LUO. A
two part article describing a home made
transceiver for use with communications
receivers. Receiver is essentially a two step
conversion receiver, variation using crystal
mixer after a 455 KHz. i.f. and converts to
500 KHz. to 30 MHz. in bands 160-15 m.

January 1971—

More Thoughts on Solid State Receiver De­
sign. W1GLS. Some ideas and suggestions.

The Morse-A-Verter, W7GHM/4. This device
can be an excellent way to print characters at
a speed from 5-60 words per minute.

Curtis EM-Sim Electronic Keyer, K1PLP.
K1PLP reviews this unit for making c.w.
operators contact with each other or not
you buy the custom memory with it.

Midlatitude Intense Sporadic-E Propagation,
W4IT. Very detailed articles on how Es clouds
are tracked from oblique propagation data
reported by amateur observations. Article
starts out with a discussion of the horizontal
and vertical propagation of Es in Australia.

The ATR-100, K1RPB. Part 1 of a two-part
description of a home made transceiver. Many
different modifications and ideas are discussed.

A 75/80 Metre Vertical Antenna Square Ar­
ray, W6DDB. An index to the coding used in
such antennas is provided.

Digital Frequency Counters, W0LMD. How
to select well fitted coupling of capacitance in
oscillator circuits.

A Field Day AC Power Monitor. K1PLP de­
scribes a simple but effective equipment.

A Solid State SSTV Monitor, W9LUO. A
two part article describing a home made
transceiver for use with communications
receivers. Receiver is essentially a two step
conversion receiver, variation using crystal
mixer after a 455 KHz. i.f. and converts to
500 KHz. to 30 MHz. in bands 160-15 m.
Awards Manager W.I.A.

Etc., are no longer available from the Federal L.I., N.Y., 11050, U.S.A. Application blanks, that organisation direct at the following ad-

l/p. for 100 mV. recovered audio. Use external connecting leads, plugs, hand books, alignment tool.

CQ Awards can no longer be checked in remote areas.

Due to an ever increasing work load for local and overseas awards, it is not possible to devote time to the "CQ" awards which are of a commercial nature.

To enable more time be devoted to official Amateur awards, checking of "CQ" award applications has had to be ceas
ted. Anyone wishing to obtain information in relation to the "CQ" awards should contact that organisation direct at the following ad-

dress: W.I.A. V.H.F.C.C.

Phone 836-0707

Contact:

J. B. ANDERSON

P.O. Box 187, Frankston, Vic., 3199

Phone Melbourne 783-2341

NO. 2 WITH

CENTRE INSULATOR

PRICE $3.50

NORTH ISLAND DX-PEDITION

You would like a small island of olde world charm with few people, rolling hills, duty tree planted, the land too high to climb, by 3 miles, 8,000 acres in all, some tourists and a short ride on a boat.

Alf, with the W.I.A. Norfolk Island, a separate "country" for DXCC.

Alf Matthews, VK3ZT, flew across in the last week of March to join Larry, P10616, and his XYL Lauren, to help with VK8NPH activations. This is not only the first DXCC mobile activities during the past few months as VK8CGB from various centres and with the laterally above VK8CGB.

A very specially warm vote of thanks goes to Alf and his XYL Lauren, to help with the W.I.A. Norfolk Island DX-Pedition, for his extremely able and willing help throughout the entire operation. On the DX band passing a long time with endless pile-ups and breakers when he appears and it seemed a pleasure to transfer the load onto other shoulders for a spell.

The DX-pedition ran for four weeks from 13th March from a QTH in the town of Burnt Pine, using Larry's FT101 with FT101 external v.f.o., TH3Jr tribander, 14A5Q (particularly useful) and 60 m dipole.

Some 8,000 contacts were made including 1 limited c.w. operation as VK8T7/9 by Alf. QSLs should go to K8RLY exchange confirmed QSOs by post to go through normal channels.

At the beginning of the period conditions were excellent on the 14, 21 and 28 m bands. For such an extent that Lauren could scarcely keep the load up to day and general sleepiness crept in. After the first week a deterioration set in on 175 m and finally recovered. Alf's c.w. operation began with 70 contacts per hour and tailed off down to 8 or so.

Openings to Europe were very good, brief periods only, and stations working DX which was totally Inaudible on QRN; a few VE and W contacts were made mostly on 15m.

Operating practices were generally very good on both s.s.b. and c.w. conditions. One potent signal-c.w. operator persistently broke in for QTH details—ah well, it takes all kinds! His mates will have some-

thing to do about that.

APPROVALS are now being sought for a visit to Willis Island in early June, followed by a short stay in a large hotel on a few days to Malindoo, in the Coral Sea. The former is a separate DXCC country and it is understood the latter is to transfer the load onto other shoulders.

In their opinion, is of a commercial nature. Copy must be received at W.I.A. 52 MHz. W.A.S. AWARD Cert.

New Members:

Cert. No. Call No. Call No. Call

92 VK3AKT

93 VK3AR

94 VK3KC

Full instructions with each kit)

FOR SALE: Trio TS510 Transceiver plus matching 240v. a.c. mains power supply and matching remote v.f.o., plus a.c. supply.

FOR SALE: Latest model FT200, only three months old, little used, with p.a., $260, T33LS, Beam Stolle Rotator, 45 ft. Telescopic Mast. BN86 Baiun, 50 ft. UR67 Co-ax.; in perfect condition, $190. W. Roper, 48 Orchard St., Glen Waverley, Vic., 3150. Phone 52-2062.


FOR SALE: Heathkit HW22, with in-built spkr. and p.t.t. manual and new spare pair EGES finals, excellent performer, mint condition, $275. Lowband AWA 1M1A1, comprising separate 1x, Rx and heavy duty 12v.p.s., less txals, $15. No. 62 Transceiver, 1.6

FOR SALE: New Members:

3002, by

ACCOMPANIED BY REMITTANCE.

Minimum S1 tor forty words. Extra words, 3 cents each.

HAMADS WILL NOT BE PUBLISHED UNLESS ADVERTISMENTS UNDER THIS HEADING ARE 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 W.I.A. PO Box 3000, by 5th of the month and remittance must accompany the advertisement.

FOR SALE: Complete Station, Swan 350, lattice wind-up and telescope mast, quad spider, antenna switchboard, power, speaker, microphone, logging manual and new spare pair EGES finals, excellent performer, mint condition, $275. Lowband


FOR SALE: Heathkit HW22, with in-built spkr. and p.t.t. manual and new spare pair EGES finals, excellent performer, mint condition, $275. Lowband AWA 1M1A1, comprising separate 1x, Rx and heavy duty 12v.p.s., less txals, $15. No. 62 Transceiver, 1.6

FOR SALE: Heathkit HW22, with in-built spkr. and p.t.t. manual and new spare pair EGES finals, excellent performer, mint condition, $275. Lowband AWA 1M1A1, comprising separate 1x, Rx and heavy duty 12v.p.s., less txals, $15. No. 62 Transceiver, 1.6
TWO METRE F.M. from YAESU

FT-2F All Solid State TRANSCEIVER

Up-to-date advanced semiconductor techniques. 25 silicon transistors, 16 diodes, 1 SCR, 2 ICs, 1 FET.

The YAESU FT-2F opens the door to noise-free, broadcast quality two meter FM operation. And thanks to repeater stations in operation around the country, the two metre band is no longer limited to line-of-sight communications.

The FT-2F Transceiver is a highly advanced, all solid-state unit complete with an automatic tone-burst signal, with an on-off switch, for repeater actuation. The FT-2F has channel capability of 12 simplex or duplex frequencies. Three channel frequencies are included in the purchase price of the FT-2F. Sets imported by B.E.S. will have simplex Ch. B and duplex (repeaters) Chs. 1 and 4 with crystals installed and aligned — 6 crystals.

Advanced circuit design protects the rig automatically from the damage of transistors caused by antenna trouble, or reverse connection of the power line.

Nothing could be simpler than the operation of the FT-2F. Just select your channel and begin push-to-talk conversation with fellow two metre enthusiasts. A simple meter on the front panel indicates battery condition and relative power output. The meter automatically reverts to S meter operation in the receive mode.

FT-2F SPECIFICATIONS

GENERAL:
- Frequency Coverage: 144 to 148 MHz.
- Number of Channels: 12 Channels (three supplied).
- Modulation: Frequency Modulation.
- Transmitter Control: Push-to-Talk.
- Power Drain: Receive 0.5 amps.; transmit 2 amps.
- Power Source: DC 13.5 volts, plus or minus 10%.
- Dimensions and Weight: 6% inch w. x 25/8 h. x 10-in. d.; 4 lbs.
- Standard Accessories provided: Dynamic Microphone, Connector Plug, DC Cord—Fuse, Mobile Mount.

TRANSMITTER:
- RF Output Power: 10 Watts (high position), 1 watt (low position).
- Frequency Deviation: 15 KHz. maximum.
- Frequency Stability: Plus or minus 0.001% or less.
- Spurious Radiation: At least —60 dB below Carrier.
- Tone Burst: Nominal 2800 Hz.

PORTABLE or home-base operation can be achieved with the addition of the optional FP-2 power pack. This AC power pack provides regulated DC power for the transceiver and charging voltage for optional leak-proof rechargeable colloidal type batteries. In addition, a high fidelity elliptical style speaker is built into the pack. The FT-2F of course has its own self-contained speaker for independent use.

In the event of a disaster causing AC power failure, the FP-2 automatically switches over to DC operation from the battery pack. The battery pack will then provide up to eight hours of dependable emergency communications.

Like all YAESU Amateur gear, the FT-2F comes to you with our 90-day warranty. Plus all the hardware you need to get on the air immediately — mike, connectors, DC power cord and mobile mounting bracket. The special noise-cancelling microphone contains two dynamic inserts connected out of phase to shut off external noise.

If you have ever wanted to explore two metres, the time is NOW! And the rig is the YAESU FT-2F.

FT-2F SPECIFICATIONS (continued)

RECEIVER:
- Receiver Circuit: Crystal-controlled Double Conversion Superhet.
- Intermediate Frequencies: 10.7 MHz. and 455 KHz.
- Sensitivity: 0.3 uV. for 20 dB. S plus N/N Ratio.
- Intermodulation: Plus or minus 15 KHz. — 6 dB.
- Audio Output: 1 Watt.
- Speaker: 2 inch Dynamic.

FP-2 AC POWER SUPPLY SPECIFICATIONS
- Output: 13.5 volts, 2 amps.
- Speaker: 5 X 3-1/5 Inch.

PRICE $269, inc. S.T., Price and specifications subject to change.

Sole Authorised Australian Agent:

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 87-1650 (AH 37-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

Amateur Radio, June, 1971
Distributors
For Australian and
International
Manufacturers . . .

TEST EQUIPMENT:

RAPAR • BWD
SWE-CHECK • HORWOOD

Call and see our big range of test equipment

SEMI-CONDUCTORS:

TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

1971-72 CATALOGUE NOW AVAILABLE, $3

RAPAR Model SK100 Multi-tester

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!
**AMERICAN RECORDING TAPE**
(New, in sealed boxes)

- 1500 feet, 7-inch, Acetate, 1/2 mil. ....... $3.50
- 1200 feet, 7-inch, Acetate, 1/2 mil. ....... $2.50
- 1200 feet, 7-inch, Mylar, 1/2 mil. ....... $3.00
- 1200 feet, 5%-inch, Acetate, 1 mil. ...... $2.00
- 1200 feet, 5%-inch, Mylar, 1 mil. ....... $2.50

**Postage 10c.**

**CASSETTE TAPES**

- Type C120 ......... $1.50
- Type C90 ......... New. Postage 10c.

**NEW HEADPHONES AND MIKE**

Phones 8 ohms, Mike 25 ohms
Price $15.75

**METERS**

- MR2P METERS: square face 5/4-in., M/Hole 1/2-in., res. 20 ohms. 0-1, 0.25, 0.5-2000, and 0-500 mA. Price $5.50 nett.
- MR2P METERS: 0-5, 0-15, 0-30, 0-300 Amps. (Res. 300 ohms) Price $6.50 nett.
- MR2P METERS: 0-20 Volts DC. Price $5.50.
- MR2P METERS: 0-50, 0-100, 0-100-100, 0500 uA. (Res. 300 ohms) Price $6.50 nett.
- MO6 METERS: New. Face size 3/4-in., M/H 2 1/2-in. Res. 120 ohms. 0-1, 0-5, 0-10, 0-20, 0-50, 0-100, 0-200, 0-500 mA. Price $5.25 nett. Postage 25c.
- MO6 METERS RES: 0-15, 0-30, 0-300 volt DC. Price $5.40 nett. Postage 20c.
- SWR 100 Meter: Replacement. Price $8.50. Postage 20c.

**DISC CERAMIC CONDENSERS**

- 25 volt working
Sizes: 0.1, 0.22, 0.27, 0.33, 0.01, 0.022, 0.0047
- 0.033, 0.047 uF. Price 36c each.

**POCKET CRYSTAL RADIO**

- Type ER22. Set complete. Price $1.50.

**A.C. ADAPTOR—BATTERY SAVER**

Type PS64—240 volts to 6 or 9 volts, 100 mA. Price $5.50.
Type PS65—240 volts to 6 or 9 volts, 300 mA. Price $11.50. Postage 10c.

**PHONE INTER-COM. SETS**

- Type T501 1 1/2 inch diameter ...... .... $2.00
- Type T502 2 inch diameter ......... .... $2.75
- Type T503 3 inch diameter ......... .... $3.00

**LOW PASS FILTERS**

- A "Cabena" Low Pass Filter will fix T.V.I. Output frequency, 30-60 MHz.; insertion loss, negligible. Impedance 50-70 ohms.
- Price $11.50. Postage 10c.

**SOLID STATE STEREO AMPLIFIER**

- 8 watts r.m.s. per channel. Input for magnetic, crystal and ceramic type microphone. P.V. cartridges, tape recorder input and output, AC/DC Interfaces. Stereo headphone jack.
- Reduced to $5.00. Postage $1.20.

**FIVE-CORE CABLE**

- 5 x 5/0076. Ideal for intercoms, Telephones, etc. New. 100 yd. roll, $17 (postage 75c), or 20c yd.

**STEREO HEADPHONES**

- Professional quality (well known brand). Large earpads, standard stereo plug, 6 ft. lead.
- Price $5.75. Postage 50c.

**CRYSTAL CALIBRATOR No. 10**

- Nominal range: 500 KHz. to 30 MHz., 500 KHz. range with 2500 KHz. settings. Provides heterodyne output in steps of 1 MHz. Dial driven by machine cut strip gears, calibrated in 2 KHz. div.
- Easily read to 250 cycles. Output "spiked" approx. 1 sec. intervals, identifies beat note. Power requirements: 12v. DC at 0.3 amp., 250 volts at 15 mA. This is a precision Instrument. Complete with crystal.
- Price $23.50
CONTENTS

Technical Articles:—

Angle Modulation—Lecture No. 14A ........................................... 7
Australis Oscar Balloon Report ........................................... 17
Home Station Antenna for 160 Metres—Part Three, The Balanced Horizontal ........................................... 14
Quad vs. Triband Yagi ..................................................... 5
The R.F. Bridge ............................................................. 12
The VK2AAR Special Antenna ............................................. 4
Two-Stub Notch Filters for T.V.I. ......................................... 15

General:—

Antarctica Research ............................................................ 32
Correspondence: Novice Licensing .......................................... 26
CR8 Licensing ................................................................. 13
Definite Sunspot Numbers for 1970 ........................................ 23
DX .............................................................................. 29
Federal Awards ................................................................. 32
Federal Comment: E.D.P. and All That .................................... 2
Federal Executive Report ..................................................... 21
Licensed Amateurs in VK .................................................... 31
New Call Signs ................................................................. 31
New Equipment: Acitron SSB-400 ........................................... 25
Novice Licensing—Some Important Correspondence ................. 3
Observation Post ................................................................. 11
Overseas Magazine Review ................................................... 30
Prediction Charts for July 1971 .............................................. 11
Silent Keys ..................................................................... 32
The Image Problem ............................................................ 31
VHF .............................................................................. 28
V.H.F.-U.H.F. State Records ................................................ 28
VK1VP/P Expedition for National Field Day Contest, 1971 .......... 22
Zone 29 Award ................................................................. 25

Contests:—

Remembrance Day Contest, 1971 ......................................... 20
Results of 2nd "World Rtty Championship" 1971 ....................... 32
VK-ZL-Oceania DX Contest, 1971 ......................................... 19
17th European (W.A.E.) DX Contest ....................................... 32

COVER STORY

The Acitron SSB-400 Transceiver made in Australia. See write up of this hybrid unit on page 25.
In Singapore I was fascinated by the dexterity and speed achieved in the use of the abacus still to be seen in some of the older-style shops. The large beads on the wires inside the frame were flipped to and fro by agile fingers and in no time at all the whole of one’s purchases had been calculated and totalled.

Our small shopkeepers write the amounts down on a paper bag or piece of paper and laboriously add them up, but at least one can audit it. I suppose one could audit the abacus method, but, although the various stages were explained to me, it still remains something of a mystery. These are, of course, one stage beyond the finger counting which goes on even today in parts of the world.

All this seems a far cry from the machines we use today. Everyone shopping in a supermarket will be familiar with the cash machines these people use and, if you value your pocket, how you must keep a sharp eye open on the cash read-out digits even though you get a tear-off strip from which you can subsequently make a check. These machines are themselves a generation or two ahead of the simple cash registers of yester-year where the old bell clanged whenever the handle was turned and the till was opened. However, the supermarket machines go further by enabling an analysis to be kept so that daily totals from different departments or classes of merchandise can be recorded and analysed. In addition, totals of cash and cheques can be read out at any time merely by pressing the appropriate buttons.

Finally, of course, the machine records every transaction on an audit roll within its entrails. A shop with one such machine would record a one line entry in the daily cash book split out into whatever categories is deemed necessary. Machines such as these are, of course, essential where pressures of daily business are quite beyond the scope of the old leisurely hand-written cash slips and where credit transactions are few.

The scope of these machines is limited to recording and totalling amounts. Something more is needed when a degree of memory is involved so, of course, electronic machines were developed. These mainly came out of the earlier mechanical punched paper card or tape systems which had been in use for data processing of various kinds where a print-out of the information was needed. After all it is no use having merely a visual read-out where the data is required for printing purposes or has to be circulated to one or more executives for study and evaluation. The development of magnetic tapes, bits and other advances in electronics were very rapid and even now we are only in second or third generation electronic computer systems.

Again, electronic data processing is of no value unless it can be put to use. It was, and still is, being discovered that the computer can perform a whole multitude of functions in double-quick time. So, although the machines are costly, they can supplant rooms full of people previously buried nose deep all day in Dickensian ledgers. But they are only as accurate as the information fed into them. As a by-product, the computer is adding rapidly to the language.

In so far as we are concerned it has been calculated that programming the essential details of the members of one of our major Divisions into a computer would reflect a small financial saving. How much greater then would be the savings over the whole W.I.A. membership? The Easter Convention at Brisbane gave us the go-ahead for this work to begin. Each Division now possesses supplies of forms to record membership details. In the proposed central office of Federal Executive members’ names are transferred onto a numerical system which will act as a key to the computer processing and these kind of lists will be kept under lock. There are many other safeguards being built into the system as well as a close look into costings.

When the whole of the membership details have been programmed into the computer it will then be possible, on pressing an appropriate button, to obtain a print-out of whatever information is needed. Who lives in Pymble, how many are over 60 or under 18, who live in post code area 7777, and so on. But, even more important, we could print out an up-to-date listing for the Call Book in about fifteen minutes whenever this may be required and also make the machine print out subscription notices analysed to any degree which Divisions require.

Note the emphasis on Divisional control. The machine is programmed with Divisional information. In so far as subscriptions are concerned, these are exactly as required by Divisions. Print-out will go to Divisions regularly so that the Divisional officers will possess regularly up-dated details of Divisional records. No more laboriously-maintained card indices and the like.

All this forms part of a greater degree of centralisation of records aimed at savings in costs without loss of Divisional control. These are major exercises which are now going on behind the scenes and which space precludes further elaboration. As members will have read elsewhere, when the new system has been finalised and polished up to everybody’s satisfaction, annual subscriptions will have to come to Federal Executive offices for processing. It costs six cents to post a letter anywhere in Australia and only those who would normally pay cash subscriptions to their Division might be affected. But the whole of these changes are still being worked on, so please do not take it that the changes begin when you read this. We all aim for a beginning from 1st January, 1972. There are bound to be the usual teething troubles of course, but, judging by the amount of forethought going into the whole thing, these should only be of a minor nature.

—MICHAEL OWEN, VK3KI, Federal President, W.I.A.
Novice Licensing—Some Important Correspondence

The following correspondence is self-explanatory. For details of the proposals suggested by the Committee appointed to investigate Novice Licensing see the "Federal Comment" in June "Amateur Radio".

* * *

11th June, 1971.

The Editor,
"Amateur Radio," P.O. Box 36, East Melbourne, 3002.

Dear Sir,

A Special Meeting of the New South Wales Divisional Council was called on 11th June, to discuss an article appearing in the June 1971 issue of "Electronics Australia".

Enclosed are copies of letters which were forwarded to the Australian Post Office Radio Branch and "Electronics Australia" subsequent to this meeting. Would you please ensure that these letters are published in "A.R." at the earliest opportunity for members' information.

Yours faithfully,

The Council of the N.S.W. Division, Wireless Institute of Australia, A. G. MULCAHY, President.

* * *

11th June, 1971.

The Editor-in-Chief,

Dear Sir,

The Council of the New South Wales Division of the Wireless Institute of Australia is deeply concerned regarding statements published on pages 132 and 133 of the June 1971 issue of "Electronics Australia" under the title "WIA ACTIVITIES" and we wish you to note that the Council completely dissociates itself from these remarks.

At no time was this Council consulted regarding the publishing of this material nor was the Council associated with or consulted about the preparation of the material allegedly broadcast by the Hunter Branch.

This Council wishes it to be clearly understood that:

(a) It gives no credence to the unsubstantiated accusations that P.M.G. and W.I.A. Officials have entered into collusive unofficial agreements as stated in the subject article.

(b) It at no time informed any person that "A motion supporting the concept of Novice Licensing for Australian Amateurs was carried unanimously by the Convention..." as reported in the subject article.

(c) It believes that Post Office Officials will consider the introduction of Novice Licensing on the merits of the case presented if and when the Wireless Institute of Australia presents such a proposal.

(d) It is aware of the support offered by Dr. Dean Blackman for the proposal that the form of the A.O.C.P. Examination be modified to conform with modern educational measurement and evaluation, and it believes that this article constitutes a most unjustified personal attack against Dr. Blackman.

(e) The opinions expressed in this article in no way represent the views of the N.S.W. Divisional Council.

The Council believes that the material printed on pages 132 and 133 has done grave damage to the relations between the Wireless Institute of Australia and Senior P.M.G. Officials. It has done grave personal injustice to Dr. Dean Blackman (one of the most dedicated Institute workers) whose views have been distorted and quoted out of context.

We sincerely regret that such a misleading article should have appeared in "Electronics Australia" which enjoys such a high reputation for accurate and truthful reporting.

We trust you will publish this letter in full in your next issue in order that your readers will know that the N.S.W. Divisional Council considers this article to be most inaccurate and misleading.

For and on behalf of,

The Council of the N.S.W. Division, Wireless Institute of Australia, A. G. MULCAHY, President.

* * *

11th June, 1971.

Controller Regulatory and Licensing, Radio Branch, Central Administration, Postmaster-General's Department, 7th Floor, Kings Parkade Building, 57 Bourke Street, Melbourne, Vic., 3000.

Dear Sir,

The Wireless Institute of Australia has for some time been giving serious consideration as to whether the introduction of some form of Novice type licence would be in the best interest of the Amateur Service in this country.

It was the policy of the Institute to advocate the introduction of such a licence until 1968 when the Federal Council decided not to continue to seek such a licence. I believe the last time the matter was raised with the Department was in 1965.

If after the present investigations are completed the Institute should decide to seek such a licence, I presume that the Department will be prepared to consider the matter in the light of the case as then presented.

I would refer you to the June issue of "Electronics Australia" (page 133) that suggests that a private agreement had been reached between the repre-
sentative of the Federal Executive” and your office to “offer” a reduced Morse speed of 10 words per minute if the Institute dropped its claim for a Novice type licence.

I am concerned at the publication of such unfounded statements. I certainly have no knowledge of any such agreement either express or implied. Likewise, the suggestion of the existence of some agreement could perhaps be seen by some as a reflection on the integrity of officers of your Department as well as officers of this Institute.

Accordingly, would you please confirm, firstly, that it is also your understanding that no such agreement exists, and, secondly, should the Institute desire to raise the question of Novice licensing again, your Department would be prepared to investigate the matter with us. In order to avoid further misconception I contemplate the publication of this exchange of correspondence if that is agreeable to you.

Yours truly,

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

10th June, 1971.

Mr. M. J. Owen,
Federal President,
Wireless Institute of Australia,
Post Office Box 67,
East Melbourne, Vic., 3002.

Dear Sir,

I have your letter of 7th June, 1971, drawing the attention of this Department to an article published on page 133 of the June issue of the magazine “Electronics Australia” which mentions discussions between members of the Federal Executive of the Institute and the Department on the possibility of introducing a “Novice” type Amateur licence in this country.

I note that you are concerned that the article appears to suggest that a private agreement had been reached between the Institute’s representatives and the Department for a reduced Morse speed of 10 words per minute if the Institute agreed to drop its claim for the introduction of a Novice licence and that your representatives have no knowledge of any such agreement.

In reply, I would like to take this opportunity to point out that I have caused enquiries to be made into this matter and there is no evidence in the Department’s records nor is there any recollection on the part of any officer of such an agreement having been made with representatives of the Federal Executive of the Institute.

With regard to your further enquiry concerning this particular type of licence, it is confirmed that the Department would be pleased to examine any fresh proposals relating to Novice operators should the Institute seek to have the subject submitted for further consideration.

H. S. YOUNG,
Controller, Regulatory and Licensing.

THE VK2AAR SPECIAL ANTENNA

REG. C. STEELE,* VK2AAR

Here is an antenna that is small—you only need a minimum of 20 feet between poles.

Cheap—the components consist of approximately 75 feet of 7/20 copper wire; efficient—all reports during last contest 5-6 to 9, and average 5-8, of 83 contacts—working only a few hours. Being both horizontal and vertical, it has a 360° coverage.

The s.w.r. of this beauty is 1:1 on 14 MHz. I have used it on 7 and 3.5 MHz, but the s.w.r. goes up to 2:5:1 and 5:1 on those bands. It is definitely a 20 metre antenna.

The sizes given are cut for 14.150 MHz. I have tried many wire antennas over the last 18 months, but have had nothing to compare with this one.

You will see by the diagram that the antenna is not quite square, so don’t think it is bad drawing. The angle of the bottom section drags the sides in slightly. This bottom section is fairly critical and sometimes needs a bit of experimenting.

The method of construction is as follows:

Take the 75 feet length of wire and thread through perspex, leaving enough to connect to the co-ax. Measure 9 ft. 2 in. and wrap wire around insulator at 2, bind; measure 18 ft. 4 in. for horizontal section and again wrap around insulator 3, and bind. Measure 18 ft. 4 in. again and take to insulator 4 and bind, then to insulator 5, and 9 ft. 2 in. to perspex and thread through three holes as at the beginning. Solder, or use connectors, to 75-ohm cable to antenna.

Hoist antenna to full height after attaching nylon strings to insulators 2 and 5. There is no set height for the antenna, but the higher the better—mine is between two 50 ft. poles, making the lowest section about 18 feet above the ground, allowing that the top has a slight sag in the centre, as my supports are 102 feet apart.

I do not use any balun or a.t.u., but feed straight to the pi-section of the Swan, through a six-section low-pass filter.

Should the guy wire go close to the antenna, make sure no length of guy wire exceeds 18 feet without an insulator. The same applies to the top support wires from antenna to support poles.

I am sure once you have tried this antenna you will scrap your dipole.

☆

PROVISIONAL SUNSPOT NUMBERS

MARCH 1971

Day R Day R

1 ................ 10 10
2 ................ 10 10
3 ................ 12 12
4 ................ 10 10
5 ................ 12 12
6 ................ 10 10
7 ................ 12 12
8 ................ 12 12
9 ................ 14 14
10 ............... 14 14
11 ............... 14 14
12 ............... 14 14
13 ............... 14 14
14 ............... 14 14
15 ............... 14 14
16 ............... 14 14
17 ............... 14 14
18 ............... 14 14
19 ............... 14 14
20 ............... 14 14
21 ............... 14 14
22 ............... 14 14
23 ............... 14 14
24 ............... 14 14
25 ............... 14 14
26 ............... 14 14
27 ............... 14 14
28 ............... 14 14
29 ............... 14 14
30 ............... 14 14
31 ............... 14 14

Mean equals 14.2


—Swiss Federal Observatory, Zurich.
Clarence Moore, the inventor of the cubical quad, probably little realised when he and his associates were huddled over the reference books back in 1942 that the product of their efforts would receive such widespread acclaim and damnation as has been poured out upon the cubical quad antenna. The controversy continues with proponents and opponents switching sides as often as the weather, the result being that there are almost as many variations in quad design as there are writers on the subject. After much deliberation, and much discussion with amateurs throughout the world, the decision was made to test three models of the quad (a fourth model was tested as will be noted later). Since the physical characteristics of the quad are fairly standard, the only dimensions of the elements and the spacing between them was considered. The dimensions for the three models tested were obtained from a Japanese manufacturer of cubical quads, from Orr's book, "All About Cubical Quad Antennas," and from Dr. J. E. Lindsay, Jr., WOHJ.

**PRELIMINARY TESTING**

Several days were spent "dry running" the test plan to validate the concept, and to smooth out the operating procedures and techniques. Of particular concern was the possible time required to make a valid data-gathering observation. If data were to be reasonably accurate, the transmission path had to be stable, and the signal strength observations must be taken on a fairly uniform basis.

![Diagram](Image)

**ANALYSIS**

Antenna performance conclusions to be based upon an analysis of data derived from a minimum of 50 unmodulated-carrier observations with each antenna, determined, and supplemented with data gathered during conventional s.s.b. QSOs.

**ANTENNA SELECTION**

This writer had been using a four-element commercial triband yagi (boom length 24 feet, and 55 feet above the ground) for approximately 14 years, so the properties of this antenna were fairly well established. Furthermore, in on-the-air comparisons with commercial models tested by other U.S. amateurs operating from the Tokyo area of Japan, the antenna appeared representative of commercial triband antennas in general use by the amateur community. Therefore, the yagi in use at the author's station was selected as the reference antenna.

**TEST PLAN AND PROCEDURE**

Every effort was made to conduct the tests in a manner which would lessen the possibility of compromising the techniques employed by either the writer or participating stations:

1. The test to be performed by establishing communications with amateur radio stations located throughout the world on a random and scheduled basis.
2. Amateur radio stations volunteering to assist in this effort to be briefed on conduct of test and data collected.
3. A voice s.s.b. transmission to be made to the participating station, identifying the first antenna as antenna "A".
4. The voice transmission to be followed immediately by an unmodulated carrier for a period of approximately five seconds.
5. The antennas would be switched, and a voice transmission made identifying the antenna as "B", and the procedures above repeated.
6. Participating stations will note signal strength related to each antenna, and provide a numerical value as observed on his s meter or other indicating device. These values to be logged, and the test replicated with another volunteer station.

**TABLE 1**

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector Element</td>
<td>72° 3&quot;</td>
<td>70° 4&quot;</td>
<td>72° 5&quot;</td>
</tr>
<tr>
<td>Driven Element</td>
<td>69°</td>
<td>70° 4&quot;</td>
<td>70° 5&quot;</td>
</tr>
<tr>
<td>Director Element</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Spacing &quot;A&quot;</td>
<td>7° 6½&quot;</td>
<td>8° 5&quot;</td>
<td>13° 4&quot;</td>
</tr>
<tr>
<td>Spacing &quot;B&quot;</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Stub</td>
<td>20°-30&quot;</td>
<td>34°-38&quot;</td>
<td>—</td>
</tr>
</tbody>
</table>

2. Dimensions later published: Lindsay, "'Quads and Yagis,'" "QST," May 1968.

**Fig. 1.—Element spacing information for Table 1.**
As a result, it was necessary to modify the verbal format, utilising simple sentences and placing them in a logical sequence. It also became apparent that the test could not be conducted under all transmission path conditions; that even under ideal conditions several observations were often necessary before a conclusive report could be compiled. It was decided to conduct the tests only on 20 metres. The operating time available to the writer was between 20:00 and 04:00 hours. Each test session was terminated when the results were considered conclusive. The measurements were made using a receiver with a signal difference meter.

During the first week of the test period, the work was concentrated on test antennas manufactured heavy duty hardware and fibre glass spreaders. It was tuned to a centre frequency of 14,200 KHz. Testing of the first model began in November of 1967 and continued for a period of one month. The results for this period are given in Table 2.

In mid-December 1967, the first quad was replaced by a model constructed according to the formula and dimensions given in Orr's book. The results obtained with model 2 are contained in Table 2.

Construction of the third model (with wider element spacing) was carried out next. Two matching systems (Gamma and Q-section) were experimented with on this antenna. A satisfactory match could be had with either system. However, the Q-section was used for the tests because it was the technique used with the previous two quad models (s.w.r. with each antenna was never more than 1.3:1 with a difference between antennas no greater than 0.1). The antenna tests indicate that:

(1) One can expect to achieve the same or better results with a two-element quad of proper dimensions than with a three- or four-element tri-band yagi.
(2) A wide-spaced quad will perform substantially better than a close-spaced quad.
(3) Dollar for dollar, the quad appears to be a better investment than a yagi.

SUMMARY

The fourth quad was a three-element wide-spaced model constructed according to more dimensions furnished by W0HJ. The results of the samplings were somewhat disappointing and are given in Table 2. (Frankly, the author felt that the three-element model would show a substantial improvement over the yagi in every case.) The three-element model did appear to have a better front-to-back and front-to-side ratio than either the yagi or the other quad models. One positive comment: the three-element model is a monster to assemble and put up! In the author's opinion the difference in performance is not worth the small improvement. Perhaps, on the other hand, if one accepts the two-element model as the departure point between a simple mechanical structure and a major project, a four-element model might be more worth the effort. However, this is purely conjecture on the part of the author.

ACKNOWLEDGMENTS

The writer wishes to thank all of the Amateurs who participated in the series of tests, and particularly the VK gang, who night after night tolerated the request for observations. The support couldn’t have been better, and on many occasions, upon completing a check with a particular station, several other stations would call to give their observations (which were taken during the same transmission test).

Table 2.

<table>
<thead>
<tr>
<th>Total Observations</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2,100 miles</td>
<td>50</td>
<td>60</td>
<td>60</td>
<td>52</td>
</tr>
<tr>
<td>2,100 to 4,800 miles</td>
<td>12</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Greater than 4,800 miles</td>
<td>33</td>
<td>31</td>
<td>33</td>
<td>32</td>
</tr>
<tr>
<td>Signal Difference: More than 1 S unit better</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Less than 1 S unit better</td>
<td>—</td>
<td>—</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>No discernible difference</td>
<td>1</td>
<td>5</td>
<td>51</td>
<td>43</td>
</tr>
<tr>
<td>Less than 1 S unit poorer</td>
<td>27</td>
<td>46</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>More than 1 S unit poorer</td>
<td>22</td>
<td>9</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

For... Better CONTEST RESULTS!

★ Very lightweight
★ They let your ears breathe
★ You do not have that "shut-in" feeling
★ Removable sponge ear pads
And the PRICE is RIGHT!

For FULL particulars of HD414 Headphones, fill in COUPON TODAY — why not NOW!

AVAILABLE from

R.H. Cunningham Pty. Ltd.

VIC.: 608 Collins St., Melbourne 3000.
NSW: 64 Alfred St., Milsons Point 2061.
WA: 34 Wollya Way, Balga, Perth 6061.
QLD: L. E. BOUGHEN & CO., 30 Grimes St., Auchenflower 4066.

Page 6 Amateur Radio, July, 1971
“Modulation” is the process by which the characteristics of an electrical wave are impressed on another electrical wave (carrier wave).

“Amplitude Modulation,” as discussed in Lecture No. 12, means modulation in which the amplitude of a carrier wave is varied in accordance with an applied audio-frequency wave (in the systems in which we are interested) and the carrier frequency does not alter because of the process of modulation.

“Angle Modulation” is another method of modulation in which the phase angle of the carrier is varied in accordance with the amplitude of the modulating wave. The frequency is varied by the modulating voltage.

Frequency Modulation (f.m.) and Phase Modulation (p.m.) are particular forms of Angle Modulation.

One of the problems which exist with amplitude modulation is that practically all forms of electrical discharge as exist in nature (lightning is one such form) and the majority of man-made electrical discharges are in the form of amplitude modulation. As all amplitude modulation receivers are designed specifically to receive amplitude modulated signals, they respond to both natural and man-made interference which is in the a.m. form and this is the reason we hear “static” and other types of interference sometimes when listening to a.m.

Both natural and man-made electrical discharges may cover a wide frequency range and may be detected from frequencies as low as 5 KHz.

Now the noise, whether from natural or man-made sources, which is picked up by an amplitude modulation receiver is proportional to the received bandwidth.

Therefore one method of reducing the effect of noise is to reduce the bandwidth of the receiver either by improving the selectivity or by reducing the upper audio-frequency after detection. However, both of these methods remove the high frequencies and reduce the fidelity of the reproduced sound.

Here in Australia all m.f. broadcasting stations can transmit musical tones of up to 3,000 Hz. and in many cases can exceed this. Such music can be termed “high fidelity”.

But if in a receiver either the selectivity or a “tone control” is adjusted to remove reproduction above 3,000 Hz., this may reduce noise but it will also cause poor quality reproduction.

As far as speech is concerned, the majority of telephone trunk lines transmit sound of frequencies from 300 Hz. to 3,400 Hz. Speech on these lines is very intelligible but may not be natural due to the removal of the lower bass and higher audio frequencies.

This statement may not appear to be correct if one has been using a modern telephone and commented on the naturalness; however, the design of the receiver in the modern telephone handset is a triumph of electrical and acoustical research.

Sometimes man-made electrical noise may be a combination of amplitude modulation and frequency modulation, but in most cases it is the amplitude modulation form which predominates.

This state of affairs was realised many years ago and in attempts to overcome this, consideration was given by many inventors to a method of modulation in which the amplitude of the carrier would be held constant but the frequency would be varied by the modulating voltage.

However, this was not very successful because the attempt was made at m.f. broadcasting frequencies and the bandwidth had to be limited to that of a.m. broadcasting stations. In fact, the variation in frequency that could be obtained was very small.

HISTORICAL BACKGROUND

Now it may come as a surprise to many to learn that proposals for frequency modulation go back almost to the beginning of the century, long before the three-element valve was invented by Lee de Forest.

The first patent for frequency modulation known to the writer is Serial No. 785,803, issued on 28th March, 1905, by the United States Patent Office to Cornelius D. Ehret, his application having been lodged on 10th February, 1902.

It is interesting to note that Ehret proposed “to vary the natural period of the carrier by changing the value of inductance, capacity or resistance in the oscillatory circuit” and in one part of the claim states “the inductance is shunted by a telephone transmitter. Any variation in the resistance changes the frequency.”

For many years a different form of f.m. has been used in radio telegraphy. Long wave transmitters used either a Poulsen arc or an Alex. Anderson h.f. alternator to generate, directly, a carrier wave. Because of the difficulty of starting and stopping such machinery for the dots and dashes of the Morse Code, keying was arranged to change the frequency of the oscillator. Thus the dots and dashes would be sent on one frequency and the spaces between on another frequency, which was known as the “back wave”.

This method of radio telegraphy is used even today with high-powered valve transmitters to avoid the great losses, change in power supplies and power line that would occur when keying a high-power transmitter.

In the early 1930’s Major Edwin H. Armstrong, one of the U.S.A’s great inventors in radio fields, gave consideration to the problem of developing a transmission system for music and speech, which would not be duplicated in nature.

In his investigations, Major Armstrong considered the use of frequency modulation and found that the only manner in which a wide audio frequency response could be obtained was to increase the transmitted bandwidth to a far greater extent than that used in normal broadcasting.

It was at this point where Major Armstrong demonstrated his genius because whereas others had tried to develop f.m. for use in the already crowded U.S.A. m.f. broadcast band, he realized that the only way to make high-fidelity f.m. successful would be to use very high frequency portion of the spectrum where the use of a wide-bandwidth would not be a problem.

The feasibility of this was confirmed by construction of a low-power phase modulated v.h.f. Amateur band transmitter and carrying out transmissions on Amateur frequencies.

Tests with this transmitter were so successful that Major Armstrong built a high powered f.m. transmitter, using phase modulation.

This transmitter was installed at Alpine, New Jersey, U.S.A., and used the call sign W2XMN. The aerial was a 16 element turnstile, 900 ft. above the Hudson River and produced approx. 1,000 watts at a frequency of 42.80 MHz.

A very large number of tests were made on this station and these proved that Major Armstrong was on the right track; it was possible during thunder storms which blotted out more powerful a.m. signals, and in many circles f.m. was hailed as being the end of normal a.m. broad-
The price reduction, announced last month, for Amateur Transceivers is genuine, but subject to adjustments, depending on the supply situation. Don’t ask questions, all is above board and no stolen property involved, no dumping either, although I am also not making a fortune with these prices.

—Arie Bles, president, sole proprietor, janitor, secretary, financier and what-have-you of this enterprise!

### YAESS MUSEN

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>FT-200</td>
<td>Transceiver, with 230/240/250 volt AC supply-speaker unit of extra-heavy duty design</td>
<td>$350</td>
</tr>
<tr>
<td>FT-DX-400</td>
<td>Transceiver, with the latest modifications, improvements, etc.</td>
<td>$425</td>
</tr>
<tr>
<td>FT-101</td>
<td>AC/DC Transceiver, with the latest modifications</td>
<td>$520</td>
</tr>
</tbody>
</table>

Yaess will soon introduce the FT-DX-401, which will be a hybrid of the FT-DX-400 and its American version FT-DX-560, with the CW filter available for the FT-DX-400 already built-in, and FT101 type noise blanker. The price is expected to be around $465.

### ELECTRONIC KEYERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katsumi</td>
<td>Model EK26, with built-in monitor, 240V. AC operation, keying paddle attached, fully or automatic operation, with switching transistors and keying relay, speeds up to 65 W.P.M.</td>
<td>$60</td>
</tr>
</tbody>
</table>

### ANTENNAS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hy-Gain</td>
<td>TH6DXX Master Tri-bander</td>
<td>$220</td>
</tr>
<tr>
<td>Hy-Gain</td>
<td>14AVQ Vertical</td>
<td>$52</td>
</tr>
<tr>
<td>Hy-Gain</td>
<td>Hy-Quad, Tri-band Cubical Quad with gamma matches for single co-ax. feedline</td>
<td>$130</td>
</tr>
<tr>
<td>Mosley</td>
<td>TA33 Jr Tri-band Junior Beam</td>
<td>$105</td>
</tr>
<tr>
<td>Mosley</td>
<td>MUSTANG Tri-band Beam, 1 kW. power</td>
<td>$130</td>
</tr>
<tr>
<td>Newtronics</td>
<td>4-BTV 4-band Vertical</td>
<td>$60</td>
</tr>
<tr>
<td>Webster</td>
<td>and MARK Helical Mobile Whips</td>
<td>$55</td>
</tr>
</tbody>
</table>

### VALVES AND TUBES

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>CETRON</td>
<td>572-B 150 W. zero-bias linear amplifier triodes</td>
<td>$45</td>
</tr>
<tr>
<td>EIMAC</td>
<td>3-500-Z zero-bias triodes</td>
<td>$37.50 each</td>
</tr>
</tbody>
</table>

All prices quoted are net, cash with order, subject to alteration without prior notice, sales tax included in all cases. Postage, freight and insurance are extras, and transformers are heavy!

---

**Information about Midland Products:**

**Type 13-710 one-watt Transceivers**, now on 27.240 or 27.880 MHz., also crystals for 27.085 MHz. available; three channels, call signal, excellent for CW operation, with eight penlite batteries, earphone, carrying case, audio squelch control, battery voltage meter, still only $1.50 per set.

**Type 23-1258 Field Strength Meter**, with five ranges, tunable from 1 to 200 MHz., with telescoping whip...

**Type 23-136 SWR-Power Meter**, dual meters 100 microamp., very sensitive for low power but good for 1 kW. maximum, up to 175 MHz., reads forward and reflected power simultaneously, 52 ohm impedance...

**Type 23-126 SWR Meter**, standard single meter type, 52 ohm impedance, with whip for field strength metering...

**PTT Dynamic Hand Microphone**, steel case, 50K ohm impedance, excellent voice quality, no rocking armature type, with coiled cord and mobile use clip...

**Table Model Dynamic Microphone**, with PTT bar or lock switch, 50K ohm impedance, a quality bargain...

**Co-ax. Connectors**, Midland types PL-259, SO-239 females with or without flanges, PL-258 double-ended female; per connector...

**Co-ax. Inserts** for PL-259 for thinner co-ax. cable; each...

**Midland 5-watt Base Station Transceivers**, eight-channels, 240V. AC, fully P.M.G. approved for 27.880 MHz. operation, with 5 meter and power-output metering, including PTT microphone, with switch to be used as 3-watt public address amplifier into separate speaker(s). All inclusive, only $100 each.

**TRANSFORMERS**

Still a few types of the old stock of new NATIONAL Transformers left!
casting because of its freedom from noise and its far better quality of reproduction.

It may be well to interpolate some comments here: As this is written in 1970, high quality f.m. has been in existence for about 35 years, yet today there are approximately 3,000 a.m. broadcasting stations in the U.S.A. alone. Somewhere about 1,500 of these do not operate at night and the most popular transmitter is the 1 kw. size.

Now in the U.S.A., due to the great number of m.f. a.m. stations, night time interference between them is at a very high level and because of this, many are restricted to the bandwidth they can transmit. Some must cut off all audio frequencies above 15 KHz.

In Europe, stations are spaced at 9 KHz., and all stations remove the audio frequencies above 9 KHz. This means a reduction in the upper frequencies that can be transmitted.

Also, it must be realised that in many of the larger cities of the U.S.A. man-made interference has always been at a far greater intensity (level) than in Australia so that even in the early 1930's noise was a major problem in broadcasting in U.S.A., this being aggravated by the low power being used by many stations. Another matter to consider is that natural noise or static appears to be more dominant in the Northern Hemisphere than in the Southern.

These comments still apply in 1970 and the writer feels that it is a perfectly valid statement to make that in the majority of cases m.f. a.m. broadcasting in Australia is technically superior to that in North America and Europe.

Here in Australia we are more fortunate as the Australian Broadcasting Control Board requires a frequency response of ±2 dB. over the range of 50 to 10,000 Hz. for a transmitter. The A.B.C.B. also stipulates the frequency response required from microphone input at a studio to radiated output, when interconnecting land-lines or links do not exceed 20 miles in length. This cannot be stated directly in decibels. The presence of the stereo and s.c.a. are not being transmitted, then the normal a.f. band to 15 KHz. will use the full deviation of ±75 KHz. However, irrespective of whether mono, stereo or s.c.a. is being transmitted, the maximum deviation is 75 KHz.

In an amplitude modulated system, irrespective of the actual mode of transmission, it is essential that the carrier frequency remains constant within close limits and this is the reason broadcasting stations use temperature controlled quartz crystal oscillators. It is common for the temperature to be held at 55°C. ±1°C. The frequency of all m.f. broadcasting stations in Australia must be held within ±10 Hz. If the frequency is allowed to drift excessively then receiver tuning becomes difficult.

Stories of m.f. stations varying greatly in frequency are brought about because of drifting mixer oscillators in superheterodyne receivers. The writer's car receiver, transistorised, drifts, particularly at the low frequency end of the m.f. band, and is recognised as a receiver defect.

THEORY OF OPERATION

As described earlier, frequency modulation and phase modulation are both variants of angle modulation.

Now frequency modulation, as its name and definition imply, is obtained by changing the frequency of a carrier wave during the modulation process. Actually, the frequency must be swung symmetrically above and below the assigned frequency and a problem which arises in f.m. transmission is to be able to vary the frequency at the same time holding the centre frequency constant.

In an a.m. transmitter, whether self-excitied or crystal controlled, every endeavour is made to make the oscillator as stable as possible, but this class of stability can cause difficulties with frequency modulation, but may be easier with phase modulation.

A.m. broadcast transmitters usually have a small variable reactance connected across the crystal circuit because it is possible to get a small variation

\[ f_c + \Delta f \]
in frequency by altering the reactance across the crystal. One particular crystal oscillator, of the writer’s knowledge, could be shifted ±30 Hz. (in the middle of the m.f. band).

However, if a self excited oscillator is used it is possible to obtain very wide changes in frequency by varying the reactance of the oscillator “tank” circuit.

Many s.w. broadcasting stations, which have to change frequency quickly, use self-excited oscillators instead of crystal oscillators, however, these oscillators are inherently very stable.

Obviously if some way could be found to vary, at audio frequencies, a reactance shunted across a self-excited oscillator “tank” it would be possible to vary the frequency of the oscillator at audio frequencies, thus producing frequency modulation.

Fortunately a valve can be operated in a special manner so that it appears to be a reactance, furthermore, if an audio frequency voltage is applied to its grid then the valve will appear to be a variable reactance.

Now if such a valve is connected across the “tank” circuit of a self-excited oscillator, the frequency of the oscillator can be made to vary above and below its normal frequency in accordance with the audio frequency voltage impressed on the grid of such a reactance valve, or as more commonly termed, a reactance modulator.

Also, if a reactance valve modulator is connected across a quartz crystal oscillator it can produce a small amount of phase shift, which is phase modulation.

It may be connected across the tank circuit of an amplifier stage to produce phase modulation and as a change in phase is also a change in frequency, a small phase change at a low frequency can be multiplied to become a large frequency change at a higher frequency.

Another variable reactance device is a varactor diode and in 1970 in the U.S.A. this device has almost completely supplanted the valve reactance modulator in broadcast f.m. transmitters.

There are several other methods of generating angle modulation in addition to phase modulation and frequency modulation as described above.

These are a magnetic frequency modulator, the Shelby cathode-ray tube, and the phasitube and the klystron tube. These are now redundant for high quality angle modulation as used in f.m. broadcast work.

In the U.S.A. it is the usual practice for manufacturers to offer f.m. exciters with power outputs ranging from 10 to 20 watts for high fidelity use. If greater power is needed then these can be followed by one or more r.f. amplifiers to form a complete transmitter.

As of January 1970 there were at least nine manufacturers in the U.S.A. of such f.m. exciters and broadcast f.m. transmitters. It is interesting to examine some of the data for these exciters:

Only one manufacturer made an all-valve, 10-watt exciter, and this was the only one using phase modulation.

(© is a Serrasoid phase modulated exciter.)

Seven of the remaining makers use all solid-state techniques with transistor output. The other maker uses solid-state devices and a valve output.

Then six of the nine makers use a varactor modulator and two use transistors as the modulators. The varactor is a very high frequency device and in four of the makes it is used to modulate the oscillator which is at the carrier frequency. This is known as direct carrier f.m. (d.c.f.m.).

Some of the others prefer to modulate the oscillator at a lower frequency. As this is direct modulation of the oscillator on another frequency, it is known as direct f.m. (d.f.m.).

In Britain, the Hunt Electronics Co. developed a method to obtain f.m. by direct modulation of a quartz crystal oscillator operating at 1/24th of the carrier frequency. This has been given the trade name of f.m.q., standing for frequency modulation, quartz.

Also in Britain, S.T.C. manufactured f.m. broadcast type transmitters using reactance valve modulators.

(yo be continued)

INTRUDERS

WHAT IS ON
14008 KHz?

Please report details to your Divisional Intruder Watch Co-ordinator.

BEAM ROTATOR
EMOTATOR MODEL 1100M

YOU CAN CONTROL THE DIRECTION OF YOUR BEAM ANTENNA FROM YOUR OPERATING POSITION

The heavy duty model 1100M features rugged cast aluminium construction, stainless steel bolts, nuts and washers. Bearing design with 90-ball bearing provides high vertical carrying capacity, and resistance to bending pressures due to unbalanced weight, wind, etc. Limit switches prevent over-run. Positive braking with solenoid operated double plunger, operates when driven paddle is released. Steel gears transmit drive from a fractional horse-power motor.

The 1100M can be mounted on a fixed tubular mast if an additional clamp assembly is bolted to the base. Otherwise, the rotator is base mounted on a flat plate fixed to the top of the mast or tower. Six mounting holes are provided. The antenna boom is supported on a short vertical tube held by the top clamp assembly. Clamp assemblies are of sturdy construction and clamp blocks free of burrs or projecting edges within the range 11⁄2” to 21⁄4” diameter. U bolts are stainless steel 9 mm. diam.

The Indicator-Control Box is attractively finished in grey, with large illuminated meter, indicator lights, power switch, and “Left-Right” controls. Transformer is within Control Box. Control Box size: 5½” x 8¼” x 4”; weight 8½ lbs.

1100M with Indicator-Control Box and bottom mast clamp, $165.00.

1100M with Indicator-Control Box (less bottom mast clamp), $148.50.

Special 7-conductor Cable for 1100M, 60 cents per yard.

All prices include Sales Tax. Freight is extra.

Main specifications of Rotator:

- Electric power source: 230V. AC, 50/60 Hertz.
- Brake system: Electromagnetic double plunger lock-in.
- Brake power: 5,000 W.
- Vertical load: Deed weight: 500 Kg.; nominal load, 70 Kg.
- Mast diameter: 11⁄2” to 21⁄4” inches.
- Weight: 16 lbs., approx.
- Control cable: Seven conductors.
- Rotation diameter, 71⁄2” in.

Specifications and Prices subject to change.

AUSTRALIAN AGENT:

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 67-1650 (AH 37-5445)


Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 65-4379
OBSERVATION POST
By HF EVERTICK

Spending a few hours walking round the 13th National Radio and Electronics Engineering Convention displays of the I.R.E.E. in Melbourne at the end of May turned out to be interesting and very instructive.

Time did not permit attendance at any of the lectures given in separate halls, but some of the subjects caught the Amateur imagination — telemetry system for small projectiles at about 460 MHz., semiconductor reliability testing, crystal filter designs, cylindrical dipole antenna equations, stripline u.h.f. frequency multiplier circuitry, Intesat tracking, telemetry and command services, hybrid micro electronics and so on. An interesting sidelight was the interference by various transmitters to human body implants, as for example, heart pacers.

The Amateur content of the various stands was often quite low. Here and there the eye locked onto displays of components of which some of the latest developments could be outside our pocket range. In between all the computer material, colour t.v. dems., car-phones, test equipment, visual telephones and recorder (both sound and video) goodies there before your vision would be undoubtedly Amateur-looking equipment. As, for example, the Acitron SSB400 transceiver with digital frequency read-out designed and manufactured here in Melbourne. On another shelf the Acitron SSB100 transceiver and further along a linear—all include the 160 mx band through to 28 MHz., and 2 metres on the 400. Some, I was told, are in production, others are in prototype form.

Round the corner I spotted an elaborate Eddystone receiver with continuous tuning from 10 KHz. to 30 MHz. on all modes, some Geloso amplifiers and, upstairs, a very neat Collins 65S1 digital read-out receiver with manual or automatically selected or controlled frequency spot tuning.

Nothing much of interest in antennas for Amateur h.f. use other than whips, but one stand displayed a 10 ft. diameter precision parabolic spinning of the kind now lathe-turned in Melbourne and usable in the range 450 MHz. to 20 GHz.

Many of the advertisers in our journal were well represented.

TIES TIES
After many unavoidable delays, including switch of weaving contract and U.K. postal strike, firm orders have been placed for the

W.I.A. TIE
for delivery in September

PRICE is now $2.75 each
Choice of blue or maroon optional. Please place your order now with your Division

PREDICTION CHARTS FOR JULY 1971
(Prediction Charts by courtesy of Ionospheric Prediction Service)
THE R.F. BRIDGE*

DON NELSON, WB2EGZ

Sometimes an important idea goes unnoticed or is not sufficiently developed to gain wide acceptance. Such, I believe, is the case of the radio frequency bridge. The r.f. bridge has been marketed for many years by the General Radio Company; however, this precision instrument is probably too expensive for most Amateurs. A moderately priced r.f. bridge, manufactured by Omega-t Systems, has been available for several years. Oliver Swan, W6KZK, described the basic circuit of the r.f. bridge in an earlier issue of "Ham Radio."*

Few Amateurs seem to have recognized the advantages of the r.f. bridge over the simple v.s.w.r. bridge. The r.f. bridge, for example, will allow you to optimize your antenna, thus reducing the dependency on a matching network. The r.f. bridge has other uses as well, some of which I'll discuss in the following paragraphs.

THE CIRCUIT

The instrument consists basically of a broadband noise generator coupled to a bridge network by a wideband 1:1 balun transformer. By carefully compensating for circuit strays, the bridge upper frequency limit can be extended to 450 MHz.

The circuit of Fig. 1 was developed without some difficulty, mainly in reducing circuit strays and constructing the balun transformer. In its present state of development, this circuit is useful to 220 MHz.

The noise generator uses a zener in an unstable (thus noisy) mode by operating it at low current. It will pay to experiment with the value of R1 for the highest noise level of your zener. When the noise-generator output is amplified by a two-stage broadband amplifier, the instrument is useful from about 1 to 450 MHz; again, the upper frequency limit is determined by how well wiring strays are compensated.

CONSTRUCTION

Simple construction was used, with parts mounted on a perforated board. Battery power was used for maximum utility. Wiring the bridge circuit is relatively easy using broadband equipment. If the layout shown is followed, you can expect good results.

If you should be better layouts, and I'm sure that every unit built will be slightly different with regard to compensation for circuit strays.

By far the most difficult part of the construction is the toroidal balun. The resultant transformer, shown in Fig. 1, has broadband characteristics that exceed those of the more common trifilar-wound units. Pay strict attention to details!

The bridge section was laid out with regard to u.h.f. performance, keeping wires on one side of the bridge equal to those on the other. Wiring strays are compensated by balancing them with the exact capacitor combination that gives the best null. Because I have found the trimmer adjusts slightly differently on 6 metres and higher, I assume there are a few sneaky r.f. paths. One suspect component is the large carbon potentiometer. Our sophisticated doubts about the layout are unfounded below 30 MHz, however. (Solid relief for the unsophisticated worried.)

This gem is self-contained in a Bud CU2103-A Minibox, ready to check antennas, receivers, quartz crystals, and other series-resonant circuits. You will, of course, need a receiver for null detecting at the frequency of interest.

CALIBRATION AND USE

In theory, if not in practice, the 100-ohm pot. will balance any resistance placed in the "unknown" arm of the bridge. At one end of the scale is zero; at the other is infinity. Fifty ohms is mid-rotation with a linear pot. At 50 MHz and higher, I've found a rotational shift of the 50-ohm (r.f.) point. This means a special calibration check will be necessary at very high frequencies (v.h.f.). Normally, for the h.f. range, the dial calibration will hold.

The best null is at midrotational scale. Because the null deteriorates at the extremes of rotation, it is not worthwhile to use the instrument beyond a 20- to 300-ohm range.

Calibration is performed using non-inductive resistors of known values placed, then nulled, across the "UNK" terminal, with a receiver connected to the "REC" terminal. Carbon composition resistance are fine if values are known to 5%. Above 100 MHz, deposited carbon resistors are preferable because of their low inductance. The dial plate should be calibrated in the h.f. range, say 10 MHz. Trim the bridge capacitance for best null with a 50 ohm resistor and correct setting of the pot. Don't be too surprised if a 50 ohm resistor changes value through the v.h.f. range.

ANTENNA MATCHING

Tuning an antenna with a v.s.w.r. bridge is a hit or miss proposition, because the v.s.w.r. bridge confuses resistive and reactive impedances. I don't mean to imply that accurate tuning is impossible with the v.s.w.r. bridge, but without a tedious procedure, the lowest v.s.w.r. will probably occur at a frequency different than that of optimum transmission. The r.f. bridge technique eliminates the tuning error, and allows an accurate measurement of v.s.w.r. once the antenna is correctly tuned.

Fig. 1—Schematic of the r.f. bridge and noise generator.

Recommended replacement for the common v.s.w.r. bridge — the radio-frequency bridge and noise generator.

Woundings A and B of the balun are No. 26 Formvar. Windings C is also 9 turns of No. 26 Formvar, continuing the A and B winding direction and connecting A2 to B1.

(1) First connect the r.f. bridge directly to the antenna or at an electrical half wavelength away from the antenna. An electrical half wavelength is different from the physical length of the wire. You can determine the electrical half wavelength with this bridge by setting the bridge to zero and placing a short across the end of the transmission line. Now cut small lengths from the line until a null is obtained at the frequency of interest (Fig. 2). Using a half wavelength or multiple thereof effectively places the bridge at the antenna, thereby reducing transmission line errors.

(2) Tuning the antenna to a frequency is the next step. You will find its resonant frequency by a null on the receiver. A sharper null will be seen with the bridge adjusted to the impedance of the antenna system. Adjust antenna length until the null occurs at the desired frequency.

(3) By adjusting the matching section, tune your antenna to the desired impedance as shown by the r.f. bridge.

**RECEIVER INPUT MATCHING**

Provided you already have a receiver to act as a null detector, you will find the r.f. bridge invaluable for determining the optimum tap position for inputs not be dipped easily on a grid-dip oscillator. Place the LC combination across the "UNK" terminal with the bridge dial set to zero. Tune receiver for null (see Fig. 4).

If a resistance is in series with L and C, the bridge will show its value. An interesting example of an R, L, C combination is the quartz crystal. While this bridge has limitations in crystal measurements, it is utilitarian. Set the dial to infinity (minimum noise for open circuit). Tune the receiver for an increase in noise at the resonant frequency of the crystal. Adjust the bridge for null. This value is the resistance of the crystal's RLC arm. In general, the lower this value, the higher will be the activity of the crystal.

The r.f. bridge takes over where the v.s.w.r. bridge leaves off. To my embarrassment, the r.f. bridge disclosed several mistakes in my station, as it may in yours. I feel certain that building this bridge will be the most rewarding project the experimenting Amateur will undertake this year.

**OTHER USES**

Any series-resonant circuit can be checked with the r.f. bridge. This, you will recall, is the combination that can...

Grateful acknowledgment is made to Mike Ward, WB2YJK, for his efforts in the design of this project.

**REFERENCES**

2. Omega-t Systems, Inc., 516 W. Belt Line Road, Richardson, Texas, 75080.

**CR8 LICENSING**

From Bill Hempel, VK1BH: "Write to—

The Director,
Posto, Telefones, and Telefones,
Dili, Portuguese Timor,
with photostat of your VK licence, whereupon a licence will be issued for three weeks with renewals available once you are there, subject to extension to your 14-day passport visa. "Several call signs have been issued to VK8s, but nobody has operated because no transmitters may be imported."

HF Evertick comments: "Apparently this is one of those places similar to Iran where the right hand is more massive than the left. It is believed that there may be only two ways to circumvent this: either to initiate a long-term approach to Lisbon through a local Portuguese representative or possibly direct or to be on good terms with a V.I.P. in the Administration to give assistance to import gear into the country. If a local resident has a licence, it might be possible to do a deal through him, but this avenue may already have been explored. There seems to be scope here for a reciprocal licensing agreement.

Quite obviously, it would be very awkward if equipment were to be smuggled into the country since difficult questions would arise if subsequently discovered, quite apart from the unlawful aspects of smuggling as such, which is an illegal activity always to be frowned upon. It was not too many years ago that an overland tourist with a mobile rig in his caravan arrived at a remote Customs House in 3V8 and was imprisoned, merely for possessing it, until he could contact his Embassy and get himself released some days later."

---

**Wireless Institute of Australia**

**Victorian Division**

**A.O.C.P. THEORY CLASS**

**MONDAY, 16th AUG., 1971**

Theory is held on Monday evenings from 8 to 10 p.m.

Persons desirous of being enrolled should communicate with Secretary, W.I.A., Victorian Division, P.O. Box 36, East Melbourne, Vic., 3002.

(Phone 41-3535, 10 a.m. to 3 p.m.)
HOME STATION ANTENNA FOR 160 METRES

Part Three—The Balanced Horizontal  

J. A. ADCOCK, M.I.E. (Aust.) VK3ACA

INTRODUCTION

A short low horizontal on medium frequencies has a very poor efficiency. Horizontal antennas should be made as large as possible, but in most cases only small dimensions are practicable. Even an antenna 120 feet long and 60 feet high is small and rather inefficient compared with a resonant antenna a quarter wavelength high.

If the antenna is to be used for multiband, the most satisfactory arrangement would be a centre fed with 600 ohm open wire feed line and tuned at the transmitter. Such an antenna will provide the dual function of a "horizontal doublet" or a "T" with the feeders in parallel.

This section will deal with this type of antenna and will endeavour to show what can be obtained from a balanced horizontal for transmission and reception.

Therefore, if we desire to take advantage of the horizontal antenna for either transmitting or receiving, it must be perfectly horizontal and the feeders must be perfectly balanced. To obtain good balance the antenna should be geometrically balanced.

As with the vertical, the calculation of radiation resistance at the centre of a short dipole in free space is fairly simple. To determine the resistance at a distance along the feeder and to introduce the effect of the ground is much more involved. In the following sections, methods of how this can be done and some simplified methods are suggested. As discussed earlier, the load can be considered as an effective parallel or series circuit but the series circuit is most commonly used. This, together with a parallel tuning circuit, is shown in Fig. 13.

The possibility of using a horizontal counterpoise was investigated by the author, but unfortunately this was found to be unworkable. A number of other experiments and on-air checks were tried to test the theories presented in the next sections.

CALCULATIONS FOR HORIZONTAL ANTENNAS

The radiation resistance at the centre of a balanced horizontal antenna in free space is given by:

$$R_r = \frac{790}{\lambda^2}$$

where $R_r$ = the effective series resistance component of the load at the feed point at the centre of the antenna.

$L_e$ = the effective total length of the antenna.

The calculation of effective length of one leg of the antenna is the same as for a vertical. Length may be taken as $L = \frac{\lambda}{2}$ for a short antenna, $2L = \pi$ for a resonant antenna, or the form factor may be calculated from equation 3 or 5 obtained from Fig. 7. The electrical length given in these graphs has been taken as the length of one leg of the antenna compared with a quarter wavelength as with previous calculations, i.e., $\lambda/4 = 90^\circ$.

Similarly, as with equation (6) for a horizontal antenna

$$R_s = 197.5 \times (\text{elect. length} \times \pi)^2$$

The comments relating to accuracy of calculation to long verticals also apply here.

From the equations it will be noticed that the radiation resistance of a centre fed antenna is twice that of a vertical of the same leg length. In the case of a vertical, the other half of the antenna is virtual or reflected in the ground. The curves and methods for vertical...
antennas can be applied so long as the calculated resistance is doubled. The curves of Fig. 8 may have some application to end-loaded horizontals, although capacitance to the earth point or the end of the antenna can be introduced into coil design calculations. In most practical cases of interest, it is unnecessary to consider the value of the reactive component of the load.

The measurement of the reactive component is difficult without a bridge but if r.f. voltage, current and power are known a reasonable result of both resistance and reactance can be calculated from standard formulae. The variation in radiation resistance of an antenna above a perfectly conducting ground is shown in Fig. 15. Possible applications of the change of resistance curve of Fig. 15 to determine the radiation efficiency of the antenna are discussed in the next series.

REFERENCE

TWO-STUB NOTCH FILTERS FOR T.V.I.*

Barry Priestley, G3JGO, has sent along some useful information on a technique which appears to offer an extremely effective means of producing filters providing a deep notch at a specific frequency. This system is an extension of the established use of single co-axial stubs, but using two stubs.

Information on this technique, published in the Swiss journal "Old Man," was passed to G3JGO by Geoff Stone, G3JCT, and translated by J. H. Hill, G3JUP, who carried out a number of tests which confirmed the original claims; these results were subsequently confirmed by G3JGO and R. K. Hemmings, G3VCT.

About this time, further information was provided by W. Burton, G8ANQ, in this case using short-circuited half-wave stubs rather than the open-circuited quarter-wave versions; he showed how the stubs could be "tuned" by using a pin to provide an easily variable short-circuiting device. Both versions are shown in Fig. 1.

As a result of all this combined effort, G3JGO draws the following conclusions on this promising technique: the notch can lie anywhere from 70 to 80 dB deep when using good quality 1/2" co-axial cable; this compares with roughly 30 dB for a single stub. The notch is also narrower, as might be expected from the use of two high-Q circuits.

The possibility of using three stubs in order to develop either a very narrow notch or alternatively using stagger tuning to provide a shaped response curve also exists, although these ideas have not been tried.

The spacing of the stubs is not critical—G8ANQ suggests 9" at 145 MHz., but has used 3" successfully. The lengths of the stubs are very critical; unfortunately bench alignment with a signal generator (as described in the G3SL article mentioned below) is difficult due to pulling of the generator. Capacitive tuning of open stubs, or the pin as a movable short circuit, has proved useful.

G3JGO considers that there is no reason why the open circuit version should not be used on a transmitter to notch out, for example, transmitter harmonics in Band 1. This particular application has not been tried although it would seem a logical extension of the techniques discussed many years ago by T. N. Lloyd, G3SL, "Curing day by day..." 1956, and later by T. N. Lloyd, G3SL, "Technical Topics, December 1970."

Fig. 1.—Two stub filters capable of providing a notch of about 70 or 80 dB at centre frequency. (a) is the open-circuited quarter wave stubs; (b) is BIANQ version using short-circuited half wave stubs with movable "pin" short-circuiting device.

PROVISIONAL SUNSPOT NUMBERS
APRIL 1971

Dependent on observations at Zurich Observatory and some of its stations in Lucerne and Arosa.

<table>
<thead>
<tr>
<th>Day</th>
<th>R</th>
<th>Day</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>59</td>
<td>16</td>
<td>104</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>17</td>
<td>93</td>
</tr>
<tr>
<td>3</td>
<td>58</td>
<td>18</td>
<td>104</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>20</td>
<td>103</td>
</tr>
<tr>
<td>5</td>
<td>58</td>
<td>21</td>
<td>88</td>
</tr>
<tr>
<td>6</td>
<td>59</td>
<td>22</td>
<td>88</td>
</tr>
<tr>
<td>7</td>
<td>61</td>
<td>23</td>
<td>87</td>
</tr>
<tr>
<td>8</td>
<td>62</td>
<td>24</td>
<td>80</td>
</tr>
<tr>
<td>9</td>
<td>52</td>
<td>25</td>
<td>44</td>
</tr>
<tr>
<td>10</td>
<td>58</td>
<td>26</td>
<td>44</td>
</tr>
<tr>
<td>11</td>
<td>64</td>
<td>27</td>
<td>36</td>
</tr>
<tr>
<td>12</td>
<td>66</td>
<td>28</td>
<td>36</td>
</tr>
<tr>
<td>13</td>
<td>100</td>
<td>29</td>
<td>36</td>
</tr>
<tr>
<td>14</td>
<td>113</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>15</td>
<td>126</td>
<td>31</td>
<td>36</td>
</tr>
</tbody>
</table>

Mean equals 70.9.


—Swiss Federal Observatory, Zurich.

HY-GAIN AMATEUR ANTENNAS

Fully Imported from U.S.A.

ACCESSORIES: LA-1 co-ax. lightning arrestor. BN-86 balun, CI centre insulators & EI end insulators for doublets.

HEAVY DUTY ROTATOR: Emotator Model 1100M available for H.F. beams.

H.F. BEAMS: TH6DXX, TH3Jr, TH3Mk3 and Hy-Quad Tribanders for 10, 15 and 20 m.; 204BA, 203BA Monobanders for 20 m.

TRAP VERTICALS: 18AVQ (80-10 m.), 14AVQ (40-10 m.) and 12AVQ (20-10 m.).


V.H.F. ANTENNAS: Beams—66B six elem. 6 m., DB-62 duo-bander for 6 and 2 m.; 23B, 28B and 215B (3, 8 and 15 elem. 2 m. beams). Also Ground Planes, Mobile Whips and Halos.

WAYNE COMMUNICATION ELECTRONICS

Catering specially for the Amateur with Components, Receivers, Transmitters, Test Equipment. Everything from Resistors to 100 MHz. Frequency Counters

ALL AT UNBEATABLE PRICES

- COLLINS ART13 AUTO-TUNE TRANSMITTER. 2-18.1 MHz. AM or CW. 813 PA, 2 x 811 Modulators. Complete with all tubes. In good condition. $30 each. Freight forward.

- COMPUTER BOARDS. Removed from functional equipment. Contain 4 VHF transistors, 12 high speed switching diodes, 2% metal oxide resistors. $1.50 each.

- CERAMIC 1625 SOCKETS. Suit also 3AP1 CRO tube. 15c each.

- POWER SUPPLIES. 230v. 50 Hz. input, 300v. 100 mA. DC output. Manufactured by A & R. Brand new. $10 each.

- WIRE WOUND RESISTORS. Range: 1.8 to 620 ohms. 6 watt. New. 5c each.

- SPECIAL! TRANSFORMERS: Primary 230v. 50 Hz., Secondary 27v. 3 amp. This month only. $3.00 each.

All items plus pack and post.

Come and inspect the full range of equipment and components at

WAYNE COMMUNICATION ELECTRONICS

757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122

Phone 81-2818
Australis Oscar Balloon Report
G. N. LONG,* VK3YDB

THE TECHNICAL ASPECTS

Last month a report was presented by Richard Tonkin on the Hi-ball flights which took place from Mildura during the months of April to May. This report will attempt to cover some of the technical results and some of the difficulties experienced during these four flights.

The package comprised the Australis receiver and the Australis transmitter with its associated keying circuitry. This was then encased in a minibox. Due to the nature of the other experiments being carried on the balloon, a great deal of r.f. “hash” is produced. In an attempt to minimise this a voltage regulator was also incorporated in the package. The h.t. from the balloon power system (20 to 25 volts) was fed to the regulator through an appropriate feed-through capacitor; the only other things on the box were two co-ax. output connectors. During the flight the translator package was housed in a polystyrene box; this being for thermal insulation.

The package was air-shipped to Mildura in the care of George Long, VK3YDB. Upon reaching Mildura and having consultations with the Hi-ball people, it was found that the package was small enough and the current drain low enough to fly on any of the flights in that series. This brought about many new problems in itself, one of which was that a new aerial would have to be fitted up for each flight. Aid came in the form of Kevin VK3ZKD, who worked for many hours and produced three aerials which were all used.

The aerials themselves were made of standard cheap flexible steel tape. This was chosen because it is a very easy medium from which an aerial, that is subject to many stresses, can be made. The two aerials were constructed to go on the same mast with about 20" of separation. The mast was constructed of 1" diameter plastic electrical conduit. The 144 MHz aerial was a quarter wave ground-plane at the end of the conduit and below this the 432 MHz aerial was constructed, this being a turnstile. The aerial positioning was very important and more will be said about this later.

George VK3YDB was up before dawn to take this photo of the balloon being filled with helium gas.

The flight unit was tested in Mildura to make sure that the system still functioned satisfactorily, but, more importantly, to make sure that the translator could be integrated into the balloon package without undue interference between the systems on the package and the translator. During these tests a fault in the power supply developed; this caused the final amplifier in the transmitter of the package to be destroyed. At that late stage it was impossible to get a spare up from Melbourne so it was decided to fly the first flight with low transmitter output, this being under 100 mW. The only readily available transistor to operate at these frequencies in Mildura at that stage was in the author’s rig, so, finally, a “PNW” type “B” transistor from this was used. After the first flight (70,000 feet), the package was shipped back to Melbourne and the correct device was inserted and power output brought up to 1 watt.

As stated in the previous article, there were four flights. The package flown was the same for all flights, varying only in power output. The same aerial design was used for all flights; the aerial position with relation to the gondola was changed on two occasions.

The results of the four flights were:

Flight No. 1
Altitude—70K (70,000) ft.
Power output—less than 600 mW.
Aerial position—pointing upwards.

General results.—The flight was well received in both Melbourne and Adelaide; no report of reception in either VK1 or VK2. Moderate to heavy QSB. Heavy interference from other on-board equipment was experienced.

Copy from the package was readable until 50K after cut-down.

Flight No. 2
Altitude—105K (105,000) ft.
Power output—1 watt.
Aerial position—pointing downwards.

General results.—On ascent, the package was received well in both capital cities, but on reaching flight altitude the signal was lost in VK3; copy was still quite readable in VK5. The signal to VK3 was, in most cases, too far down to be read. The suspected cause for the loss of the signal was a large temperature inversion which was covering most of Victoria. It was observed that the level of interference from other equipment was very high. On recovery, it was found that the voltage regulator was faulty. The fault was traced to an IC. The package was again returned to Melbourne and the voltage regulator was changed and a much simpler design, using a 15v. zener and a 2N3055, was installed. No further problems were had with this circuit for any of the remaining flights.

Flight No. 3
Altitude—90K (90,000) ft.
Power output—1 watt.

General results.—The signal was observed to be a little bit stronger, but the same conditions as applied to Flight No. 2 took place in this flight. Signals were quite readable in VK3 during the ascent, but were almost totally lost after flight altitude was attained. Again, an inversion was found to be covering the greater part of VK3. A valuable clue was supplied to the Group about this inversion when reports in VK1 reported hearing VK3 stations calling even though the 432 MHz transmission back to Melbourne could not be copied. Interference from on-board equipment...
was again at a very high level, particularly the 2 MHz. c.w. beacon carried on the balloon. This was found to be because the 2 MHz. beacon aerial wrapped itself around the 432-144 MHz. aerials used by the Australis translator.

**Flight No. 4**

Altitude—120K (120,000) ft.
Power output—1 watt.
Aerial position—pointing upward.
General result—exceptional. A four State hook-up took place. High level signals were received in VKs 1, 2, 3 and 5. No deep fades were reported and all the systems worked well. Interference from other systems on the balloon were very low. By cut-down, everybody using the experimental package had gone to work and no results were gained as to the behaviour of the package during descent. The most important fact to come out of the flight was that, even though an inversion was experienced during the flight period, there was not any deep fading or loss of the signal in the area covered by the inversion.

The problem of why the package could not be received in VK3 during Flights 2 and 3 had many people thinking. The only reason advanced, which seemed to cover all the facts, was that the problem was not due to any single reason or fault, but due to a number of cumulative conditions. The fact that the problem showed up only when the aerial was pointing downwards seems to be the heart of the problem. The following is what was thought to have happened.

Because the aerial was pointing downward and subject to screening in certain positions of rotation of the balloon, the signal was reduced. This, with the added attenuation of the temperature inversion at the time, caused signals in VK3 to be too low to be read, but when the aerial was pointing upwards, the aerial was not screened and, so even after the attenuation of the inversion, good signals could be copied.

This problem is very important because, if an inversion alone is enough to stop signals on the 432 MHz. band, then signals from a satellite operating in this band would also be stopped.

It should be pointed out at this stage that it has been recorded that the rotation rate of the balloon could be as low as one rotation every two hours so, if the aerial was screened by some part of the gondola, it could remain screened for up to two hours.

It was noticed that mobiles travelling in the respective capital cities that had not heard of the balloon flights and were using Channel B for their morning run to work, were getting into the package with very good signals on some occasions.

Any future launches of the balloon series (it is hoped to have some more shortly) will be publicised in all States with as much notice as possible to give everybody a chance to get into the package and so prepare their equipment for the future launch of Australis-Oscar 6.

**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; Drawings will be done by "A.R." staff.

Please address all articles to:
EDITOR "A.R."
P.O. BOX 36,
EAST MELBOURNE,
VICTORIA, 3002
VK-ZL-OCEANIA DX CONTEST, 1971

W.I.A. and N.Z.A.R.T., the National Amateur Radio Associations in Australia and New Zealand, invite world-wide participation in this year's VK-ZL-Oceania DX Contest.

Object: For the world to contact VK, ZL and Oceania stations and vice versa.

(1) For the world to contact VK, ZL and Oceania stations and vice versa. Note.—VK and ZL stations, irrespective of their locations, do not contact each other for Contest purposes except on 80 and 160 metres.

Dates—Phone: 24 hours from 1000 GMT on Saturday, 2nd October, 1971, to 1000 GMT on Sunday, 3rd October, 1971.

C.W.: 24 hours from 1000 GMT on Saturday, 9th October, 1971, to 1000 GMT on Sunday, 10th October, 1971.

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 Amateur transmitting stations in any part of the world. No prior entry need be made.

Mobile marine or other non-land based stations are not permitted to enter.

3. All Amateur frequency bands may be used, but no cross-band operation is permitted.

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 for each section.

5. Only one contact 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.)

7. Entrants must operate within the terms of their licences.

8. Dyphers: Before points can be claimed for contact, serial numbers must be exchanged and acknowledged. The serial number of five or six figures which may begin with any number, 001-999, plus the number sent, will be considered a “scoring area”, with contact points and bonus points to be counted as for DX contacts.

9. Calls: VK and ZL stations irrespective of location do not contact each other for Contest purposes except on 80 and 160 metres, on which bands contacts between VK and ZL are encouraged.

10. 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 for each section.

11. Only one contact per band is permitted with any one station for scoring purposes.

12. 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 for each section.

13. 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.)

14. Entrants must operate within the terms of their licences.

15. Dips: Before points can be claimed for contact, serial numbers must be exchanged and acknowledged. The serial number of five or six figures which may begin with any number, 001-999, plus the number sent, will be considered a “scoring area”, with contact points and bonus points to be counted as for DX contacts.

16. Calls: VK and ZL stations irrespective of location do not contact each other for Contest purposes except on 80 and 160 metres, on which bands contacts between VK and ZL are encouraged.

17. 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 for each section.

18. Only one contact per band is permitted with any one station for scoring purposes.

19. 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 for each section.
REMEMBRANCE DAY CONTEST, 1971

In recent years a close relationship has developed between the N.Z.A.E.T. and the W.I.A. in many fields. This year, reflecting these ties, New Zealand Amateurs are invited to participate for the first time in the W.I.A. Remembrance Day Contest. Whilst the scores of the ZL operators will not affect W.I.A. Divisional scores for the Trophy, they will be eligible for the Certificates specified in the Rules, and to this end are invited to submit logs to the Federal Contest Manager in Brisbane. It is hoped that the participation of New Zealand operators will add considerably to the activity on the bands and to the success of the Contest.

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 and, in addition, the winning Division will receive a suitably inscribed Certificate.

Objects: Amateurs in each VK Call Area, including Australian Mandated Territories and Australian Antarctica, will endeavour to contact Amateurs in other VK and ZL Call Areas on all bands. Amateurs may endeavour to contact any other Amateurs on the authorised bands above 52 MHz. (i.e. intrastate contacts will be permitted in the v.h.f./u.h.f. bands for scoring purposes).

Contest Date: 0800 hours GMT on Saturday, 14th August, 1971, to 0759 hours GMT on Sunday, 15th August, 1971.

All Amateur stations are requested to observe 15 minutes' silence before the commencement of the Contest on the Saturday afternoon. An appropriate broadcast will be relayed from all Divisional stations during this period.

RULES

1. There shall be four sections to the Contest—
   (a) Transmitting phone,
   (b) Transmitting c.w.,
   (c) Transmitting open,
   (d) Receiving Open.

2. All Australian Amateurs may enter the Contest whether their stations are fixed, portable or mobile. Members and non-members will be eligible for awards.

3. All authorised Amateur 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 to phone or c.w. to c.w. or phone to c.w. However, only one entry may be submitted for sections (a) to (c) in Rule 1.

An open log will be one in which points are claimed for both phone and c.w. transmissions. Refer to Rule 11 concerning log entries.

5. For scoring, only one contact per station per band is allowed. However, a second scoring contact can be made on the same band using the alternate mode. Arranged schedules for contacts on the other bands are prohibited.

6. 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 two or more wish to operate any particular station, each will be considered a contestant and must submit a separate log under his own call sign. Such contestants shall be referred to as "substitute operators" for the purpose of these Rules and their operating procedure must be as follows:

- **Phone**: Substitute operators will call "CQ RD" or "CQ Remembrance Day" followed by call of the station they are operating, then the word "log" followed by their own call sign, e.g. "CQ Remembrance Day from VK4BBB log VK4BAA".

- **C.W.**: Substitute operators will call "CQ RD de" followed by the group call sign comprising the call of the station they are operating, an oblique stroke and their own call, e.g. "CQ RD de VK4BBB/VK4BAA".

Contestants receiving signals from a substitute operator will qualify for points by recording the call sign of the substitute operator only.

---

**SCORING TABLE**

<table>
<thead>
<tr>
<th>From</th>
<th>VK0</th>
<th>VK1</th>
<th>VK2</th>
<th>VK3</th>
<th>VK4</th>
<th>VK5</th>
<th>VK6</th>
<th>VK7</th>
<th>VK8</th>
<th>VK9</th>
<th>ZL1</th>
<th>ZL2</th>
<th>ZL3</th>
<th>ZL4</th>
<th>ZL5</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK0</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK1</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK2</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK3</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK4</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK5</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK6</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK7</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK8</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>VK9</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ZL1</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ZL2</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ZL3</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ZL4</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ZL5</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

**Note.**—Read Table from left to right for points for the various Call Areas.

In addition, all intrastate contacts on 52 MHz. and above are worth 1 point each per band.
7. Entrants must operate within the terms of their licences.

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 (telephony) or RST (c.w.) reports plus three figures, that will increase in value by one for each successive contact. If any contestant reaches 999 he will start again with 001.

9. Entries must be set out as shown in the example, using only one side of the paper and whatever possible standard W.I.A. Log Sheets should be used. Entries must be clearly marked “Remembrance Day Contest 1971” and must be postmarked not later than 3rd September, 1971. Address them to Federal Contest Manager, W.I.A., Box 638, Brisbane, Qld., 4001. Late entries will be disqualified.

10. Scoring will be based on the table shown.

Portable Operation: Log scores of operators working outside their own Call Area will be credited to that Call Area in which operation takes place, e.g., VK5ZP/2. His score counts towards N.S.W. total points score.

11. All logs shall be set out as in the example. The number and one additional entry will carry a front sheet showing the following: Name....................................

Date.....................

Signed..................................

Statement.—I hereby certify that I have operated in accordance with the Rules and spirit of the Contest.

AWARDS

Certificates will be awarded to the top scoring entrants in Sections (a) to (c) of Rule 1 above, in each Call Area, and will include top scorer in each Section of each Call Area operating exclusively on 52 MHz and above. VK1, VK8, VK9, VK0, ZL1, ZL2, ZL3, ZL4 and ZL5 will count as separate areas for awards. There will be no outright winner. Further Certificates may be awarded at the discretion of the Federal Contest Manager.

The Division to which the Trophy will be awarded shall be determined in the following way:

To 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 points from all entries in Sections (a), (b) and (c) of Rule 1.

Average of top six logs + 

\[
\begin{align*}
&\text{State Licensees} \times \text{all entries in (a)} \\
&\text{incl. } Z & Y \text{ Calls} \text{ Sect. (a) (b) (c)}
\end{align*}
\]

VK1 scores will be included with VK2, VK8 with VK5, and VK0 with VK1. VK9 logs and score will be added to the Division which is geographically the closest. ZL scores will not be included in the score of any W.I.A. Division.

Certificates will be awarded at the discretion of the Federal Contest Manager.

EXAMPLE OF TRANSMITTING LOG

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Band</th>
<th>Emission</th>
<th>Call Sign Worked</th>
<th>RST No. Sent</th>
<th>RST No. Received</th>
<th>Points Claimed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 71 14</td>
<td>7 Mc</td>
<td>A3 (a)</td>
<td>VK5PS</td>
<td>58002</td>
<td>VK6RZ</td>
<td>1</td>
</tr>
<tr>
<td>14 0812</td>
<td>1025</td>
<td>A3</td>
<td>ZL2AZ</td>
<td>59007</td>
<td>VK3KI</td>
<td>2</td>
</tr>
<tr>
<td>1040</td>
<td></td>
<td></td>
<td>VK5AZ</td>
<td>50252</td>
<td>VK3QV</td>
<td>1</td>
</tr>
</tbody>
</table>

Note.—Standard W.I.A. Log Sheets may be used to follow the above form.

EXAMPLE OF RECEIVING LOG (VICTORIAN S.W.L.)

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Band</th>
<th>Emission</th>
<th>Call Sign</th>
<th>RST No. Sent</th>
<th>RST No. Received</th>
<th>Points Claimed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 71 14</td>
<td>7 Mc</td>
<td>A3 (a)</td>
<td>VK5PS</td>
<td>58002</td>
<td>VK6RZ</td>
<td>1</td>
</tr>
<tr>
<td>14 0812</td>
<td>1025</td>
<td>A3</td>
<td>ZL2AZ</td>
<td>59007</td>
<td>VK3KI</td>
<td>2</td>
</tr>
<tr>
<td>1040</td>
<td></td>
<td></td>
<td>VK5AZ</td>
<td>50252</td>
<td>VK3QV</td>
<td>1</td>
</tr>
</tbody>
</table>

Note.—Standard W.I.A. Log Sheets may be used to follow the above form.

Federal Executive Report

Two meetings of Federal Executive have been held since the last meeting at Brisbane—one on April 28 and the other on May 26. At the latter meeting it was decided to split the Contest purposes because all residual outstanding at a further special meeting scheduled on June 22.

Novice licensing was singled out for special discussions during June and July. The proposal to disallow any illegible, incomplete or incorrectly set-out logs was discussed. It was decided that the Contest Manager also has the right to disqualify any entrant who, during the Contest, has not operated in accordance with the Rules and spirit of the Contest.

Certificates will be awarded to the highest scorers in each call area. Further Certificates may be awarded at the discretion of the Federal Contest Manager.
The high mountains to the west of Canberra are very attractive for portable v.h.f. operation as some of them are easily accessible by road. Mount Ginini, 5,782 feet above sea level, with a good road leading to the D.C.A., was chosen for many v.h.f. field operations by locals and others over the last couple of years. Another is Mt. Gingera, several miles south of Ginini and several hundred feet higher. Mt. Franklin is several miles north and correspondingly lower.

For this expedition, we were originally going to Gingera, but recent heavy rain had made access impossible. We settled on Ginini.

Eddie VK1VP, Graeme VK1CG, Reg VK1ZMR and I arrived on site by about 8.30 on the Saturday morning. Reg and I set up the tent and h.f. antennas; but there were problems with the beam and the dipoles. After raising and lowering the beam (with the dipoles mounted on top) four times, we decided to do without the 40 mx dipole as it was shorting against the 80 mx one. A simple operation was performed by Reg with a pair of side cutters, and we were away. We also forgot to make the beam lower rotatable in the "heat of the moment" and that caused one more raising and lowering. Then, when we stood back and noticed that the director and reflector were not horizontal and the beam looked more like a tornado victim), it was just too bad, and we left it that way.

We also had some trouble getting stakes into the ground. The hill must be solid rock—at least it was in the positions we were trying to get the stakes in!

Meanwhile, Eddie and Graeme were setting up the v.h.f. gear. The antennas took some time to assemble and the sun shone brightly on two backs for a couple of hours. The v.h.f. station was located in Eddie's Land Rover, which was really well set up for field operation. Shelves, speakers, power outlets, 240v supply metering (for use when operating from 240v. instead of 12 volt batteries only) and antenna feed-throughs are permanently installed.

Eddie uses N type connectors from the "shack" to all antennas, using UR67 50-ohm co-ax. The antenna feed-throughs referred to above enable short lengths of co-ax. with B.N.C. connectors to be used in the "shack", making changes quick and reliable (e.g. changing converters or bands), and you do not have heavy co-ax. flopping around carrying your transmitter away when you turn the beam.

Quickest of all to erect was the 14AVQ—it's as light as a feather. Once you know where to clamp the thing together (that's easy, you mark the position with tape at home), it's a one-minute job to get up in the air from start to finish. However, you must spend some time with the radio as they are the secret of the antenna's success. The trap verticals can be unclamped in the centre or thereabouts and are then a suitable size for carrying on ski bars, etc.

We had everything up and running by about noon, so we sat about and listened to the bands until the contest started. We also had the occasional bite to eat.

I operated 40 most of the time, occasionally going to 20 on Sunday, when 40 slackened off. 40 was quite good and the vertical did well, scoring a G 200 points on phone and giving excellent coverage around Australia.

Reg operated on all the other h.f. bands. 20 was the best scorer for him, with 80 close behind. However, the beam did not go as well as we had expected; it did well on 20 and not well on 15 and 10, the reverse of what I would expect for a compact beam. So when 10 was open on Sunday morning, we didn't do too well. Reg also had a faulty speech amp., putting him out of action for a while.

One very pleasant surprise was the lack of interference between the two h.f. rigs. They were about 1 foot apart. Some spots were as high as S8, but that is good compared to other rigs I have operated under similar conditions. There were no key clicks either, showing that once modified, these rigs are quite clean on c.w.

Graeme operated 52 MHz., and Eddie operated 144 and 432 MHz. The 146 MHz gear was sitting between them, and whenever the mobiles in Sydney were silent, the f.m. provided some good contacts.

Generally though, v.h.f. conditions were poor. On 144, quite a few contacts were made into Sydney (normally easy from this mountain) and also with country stations that normally work the repeater only. Interstate, VK3AOT was heard on Saturday night and on Sunday morning. Just before packing up on Sunday afternoon, VK3ZQC was worked, on 144 MHz. This was quite a contrast to last year, when we worked many VK3 stations.

We are hoping that the activity on the f.m. nets caused by repeaters will encourage more Amateurs to build and use equipment on the non-net or tunable sections of the v.h.f. bands. For it is certain that the results attained using f.m. and vertical polarisation are easy to beat using c.w., s.s.b. or a.m., on horizontal polarisation. Instead of having marginal contacts on f.m. net channels, we could be having solid reliable contacts, and more of them.

We started to pack up at about 2.30 on Sunday. 20 and 40 were still good for a few points, so I stayed on the air until about 3.15. I think there is a section of Murphy's rules which says that you cannot take home as much as you took, using the same space. In other words, you do an inefficient packing job when you are up on a mountain. We proved it! However, by about 4 p.m. we were on our way, with all the gear on board. (continued next page)
EQUIPMENT

Two FT200 transceivers, 80 metre dipole, TA33Jr triband beam, 14AVQ trap vertical (used almost 100% on 40).

Home-brew transmitters for 52, 144, 432 MHz. a.m., having power outputs of 40, 25 and 15 watts respectively. Common 50-watt transistor modulator/power supply for the 144 and 432 MHz tx's, which operate from 12v. battery. Huge 12v. battery, charger for same, stabilised 12v. supply for converters.

A modified T.C.A. 1674 unit for 146 MHz f.m. channels A, B and C; power output 55 watts.

FET or MOSFET converters for v.h.f. bands—home-brew. Home-brew receiver for 4-6 MHz. tunable i.f. for 52 MHz. Collins 75S2 receiver for 21 MHz. i.f. for 144 and 432 MHz. Davco DR30 receiver for 21 MHz. tunable i.f. for 144 and 432 MHz. Spare transmitter for each above; spare converters for each band.

Four element beam on 20 ft. mast for 52 MHz. Two 10 element beams stacked vertically for 144 MHz, matched with a half-wave section of 70-ohm coaxial line. Two 5 element beams stacked vertically for 146 MHz, matched as above. Four 9 element beams H-stacked for 432 MHz., matched with lines as above. All antennas fed with UR67 (50 ohm) co-ax.; fittings mostly N type from antenna to tx, BNC inside the shack.

2.5 kva. alternator, 75 yards extension cable, tent, towers for all beams, rope, headphones, morse keys, log books, etc., and FOOD.

The gear was carried in and/or on a Land Rover and a Valiant sedan.

We certainly had a good time in the contest and we are sure everyone else in it did also. A contest is a fine way of testing your gear and your operating techniques (including your temper). A field day is even better if it gives you a chance to get out of the power line noise and i.f. clutter you in the city.

Get together with some locals and organise an expedition for next year's contest. You don't need to do it on a grand scale—that can come later. It's easy to borrow camping gear, get someone to hire it (same applies to your generator—share the cost among three or more).

We'd like to see some multipliers introduced for v.h.f. operation in this contest (higher scoring anyway). Seems peculiar that a 200-mile contact is worth the same points on 80 metres as on 432 MHz. Alternatively, how about multiple contacts? We invite comments and suggestions from other operators.

Finally, thanks to all the home stations who came on the air and provided some extra activity this year.

---

DEFINITE SUNSPOT NUMBERS FOR 1970

<table>
<thead>
<tr>
<th>Day</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>115</td>
<td>121</td>
<td>137</td>
<td>112</td>
<td>118</td>
<td>102</td>
</tr>
<tr>
<td>2</td>
<td>83</td>
<td>96</td>
<td>129</td>
<td>105</td>
<td>118</td>
<td>92</td>
</tr>
<tr>
<td>3</td>
<td>78</td>
<td>82</td>
<td>113</td>
<td>122</td>
<td>121</td>
<td>64</td>
</tr>
<tr>
<td>4</td>
<td>69</td>
<td>60</td>
<td>116</td>
<td>110</td>
<td>116</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>66</td>
<td>72</td>
<td>107</td>
<td>120</td>
<td>113</td>
<td>59</td>
</tr>
<tr>
<td>6</td>
<td>57</td>
<td>93</td>
<td>101</td>
<td>117</td>
<td>113</td>
<td>57</td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>104</td>
<td>112</td>
<td>123</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>37</td>
<td>102</td>
<td>118</td>
<td>147</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>59</td>
<td>126</td>
<td>172</td>
<td>133</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>84</td>
<td>132</td>
<td>125</td>
<td>186</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>136</td>
<td>117</td>
<td>122</td>
<td>132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>138</td>
<td>153</td>
<td>88</td>
<td>163</td>
<td>134</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>145</td>
<td>145</td>
<td>104</td>
<td>141</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>134</td>
<td>174</td>
<td>144</td>
<td>145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>155</td>
<td>115</td>
<td>65</td>
<td>106</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>138</td>
<td>146</td>
<td>48</td>
<td>92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>160</td>
<td>142</td>
<td>29</td>
<td>82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>168</td>
<td>143</td>
<td>41</td>
<td>68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>159</td>
<td>126</td>
<td>67</td>
<td>106</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>133</td>
<td>125</td>
<td>93</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>118</td>
<td>126</td>
<td>115</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>104</td>
<td>132</td>
<td>122</td>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>79</td>
<td>104</td>
<td>135</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>72</td>
<td>106</td>
<td>140</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>98</td>
<td>173</td>
<td>142</td>
<td>93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>118</td>
<td>124</td>
<td>81</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>130</td>
<td>150</td>
<td>115</td>
<td>88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>146</td>
<td>146</td>
<td>110</td>
<td>106</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>154</td>
<td>143</td>
<td>118</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>158</td>
<td>111</td>
<td>116</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>131</td>
<td>101</td>
<td>127</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean: 111.54 127.8 102.9 109.5 127.5 106.8

<table>
<thead>
<tr>
<th>Day</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>137</td>
<td>77</td>
<td>93</td>
<td>63</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>153</td>
<td>61</td>
<td>104</td>
<td>57</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>153</td>
<td>94</td>
<td>110</td>
<td>43</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>159</td>
<td>59</td>
<td>115</td>
<td>55</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>165</td>
<td>65</td>
<td>120</td>
<td>75</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>161</td>
<td>63</td>
<td>133</td>
<td>53</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>125</td>
<td>72</td>
<td>136</td>
<td>72</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>115</td>
<td>83</td>
<td>109</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>104</td>
<td>76</td>
<td>116</td>
<td>78</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>71</td>
<td>103</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>81</td>
<td>75</td>
<td>92</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>74</td>
<td>73</td>
<td>76</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>118</td>
<td>124</td>
<td>81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>68</td>
<td>94</td>
<td>76</td>
<td>117</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>61</td>
<td>108</td>
<td>75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>61</td>
<td>104</td>
<td>68</td>
<td>133</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>59</td>
<td>99</td>
<td>65</td>
<td>84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>106</td>
<td>108</td>
<td>76</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>92</td>
<td>113</td>
<td>83</td>
<td>92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>117</td>
<td>114</td>
<td>70</td>
<td>126</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>120</td>
<td>117</td>
<td>69</td>
<td>101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>128</td>
<td>111</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>110</td>
<td>116</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>110</td>
<td>129</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>114</td>
<td>124</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>138</td>
<td>109</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>153</td>
<td>91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>161</td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>114</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>138</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>122</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean: 112.5 93.0 99.5 86.6 95.2 83.5

Yearly Mean equals 104.7.

---

WENDT ELECTRONICS

COMMUNICATIONS' RECEIVER

FOR FOA SYDNEY: $178.50

A BANDS COVERING 540 Kcs. TO 30 Mcs.
TWO MECHANICAL FILTERS ENSURE MAXIMUM SELECTIVITY.
PRODUCT DETECTOR FOR S.S.B. RECEPTION.
AUTOMATIC NOISE LIMITER.
LARGE TUNING AND BANDSPREAD DIALS FOR ACCURATE TUNING.
"S" METER AND B.F.O.
2 MICROVOLTS SENSITIVITY FOR 10 DB S/N RATIO.

TRIO
9R - 59DS

WESTON ELECTRONICS

376 EASTERN VALLEY WAY, ROSEVILLE, 2069.
Cables and Telegraphic Address: WESTELECI, Sydney.
Phone: 40 1212

Please forward free illustrated literature and specifications on Trio equipment.

NAME ____________________________
ADDRESS ____________________________

PRICE: FOR/FOA SYDNEY: $178.50

Eidgenossische Sternwarte, Zurich.

A UNIT OF JACOBY MITCHELL HOLDINGS LTD
376 EASTERN VALLEY WAY, ROSEVILLE, 2069.
Cables and Telegraphic Address: WESTELECI, Sydney.
Phone: 40 1212

Please forward free illustrated literature and specifications on Trio equipment.

NAME ____________________________
ADDRESS ____________________________

PRICE: FOR/FOA SYDNEY: $178.50

---

Amateur Radio, July, 1971 Page 23
20-PAGE STOCK CATALOGUE!

New extended range of ELNA electrolytic and tantalum capacitors.
New range of TYK ceramic capacitors.
New ELNA-FOX C.C. resistors.
New NOBLE slide miniature trim potentiometers.
New car radio suppressors.

Send for your copy NOW!

SOANAR ELECTRONICS Pty. Ltd.

Hy-Q Electronics Pty. Ltd., Australia's largest facility devoted exclusively to the development and production of Quartz Crystals and related products, have greatly expanded their production capacity to provide even better service for Australian equipment manufacturers.

Hy-Q's new fully air-conditioned plant provides application engineering, design and testing facilities in addition to a large production capacity for low frequency and high frequency crystals in glass, cold weld or solder seal holders, crystal filters, discriminators and crystal oscillators.

These facilities are available to all equipment manufacturers and crystal users. Hy-Q Electronics do not manufacture equipment, nor are they affiliated with any other manufacturer so that you may discuss your problems and requirements in complete confidence.

Write, Phone or Telex us any time.

Hy-Q Electronics Pty. Ltd.

1-10-12 Rosella Street,
P.O. Box 256, Frankston, Victoria, 3199
Telephone: 783-9611. Area Code 03.
New Equipment

ACITRON SSB-400

We believe this unit (photograph is on the front cover), known as the SSB-400 and is designed specifically for Amateurs, is the first Australian designed and made product of this type.

The transceiver is basically a 400 watt p.e.p. transmitter covering the Amateurs bands 160 through to 10 metres and including also two metres at a lower power level of 20 watts p.e.p. out.

The receiver front end uses dual gate zener protected Mosfets for improved cross-modulation and inter-modulation performance. This in turn feeds into an integrated circuit balanced mixer which in turn goes through an eight-pole 9 MHz. crystal filter with a bandpass of approximately 2.3 KHz. The i.f. system also uses dual gate zener protected Mosfets for greatly improved a.g.c. action, followed by the product detector and finally the audio system which delivers 3 watts of audio output at less than five per cent. distortion.

The local oscillator system starts with a 5-6 MHz. v.f.o. which is heterodyned with high frequency carrier crystals in an integrated circuit balanced mixer. The output of this feeds through bandpass filters before it goes into the transmit and receive mixers, thus greatly reducing the possibility of spots.

The frequency readout incorporates approximately twenty integrated circuits in a complete frequency counter which in turn drives a set of gallium arsenide seven-segment display indicators. These have the advantage of greatly reduced size and greatly increased life over the more conventional nixie type display.

The clock oscillator for the frequency counter is a 100 KHz. crystal, this gives approximately 50 cycle accuracy on the readout itself. The readout system is designed to readout to the nearest 1 KHz., but has a built-in scaling switch which enables the final decimal place to indicate 100 cycle steps.

The unit tunes directly both 7.5 and 15 MHz. which enables the digital readout clock oscillator to be accurately set up without any sophisticated test equipment.

The transmitter consists of a 9 MHz. balanced modulator, once again an integrated circuit, which gives greatly improved carrier suppression. This in turn feeds through the 9 MHz. filter and into the transmitter mixer. The output of the transmitter mixer feeds through the receiver front end which is band switched to obtain the required spurious rejection, the output of this feeds through a broad-band transistor amplifier and finally into the p.a. valve. Apart from the final p.a. valve, which is a v.h.f. dual tetrode, the unit is fully solid state.

For two metre operation an in-built conversion system enables the 28 MHz. band to act as an i.f. for the two metre converter. Two MHz. coverage is given on ten and consequently also on two metres. The front end on two metres consists also of dual gate zener protected Mosfets and the transmitter output on two metres consists of strip lined v.h.f. transistors.

The transceiver comes complete with a matching power supply and extension speaker and has all the normal features such as v.o.x., a.l.c., c.w. both upper and lower sideband, noise blanker, etc.

The SSB-400 is currently in production and should be available to the general public during the month of September.

ZONE 29 AWARD

The Zone 29 Award is issued by the Western Australian Division of the Wireless Institute of Australia to licensed Amateurs and S.W.L's throughout the world. To qualify for this award, the following conditions must be satisfied:

2. The total of 25 different stations may be obtained by operation on one or more of the Amateur bands.
3. Any types of emission which are permitted by the local licensing authority may be used.

The Certificate will be endorsed when issued as confirmation of fulfilment of the following special conditions:

(a) All 25 stations obtained from operation on one band only. (Open)
(b) All 25 stations obtained from operation of phone transmission (a.m., f.m., etc.).
(c) All 25 stations obtained from operation of c.w. transmission.
(d) All 25 stations obtained by one band operation and phone only.
(e) All 25 stations obtained by one band operation and c.w. only.
(f) 25 stations heard by S.W. Listener in (a) to (e) of above.

Confirmation in writing of all contacts must be submitted to:

The Secretary,
W.I.A. (W.A. Division),
Box N1002, G.P.O.,

Together with $1(A) or 10 I.R.C.

THE WIRELESS INSTITUTE OF AUSTRALIA
WESTERN AUSTRALIAN DIVISION

ZONE 29 AWARD

This is to certify that has this day submitted to the VK6 Division of the W.I.A. satisfactory evidence of two way communications with twenty-five Amateur Stations in Zone 29, by operating under conditions as printed on reverse side of this certificate.
CORRESPONDENCE:

NOVICE LICENSING

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 am somewhat perturbed by the correspondence which has appeared in your pages on the subject of Novice Licensing. I believe this correspondence has all been from those who oppose the proposal, or at least from those against the proposal. I am, therefore, compelled to the opinion that either such correspondence is not in the majority, or if so, likely, those against the proposal are suffering from the unwarranted weakness of yielding to a very local minority.

As I understand the position, a report was prepared and done by sub-committee and presented to the last Federal Convention. I further understand that the report will be made available on application to the chairman of the sub-committee (this information was garnered from VK2APQ) but apart from one small plea in a letter in "A.R." No. 399, I have been unable to obtain arguments against the proposal appear to have been made. They have been made a rather weak case, I believe, but apart from one small plea in a letter in "A.R." No. 399, I have been unable to obtain arguments against the proposal appear to have been made. They have been made a rather weak case, I believe, but apart from this, it seems to me that if they give the impression that they are not pertinent to the main trouble in that matter, and such comments as they received or thought up themselves are better left to themselves.

I have made it my business to read the report and prepare a presentation for the committee and presented it at the meeting. I find it is time some attention was drawn to the inaccuracies in the figures that are presented in the general public. It is obvious, I believe, that the committee was composed entirely of gentlemen desirous of establishing a novices licence. This is not to be faulted. It is done in an attempt to state a case against the proposal, and I will try to do so. It is not to be faulted.

I believe that the committee has some trouble in Japan, in fact, if it is anything, it is far better to ask for a comparison. There is no increase in October? Surely this is not the fairest way to seek a comparison. Allow me to partly rectify their oversight, but apart from that, it appears to me that this was not possible not entirely due to the advent of a new licence. It is true that the advent of a new licence was due largely to two other factors which I believe appear to ignore, as I believe this was not possible not entirely due to the advent of a new licence. It is true that the advent of a new licence was due largely to two other factors which the report appears to ignore, and that is not to say that it is not possible. The report does not cover this aspect more fully, when one considers the fact that in 1969, there were 250,000 Novices in Japan, and the Japanese licence figure should read 250,836. If this is the case, then I will stand up for the proposal.

The report has the grace to say that this was a fair comparison. But the report has the grace to say that this was a fair comparison. Let us look at some further figures for countries which, from the report, I would infer to be well above the average of the majority of countries in the world, as is Australia, by Argentina 1 in 1460, Canada 1 in 1460, Faroe Islands 1 in 1900, and the Japanese figure should read 250,836. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal.

The report has the grace to say that this was a fair comparison. But the report has the grace to say that this was a fair comparison. Let us look at some further figures for countries which, from the report, I would infer to be well above the average of the majority of countries in the world, as is Australia, by Argentina 1 in 1460, Canada 1 in 1460, Faroe Islands 1 in 1900, and the Japanese figure should read 250,836. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal.

The report has the grace to say that this was a fair comparison. But the report has the grace to say that this was a fair comparison. Let us look at some further figures for countries which, from the report, I would infer to be well above the average of the majority of countries in the world, as is Australia, by Argentina 1 in 1460, Canada 1 in 1460, Faroe Islands 1 in 1900, and the Japanese figure should read 250,836. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal.

The report has the grace to say that this was a fair comparison. But the report has the grace to say that this was a fair comparison. Let us look at some further figures for countries which, from the report, I would infer to be well above the average of the majority of countries in the world, as is Australia, by Argentina 1 in 1460, Canada 1 in 1460, Faroe Islands 1 in 1900, and the Japanese figure should read 250,836. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal.

The report has the grace to say that this was a fair comparison. But the report has the grace to say that this was a fair comparison. Let us look at some further figures for countries which, from the report, I would infer to be well above the average of the majority of countries in the world, as is Australia, by Argentina 1 in 1460, Canada 1 in 1460, Faroe Islands 1 in 1900, and the Japanese figure should read 250,836. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal.

The report has the grace to say that this was a fair comparison. But the report has the grace to say that this was a fair comparison. Let us look at some further figures for countries which, from the report, I would infer to be well above the average of the majority of countries in the world, as is Australia, by Argentina 1 in 1460, Canada 1 in 1460, Faroe Islands 1 in 1900, and the Japanese figure should read 250,836. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal. It was recently stated that there are 250,000 Novices in Japan. If this is the case, then I will stand up for the proposal.
much of this equipment will prove to be too tempting for the owners, and we will have a spate of piracy?

4. How is the P.M.G.'s Department going to police the activities of this hoped-for increase in the Amateur ranks, when they do not have the manpower to adequately do the job at the present time?

5. Assuming that the manpower can be found to adequately police the Amateur bands, what will be the cost and what will be required in the way of increased licence fees to meet such expenses?

6. What is the estimated costs of the straightforward administration of a Novice licence scheme as far as the P.M.G.'s Department is concerned, and will it affect examination and/or licence fees?

7. With the best will in the world, it is impossible to imagine that there will not be an increase in the amount of radio equipment available for commercial work. Is it not possible that the AMATEURS will be responsible for the increasing amount of time fiddling with radio, rather than devoting their time to more essential studies, however, as a Novice licence is a vastly different proposition from an A.O.C.P., there is a chance to put in a neat little week a night a week. The position may be different in the case of a person contemplating a career in the teaching profession. While it is an accepted axiom that all work and no play makes Jack a dull boy, I recall it, the code examination takes only a matter of minutes. As a suggestion, would any advantage be found in devoting a little extra time to this part of the examination, and run two or three minutes at 5 w.p.m., followed by two or three minutes at 8 w.p.m., followed by two or three minutes at 10 w.p.m. A pass could be gained with a mark of 85% at 5 w.p.m., 85% at 8 w.p.m., and 75% at 10 w.p.m., at the expense of the teacher being sufficient to qualify in one examination rather than two examinations.

Sir, I thank you for the space you have made available, whilst the examination requires 10 w.p.m. Can I recall it, the code examination takes only a matter of minutes. As a suggestion, would any advantage be found in devoting a little extra time to this part of the examination, and run two or three minutes at 5 w.p.m., followed by two or three minutes at 8 w.p.m., followed by two or three minutes at 10 w.p.m. A pass could be gained with a mark of 85% at 5 w.p.m., 85% at 8 w.p.m., and 75% at 10 w.p.m., at the expense of the teacher being sufficient to qualify in one examination rather than two examinations.

Amateur Radio, July, 1971
MEET THE OTHER MAN
Meet David VK4AUU (ex-VK32AT, VK4AK, VK3AUV, of Noibies Nob, Tennant Creek First licensed in 1955. David moves around a lot in the ‘outback’ for the various callsigns. At present he is fully operational on 52 MHz running 400 watts p.e.p. from a pair of 572BS into a 9 element Swan-type yagi at 25 feet. He uses an FTV6000 transverter at VK4AUU and a VK6SV/4 at VK4KCR for receiving. Tunable i.f. is a Drake 7B. He has a 15 element 2 metre yagi 30 meters tall at present on the ground! On 23rd, while on 432 he has a 20 watt output capacity using a BATYSE.

Whilst in VK3 on 23rd, he worked VK1 to 9 inclusive, ZL1, 2, 3, and 4 plus KH6 and 3A. From the same area on 144 MHz, VK3, 5, and 7. While at Tennant Creek, David has worked on 52 MHz: VK1, 2, 3, 4, 5, 7, and 8, JA, HL5 and KH6. Note also he worked VK7LZ on 285 MHz, while in VK3. He is a member of the W.I.A. and during 1960-61 was Sub-Editor for the V.h.f. page in "Amateur Radio." From Noibies Nob, 1105 feet above sea level, he has been interested in meteor scatter working and has a fairly constant path to Doug VK4KMK in Darwin, a distance of 540 miles.

Mike VK3ASQ passes along the news that experimental activity on 432 and 1296 MHz. seems to have had a considerable initial boost. Late in April Phil VK3OPH on Casey Base worked a station on Macquarie Island, and later he and Steve VK3TAB had a series of contacts. Phil runs a continuous keyer c.w. at present, and while it is a bit hit-and-miss, it was a good sign that some sort of beacon was being operated. It seems to be open to question, so will someone hear something? A brief note refers to a new member of the W.I.A., Peter Florentine, who is a member of the W.I.A. and during 1960-61 was Sub-Editor for the V.h.f. page in "Amateur Radio". Peter Florentine, who is a member of the W.I.A. and during 1960-61 was Sub-Editor for the V.h.f. page in "Amateur Radio."

David concluded his transmission with the comment "Why do a lot of people use crummy receivers to feed their v.h.f. converters into, while they have good communications receivers for the f.m. bands? It’s no wonder they can only work the station on the back fence." "Why do a lot of people use crummy receivers to feed their v.h.f. converters into, while they have good communications receivers for the f.m. bands? It’s no wonder they can only work the station on the back fence."

Thought for the month: "While money isn’t everything, it does keep you in touch with your friends. Why can’t people understand this?"

David concluded his information with the comment "Why do a lot of people use crummy receivers to feed their v.h.f. converters into, while they have good communications receivers for the f.m. bands? It’s no wonder they can only work the station on the back fence."

David concluded his transmission with the comment "Why do a lot of people use crummy receivers to feed their v.h.f. converters into, while they have good communications receivers for the f.m. bands? It’s no wonder they can only work the station on the back fence."

Thought for the month: "While money isn’t everything, it does keep you in touch with your friends. Why can’t people understand this?"

David concluded his information with the comment "Why do a lot of people use crummy receivers to feed their v.h.f. converters into, while they have good communications receivers for the f.m. bands? It’s no wonder they can only work the station on the back fence."

Thought for the month: "While money isn’t everything, it does keep you in touch with your friends. Why can’t people understand this?"

David concluded his transmission with the comment "Why do a lot of people use crummy receivers to feed their v.h.f. converters into, while they have good communications receivers for the f.m. bands? It’s no wonder they can only work the station on the back fence."

Thought for the month: "While money isn’t everything, it does keep you in touch with your friends. Why can’t people understand this?"
As intimated previously, this will be the last batch of notes for some time, and there is a good possibility that I will return to the game in a few months. In the meantime I would like to thank those who have sent so many QSLs. It has been an easy task and trust that you will support the new scribe. The address for all correspondence is Box 36, East Melbourne, Vic., 3022.

Mr. Bill W., Ernie Luft, in Elizabeth, S.A., told me he has received JY1/King Hussein's call at last, also one from LA3UF for QSLs. He has heard TA3HC, who has been active during the period 14225 from 0300-0700 and 1200 to 1530z.

The home address is C/o. S.E.G., B.P. Libre-TR3MR and often heard during the period 14225 from 0300-0700 and 1200 to 1530z.

The reasons for QSLs have been active from Casey on 20 metres, whilst the first prefix was used by some of the DX News recipients. The fine efforts of the operator concerned. They have not neither the brains nor the ability to do something worthy of support. Another DX-pedition to Willis Is. and Mellish Reef later this year.

This DX-pedition to Willis Is. and Mellish Reef later this year.

Several stations are active from JT in Zone 1B, all being on 14225 from 0300-0700 and 1200 to 1530z.

The St. Lucia Amateur Radio Club were scheduled to operate from VP2LDD on 1st and 2nd May using all bands. There is only one batch of notes I will be preparing. The reasons for QSLs have been active from Casey on 20 metres, whilst the first prefix was used by some of the DX News recipients. The fine efforts of the operator concerned.

That is all for another month, and for me the final issue. I would thank those who have supported us over the past couple of years, and sincerely urge as many of our readers from this country to support the new sub.

No DX-pedition to Willis Is. and Mellish Reef later this year.

Both these DX-peditions are purely private ventures worthy of support. Another DX-pedition to Willis Is. and Mellish Reef later this year.

The DX-peditions are purely private ventures worthy of support. Another DX-pedition to Willis Is. and Mellish Reef later this year.
Overseas Magazine Review

AssYAN BROADCASTING UNION TECHNICAL REVIEW

March 1971, Issue No. 18—

Price-Locked Local Oscillator, WESFP. A new type of locking circuit is described in detail, covering 14 to 50 MHz. This is for the amateur's equipment and is for use in a general receiving set. It is described in more detail on page 249 in the "Amateur Radio" series of lectures 11 and 12. The A.B.U. Then.

The A.B.U. Review might not be readily available, but it is possible to borrow a copy from the Electrical Society of Australia in most parts of the world, other than some parts of Africa and North America. The International Telecommunications Union and broadcasting organisations are members or associates of the A.B.U. —VK3AXU.

HAM RADIO MAGAZINE

March 1971—

Phase-Locked Local Oscillator, KIRAK. The mixer-driver involves only three valves push-push 750s in output, with a power output in the linear range of 0.5 W at 14 KHz. A receiving converter achieves a good moderate signal with a single and dual gate FET combination.

The Repair and Technical Review by W1HDQ. Here is an easy to build Transmitter that will not run out of power for the amateur's equipment. It is described in more detail on page 251 in the "Amateur Radio" series of lectures 11 and 12.

New Products. Various commercial items of moderate interest, but none of great importance about the availability of a "QRPP Magazine" published by the A.R.S. and "The Modified ZS". Includes construction projects, technical articles, operating news, etc. Published six times per year. The price is $3.00 annually. W. Mattock, K6EIL/2, 115 Park Ave., Binghamton, New York 13902, U.S.A.

O.H.M. (The Oriental Ham Magazine) February 1971—

For those amateurs who are keen to keep in touch with what is happening in the Far East and especially in the British Crown Colony of Hong Kong, this little magazine will do the job. In the issue they talk about a DX-pedition to the Gulf where Dick Bartlett was to go in April. There is an "Intruder Report" on page 7 which lists a number of stations that are supposed to be elsewhere in the spectrum.

Harris on the MET 2000 describes a mobile rally held recently on that band in Hong Kong and the fun that was had by all.

April 1971—

A Transmatch for Field Day, W1KGL. Here is an easy to build Transmatch that will not run out of power for the amateur's equipment. It is described in more detail on page 251 in the "Amateur Radio" series of lectures 11 and 12.

Digital Filters, 2LZAF. Seems like another device which will fit its way into some Amateurr rigs, perhaps to narrow the bandwidth for a few (c.w. and a few) and for space time frequencies used in r.t.y.

The Down-to-earth "Sky Hook". W1HE deserts a note on their local oscillator cover problems. All materials are commonly available and the main point is that there should be no difficulty in duplicating the design. The core counterweight is a useful gimmick. I have seen another type in VKJ which used four gallon oil drums filled with an appropriate quantity of water.

The Five Finger Keyer, W2IMU. Working on the assumption that the more of the hand you touch the more you can do.

The Lemon Antenna Switching, WCICP. A simple method, particularly suited to the needs of the newcomer to Amateur Radio. The relay is an n.d.t. type.

A 2.3 GHz. Crystal Controlled Receiver, W1WJK. A practical idea for narrow band u.h.f. reception.

Receiving F.M. Part IV, W1KGL. Basic principles and new circuits.

Husky Power Supply for Sweep Tube Amplifiers, WCICP. Take one transformer at 950-960v. 700 ma., full wave rectifier, and feed to a filter consisting of 3 x 23 ohm, u.f. electrolytically charged and wired with 90000-0.5 amp continuous/over 1 amp s.s.b. rating. The full-wave bridge power supply is stated to be no problem to this omnidirectional antenna using two full wave loops. The Letters in April 1971—

Review by W1HDQ.

Five Foot Finger Keyer, WCICP. Defined by the author as "The Ultimate Solution to C.W. QRM". You'll need to read it yourself to see whether or not it is a "have-one". Stated to be a system recently "de-classified by the U.S. Government".

Modern Ham Jargon Defined, WIRGL. An old theme in new guise.

RADIO ZS

April 1971—

Testing the VHF and UHF Spectrum, ZS1FM. An article designed to show newcomers how they can go about making the most use of these bands.

Indexing Systems. ZS1ACK describes some methods of indexing the QSOs you conduct and the QSLs sent out so that you do not waste money duplicating some of them.

Captain Alcatraz, HOCBEP. Makes an Incredible Voyage. VK4SS tells the story of the incredible VC40 "La ZB".

Fifty Years of Amateur Radio. Eddie ZS1DH describes how the "Amateur" could not be Amateurs without being builders and they all rolled their own from raw materials. It seems that before the advent of 1930 there were no radio retailers, wholesalers or manufacturers of any kind.

In the same issue is an "insert" describing a New, Solid Slate Receiver, the W1KGL, built from a DC amplifier and a thyatron detector with s.s.b. type signals with I.F. bandwidths of 5000 - 10000 Hz and 3 KHz called the "Barlow-Wadley XCR-30 Receiver". Performance is stated to be quite outstanding for a price of $29 and in a box U.S. x 10 x 14 x 3 inches, operating from six dry cells.

COPAL-CASLON

DIGITAL ELECTRIC CLOCKS

Clearly Visible Figures instantly readable Accurate

CASLON 201
A desk/table model of graceful design. 12- and 24-hour types. White. Charcoal Grey. Built-in neon lamp. 6.1 x 3.5 x 3.5 in. Price $16.95

CASLON 401
A larger model wall clock awarded the Good Design Selection by the Japan Design Committee. Features larger flip cards, 12- and 24-hour types. Charcoal Grey and Light Grey. Built-in neon lamp. 6 x 4.7 x 3.3 in. Price $24.00

CASLON 601
A unique desk/table calendar model, combining beauty, receiving the Mainichi Industrial Design Award, Japan. Digital flip cards advance date, day, hour and minute automatically. 12- and 24-hour types. Anodised aluminium case houses build-in neon lamp. 6:1/2 x 4.0 x 3.5 in. 602: 8.5 x 4.0 x 3.5 in. Price $25.00

CASLON 701

Caval Electronic Services
60 SHANNON ST., BOX HILL NTH., VIC., 3129
Phone 882-2133

Casio Clocks come from the world's larg- est and most advanced producer of Digital Clocks and Movements

Post and Packing (registered), $1

Bail Electronic Services

Amateur Radio, July, 1971
Results of 2nd "World Rtyt Championship" 1971

The table shows the scores obtained in the five categories, with 0 points possible. The final placing is given by the best four scores out of five possible. The final placing is given by the best four scores out of five taken into account.

<table>
<thead>
<tr>
<th>No.</th>
<th>Call</th>
<th>Bands</th>
<th>WAC</th>
<th>EUR</th>
<th>OCE</th>
<th>AFR</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>VE2LO/W6</td>
<td>40</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>2.</td>
<td>VK3DV</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>3.</td>
<td>VK3AY</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>20</td>
<td>130</td>
</tr>
<tr>
<td>4.</td>
<td>VK3AO</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>40</td>
<td>160</td>
</tr>
<tr>
<td>5.</td>
<td>VK3AJ</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>60</td>
<td>190</td>
</tr>
<tr>
<td>6.</td>
<td>VK3AM</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>80</td>
<td>210</td>
</tr>
<tr>
<td>7.</td>
<td>VK3AX</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>100</td>
<td>240</td>
</tr>
<tr>
<td>8.</td>
<td>VK3AY</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>120</td>
<td>270</td>
</tr>
</tbody>
</table>

Scoring: The final score is the total QSO number multiplied by the sum total multiplier from all bands. Scoring is based on the number of contacts made. Only the original contact, however, has QSO number value. An additional 1 point credit can be claimed for every QSO number over 100.

Certifications: Single operator, all bands; multi-operator, single transmitter. Contest periods: Only 12 hours of operation out of the 48 hours are permitted for single operators. The 12 hours of non-operation may be taken one hour at a time, or in more than three periods any time during the contest. Exchange: A contact QSO can only be established between a European and a European, and a European and a station in the United States. The usual five or six digit serial number plus a progressive QSO number starting with 001.

Points: Each QSO will count 2 points, except for the continental leader. A station may be worked once per band. Each confirmed QSO given receives one point. Point values: Single operator participants holding their first certificate will receive a certificate when scoring 10 percent of the continental leader. Disqualification: Violation of the rules of the contest, or unsportsmanlike conduct, or taking credit for excessive duplicate contacts will be deemed sufficient cause for disqualification. The decisions of the Contest Committee are final.

Legs: It is suggested to use the log sheets of the DARC or equivalent, i.e., QSO number, country code, time, band, operator, signal report, number of QSOs by country, and summary sheets (QSOs or QTCs per sheet). Minimum $1 for forty words. Extra words, 3 cents each.

SILENT KEYS

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

VK4EJ—Dale West.
VK4GZ—Esmond Waddle
VK4HR—Harry Scholz

ANTARCTICA RESEARCH

The W.I.A. has been requested to assist in current scientific discussions about propagation into, out of, through, or via Antarctica. It appears that there is a lot of scientific knowledge stored away in individuals minds or log books but not brought together for general discussion and application. So, next May a Symposium on technical and scientific problems affecting Antarctic Telecommunications is proposed to be held in Norway.

If so, please write it down and send it in as early as possible to Federal Executive, W.I.A., P.O. Box 67, East Melbourne, Vic., 3002. Thank you.
ECONOMICAL SSB! from YAESU

FT-200 FIVE-BAND TRANSCEIVER

A superb quality, low cost, versatile transceiver. Covers 80-10 m, tuning range 500 Kc. each band. On 10 m, crystal supplied for 28.5-29 Mc. (Crystals available optional extra for full 10 m 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. Fixed channel facility optional extra, useful for net operation, skeds, etc.

Operates from conservatively rated separate 230 volt 50 c.p.s. AC power supply, FP-200, which includes built-in speaker. A 12 volt 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.

Price, FT-200, $350 inc. Sales Tax
FP-200 AC Power Supply to suit FT-200, $90 inc. Sales Tax
DC-200 DC Power Supply to suit FT-200, $120 inc. Sales Tax
FV-200 External VFO for use with FT-200, $98 inc. Sales Tax


All sets checked before despatch. After-sales service, spares availability, 90-day warranty. All Yaesu sets sold by us are complete with plugs, power cables and English language instruction manual. Prices and specifications subject to change.

Sole Australian Agent:
BAIL ELECTRONIC SERVICES
60 Shannon St., Box Hill North, Vic., 3129. Phone 89-2213

N.S.W. Rep.: STEPHEN KUHL, P.O. Box 58, Mascot, N.S.W., 2020. Telephone: Day 67-1650 (AH 37-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379
Distributors
For Australian and
International
Manufacturers...

TEST EQUIPMENT:

RAPAR • BWD
SWE-CHECK • HORWOOD

Call and see our big range of test equipment

SEMI-CONDUCTORS:

TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

1971-72 CATALOGUE NOW AVAILABLE, S3

RAPAR Model SK100 Multi-tester

radio parts

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!
A & R OUTPUT TRANSFORMER

TYPE ED M10

Primary impedance: 8,000 ohms c.t.; ultra-linear screen taps: 43% turns; ultra-secondary impedance, 2.8 and 15 ohms; power rating: 10 watts; frequency response: plus or minus 1 dB 50 Hz. to 20 kHz.; overall size: 4½ x 2-1/16 x 2½ in.; mounting centres: 2½ in.

Few Only! Price $8.00 Postage $1.

AMERICAN RECORDING TAPE

(New, in sealed boxes)

1500 feet, 7-inch, Acetate, 1 ½ mil. ................... $3.50
1200 feet, 7-inch, Acetate, 1 ½ mil. .................. $2.50
1200 feet, 7-inch, Mylar, 1 ½ mil. ................... $2.50
1200 feet, 5½-inch, Acetate, 1 mil. .................. $2.20
1200 feet, 5½-inch, Mylar, 1 mil. ................... $2.50

Postage 10c.

LAFAYETTE SOLID STATE

HA600 COMM. RECEIVER

Five bands, a.m., c.w., s.s.b., Amateur and Short Wave. 150 to 400 kHz, and 30 MHz. Two mechanical filters, base dial. Product detector. Crystal calibrator. Variable BFO. Not limited. 6 metres. 24 in. bandspread: 250 MHz. a.c./12v. d.c., neg. earth operation. RF gain control. Size: 15 x 9½ x 8 inches. Weight 18 lb. S.A.E. for full details.

Price $199.50 net.

LAFAYETTE HAB00, solid state, as above but Ham Band only. SS.B-CW AM. Price $195 net.

TRIO COMM. RECEIVER

MODEL BR-58DS

Four-band receiver covering 550 kHz to 30 MHz. continuous, and electrical bandwidth on 10, 15, 20, 40 and 80 metres. 8 valves plus 7 diode circuits. 4/8 ohm output and phone jack. SSB-CW-AM, ANL, variable BFO. 5 meter, sep. bandspread dial. I.F. 455 KHz., audio output 1.5w., variable RF and AF gain controls. 115/250v. AC mains. Beautifully designed. Size: 7 x 15 x 10 in. With instruction manual and service data.

Price $178.50 including sales tax

Speaker to suit, type SP5D, $15.30 incl. tax.

“REALISTIC” DX150

COMM. RECEIVER

Solid state, four bands covering 535 KHz. to 20 MHz., and electrical bandwidth on 10, 15, 20, 40 and 80 metres. 8 valves plus 7 diode circuits. 4/8 ohm output and phone jack. SSB-CW-AM, board: 240v a.c. or 12v. d.c. operation. Product detector for SSB/CW plus fast and slow a.v.c. variable pitch b.f.o.; illuminated electrical bandspread; fully calibrated for Amateur bands, cascaded r.f. stage, and for r.f. a.v.c.; a.f.; t.i.; audio; illuminated S meter; built-in monitor speaker.

Price $234.20 incl. tax

Matching speaker to suit, $13.60

BROADCAST BAND TUNER

Locally made, Model 401 uses a shielded 3-stage pre-selector. Product detector. Crystal calibrator. Variable BFO. Provides heterodyne output in steps of 1 MHz. Dial driven by crystal and 250 KHz./500 KHz. BFO. Provides heterodyne output 1 MHz. to 20 MHz., audio output 1.5w., load impedance not less than 47k. Complete in plastic box with dial. Ready to plug in. Price $25.00 net.

POCKET CRYSTAL RADIO

Type ER22. Set complete. Price $1.50.

A.C. ADAPTOR—BATTERY SAVER

Type PS54—240 volts to 6 or 9 volts, 300 mA. $12.50
Type PS62—240 volts to 6 or 9 volts, 100 mA. $8.50

Price 30c.

GREEN CAP CONDENSERS

Sizes: 0.001, 0.0022, 0.0033, 0.0047, 0.0056, 0.0068, 0.0082 uF. Price 12c each.
Sizes: 0.01, 0.022, 0.033, 0.047, 0.056, 0.068, 0.082 uF. Price 15c each.
Sizes: 0.1, 0.22, 0.33, 0.47 uF. Price 18c each. 1 uF. (200w.v). 2 uF. (200w.v). Price 58c each.

RESISTORS

½ watt 8c each. 1 watt 16c each.

RADIO SUPPLIERS

323 ELIZABETH STREET, MELBOURNE, VIC., 3000
Phones: 67-7329, 67-4286 All Mail to be addressed to above address

Our Disposals Store at 104 HIGHET ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 10.30 a.m. to 5.00 p.m., and on Saturdays to midday.

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.
CONTENTS

Technical Articles:

- Angle Modulation—Lecture No. 14B ................................................................. 3
- Home Station Antenna for 160 Metres: Part Four—Practical Application ............. 13
- P.e.p., Average Power, and Related Matters .................................................. 6
- Practical V.h.f. and U.h.f. Coil-Winding Data ............................................... 7
- V.h.f. Meteor Scatter Propagation ....................................................................... 11

General:

- Antarctica Research ......................................................................................... 15
- Australian Flying Corps No. 1 Squadron in Egypt 1917 ................................. 16
- Book Review: “Understanding Amateur Radio” ............................................. 10
- Correspondence ................................................................................................. 21
- DX ..................................................................................................................... 22
- Federal Awards .................................................................................................. 22
- Federal Comment: An Open Reply to an Anonymous Letter ......................... 2
- Federal Contest Committee ............................................................................. 20
- Golden Jubilee .................................................................................................. 20
- Indonesia Licensing .......................................................................................... 15
- Licensed Amateurs in VK ............................................................................... 15
- New Call Signs .................................................................................................. 17
- Obituary ............................................................................................................. 15
- Observation Post ............................................................................................... 20
- Overseas Magazine Review ............................................................................ 19
- Prediction Charts for August 1971 .................................................................... 19
- Repeater News .................................................................................................. 23
- Silent Keys .......................................................................................................... 24
- SPX Bulletins ..................................................................................................... 21
- VHF ..................................................................................................................... 23
- W.I.A. D.X.C.C. ............................................................................................... 24
- 3 Squadron Amateurs at Richmond, N.S.W., 15th July, 1940 ......................... 16

COVER STORY

Industry, as well as Radio Amateurs, uses relays for switching purposes. Here 22 relay racks are being pre-wired for signalling of Melbourne railway yard. Each rack holds 231 transistor radio size relays.

(Block by courtesy of V.R.)
FEDERAL COMMENT:

AN OPEN REPLY TO AN ANONYMOUS LETTER

"Michael Owen, VK3KI,

Dear Sir,

Having perused Ron's (VK3RN) correspondance item in the July issue of 'Amateur Radio,' I can only fully agree with his findings.

The Institute is seeking an increase in membership—that is the impression I get from the various articles I read. My personal advice is, you are not seeking in the right area. There are many who would join the organisation if it would at least attempt to try to do something for them. I have spoken with Limited licensees on the question of the W.I.A., but they have said that they would not join. They feel that the Institute serves only one class, and that it has done nothing towards fighting for better frequency allocations for them.

The Institute has now worsened their image in their sight, in as much that you are willing in principal to allow an unskilled Novice on the h.f. bands, and the Limited licensees well knows of your opposition towards his gaining a little extra. If these people were allowed to operate on some of the h.f. bands it might liven it up a bit, because they are quite dead at the moment. As far as I am concerned these people in most cases are more than technically qualified—the greater percentage being employed in the electronic industry as engineers and advanced technicians.

Close your eyes if you dare—but let me warn you that it is in danger of starting an organisation* totally divorced from you, then it will be too late for you to make amends.

—A VERY FULL-UP CALL

"This could [be] closer than realised."

Dear Mr. Anonymous Letter Writer,

Unfortunately, as you did not put your name or address on your letter, I cannot reply to you personally. However, as I think you have raised some important issues, I think that it is proper to reply to your letter through this magazine. I hope that you do not mind.

At the outset, I would like to thank you for your interest in writing to me expressing your opinion. I think that is very good; it is really what the Institute is all about. Its task is to represent the Amateur Service in our country and obviously it can't do this without knowing what Amateurs think. Of course I think I should also point out that the anonymous letter is usually the least effective way of expressing views.

Having said that, may I join issue with the Anonymous Letter Writer, on a number of things that you say in your letter as I am afraid that you have been misinformed on a number of points.

You are right, of course, when you say that the Institute seeks an increase in membership. The higher the percentage of licensees that are members of the Institute, the more representative the organisation is of the Amateur Service and, at the same time, the more effective it can be its representation. That is why I think that it is in all our interests for as many Amateurs as possible to be members of the Institute.

But then you go on to say that you have spoken to many Limited licensees but that they feel that the Institute represents only one class of licence and has done nothing towards fighting for better frequency allocations for them. Your argument really surprises me. As I was a Limited licensee myself for ten years prior to 1967, I have always had a particular interest in the v.h.f. spectrum.

Mr. Anonymous Letter Writer, you seem to have overlooked the fact that the Limited licence was only introduced because of the representations of the Institute. You also overlooked the fact that a major portion of the Federal Council and Federal Executive's time in the last two years has been devoted to the International Telecommunications Union Space Conference which, as I write to you, is now in session in Geneva. This Conference is of great interest to the v.h.f. operator and it is possible that it could substantially affect his operating rights and privileges.

You overlook also, that as a result of what the Institute has done, our country is one of the countries at this Conference that has taken up the cause of the Amateur Service. You also overlook the fact that as a member of the Region 3 Association (which, incidentally, was formed as a result of the initiative of the Institute in 1968) the Institute is a substantial contributor to the costs of sending a representative, Tom Clark­son, ZL2AZ, of New Zealand, to Geneva as a member of the International Ama­teur Radio Union's delegation. There, he is our special representative at the Space Conference.

You asked for "better frequency allocations". Yes, I know all about the 6 metre band—you cannot win them all. But really, are you serious in seeking more v.h.f. spectrum? I have not noticed an overcrowding problem on either the 144-148 MHz. allocation or the 420-450 MHz. allocation. Have you? I am not sure that your letter makes your complaint completely clear.

I think you really mean that Limited licensees should be permitted to operate on v.h.f. bands above 50 MHz. Many people would agree with you, but I rather think that more would disagree with you. Of course, if you are a member of the Institute, it is open to you to attempt to persuade the Institute to adopt a long term policy in relation to the Morse qualification requirement.

But, of course, the simple fact is that this is not just a matter for the Aus­tralian Post Office. Australia, as a member of the International Telecommu­nications Union, is bound by the I.T.U. Convention, an international agreement between the countries. That agreement specifies that a Morse qualification is required for Amateurs licensed to operate below 144 MHz. Although in fact in Australia, this qualification is only required below 32 MHz.

I am afraid that you have completely misconceived the present position in relation to Novice licensing. You also seem to think that I am personally "pushing" the Novice licence proposals. I am not. Neither I nor the Federal Executive have expressed any view at all on this matter. The policy of the Institute at this time is not to advocate the issue of a Novice type licence, but the Institute is having another look at this policy. The Federal Council has sought a report from a committee formed for the purpose and the Divisions are now seeking the views of members generally. That is the reason that I am not expressing my view on the question of a Novice licence. As Federal President, I feel that on this matter I should not, in any way, attempt to influence members to my particular view.

If, Mr. Anonymous Letter Writer, you are a member (and you do not make this clear), then you can and I suggest you should, take part in Institute affairs by expressing your view. As I said at the outset, that is what the Institute is all about. I agree with you that we do need more Amateurs on the h.f. bands. I think we need more Amateurs on all bands, but I believe that the Institute has to be realistic. We cannot, even if we wanted to (and I do not suggest that we do), just go and change the International Regulations. The Institute can, however, make it easier and more attractive for the Limited licensee to take part in Institute affairs. But, I think, Mr. Anonymous Letter Writer, that the Morse code speed used to be 14 words per minute. It was the Institute that successfully sought a reduction of this speed to 10 words per minute.

No, Mr. Anonymous Letter Writer, I do not think that neither I nor the Insti­tute has to make amends to the Limited licensees. We are not perfect and certainly we cannot expect all our members to be in agreement on every issue all the time, but I do think that the Limited licensee has no basis for thinking the Institute is not representing him.

Indeed it may well be that the thinking Limited licensee, who knows the real facts, could conclude that he should be a member of the Institute because of what it is now doing for him and because, perhaps, it could do even more with more support by Limited licensees.

Yours sincerely,

Michael J. Owen, VK3KI,
Federal President.
ANGLE MODULATION

LECTURE No. 14B

Using sine waves, it is possible to illustrate the differences between amplitude, frequency and phase, and this has been done in Fig. 1.

Fig. 1a shows a single sine wave at three different amplitudes.

Fig. 1b shows three sine waves of the same amplitude and phase, but differing in frequency.

Fig. 1c shows three sine waves of the same frequency and amplitude, but differing in phase.

These three figures should be studied closely.

FREQUENCY MODULATION

When using an audio frequency voltage to produce f.m. it is the amplitude of the voltage which causes the carrier frequency to shift or deviate symmetrically from its assigned frequency and amplitude, but differing in frequency.

Furthermore, it must be realised that in an f.m. transmitter the frequency deviation depends entirely on the amplitude of the modulating wave, not on its frequency, thus if we take two frequencies at random, say 200 Hz. and 3,000 Hz., the carrier frequency deviation depends on the amplitudes of these frequencies.

Now in speech, music and sounds produced in nature, it is almost impossible to find a sustained sine wave, as almost all sounds are made up of many waves and produce complex waves. Our radio and television receivers recover such complex waveforms from the transmitted signal and the loudspeaker converts this into the motion of particles of the air, to produce sound waves which our ears can register and understand.

However, so far in this discussion of f.m. we have described only the manner in which an audio frequency voltage, sine wave or complex, causes deviation of the carrier frequency and amplitude variation in the a.m. transmitter. Then each of these characteristics would be varied if either of the other waves of Fig. 1a was to be substituted.

In the U.S.A. for f.m. broadcast stations the maximum deviation is ±50 KHz. and audio frequency pre-emphasis of 50 micro-seconds.

In the U.S.A. for f.m. broadcast stations the maximum deviation is ±75 KHz., and audio frequency pre-emphasis of 75 micro-seconds, however, for television sound the maximum deviation is ±25 KHz. with an audio frequency pre-emphasis of 50 micro-seconds.

Digressing for a moment; in the Australian mobile radio-telephone services in the frequency bands 30-85 MHz. and 156-174 MHz., as from 30th June, 1969, the maximum deviation permitted for angle modulated stations has been ±5 KHz. (International maritime mobile u.h.f. radio-telephone and existing P.M.G. subscriber services were excluded.) The reduction of deviation to ±5 KHz. was made to enable 30 KHz. channeling of mobile stations so that more "speech" type stations could be accommodated in the available spectrum space. However, in January 1970 the demand for f.m. mobile services was becoming so great that stations in the same area had to share a common carrier frequency.

It is proposed to use the Australian standards in the remainder of this lecture to avoid confusion. This means that the loudest passage of, say, a musical concert would cause the carrier to deviate ±50 KHz. Thus the maximum applied audio frequency modulating voltage produces the maximum frequency deviation of the carrier whilst the carrier amplitude remains constant.

This is in direct contrast to amplitude modulation where the carrier frequency remains constant but the amplitude varies.

Thus if one of the sine waves shown in Fig. 1a was applied simultaneously to an f.m. transmitter and an a.m. one it would produce a certain amount of frequency deviation in the f.m. transmitter and a certain amount of amplification in the a.m. transmitter.

Fig. 2 is not drawn for any particular audio frequency. Therefore if the audio frequency is, say, 100 Hz. then time is 1/100th second, for 1,000 Hz. time is 1/1,000th second and for, say, 15 KHz. time is 1/15,000th second.

Fig. 2 shows that the deviation is entirely dependent on the amplitude of the modulating voltage and not on frequency.

It is the frequency of the modulating voltage which governs the rate at which the deviation takes place.

It is the frequency of the modulating voltage which governs the rate at which the deviation takes place.

It is the frequency of the modulating voltage which governs the rate at which the deviation takes place.

This is in direct contrast to amplitude modulation where the carrier frequency remains constant but the amplitude varies.

Thus if one of the sine waves shown in Fig. 1a was applied simultaneously to an f.m. transmitter and an a.m. one it would produce a certain amount of frequency deviation in the f.m. transmitter and a certain amount of amplification in the a.m. transmitter.

---

*6 Adrian Street, Colac, Vic., 3250.
To the list of Transceivers, available at reduced prices, are to be added two products of K.W. ELECTRONICS LTD. of England. Solidly built sets, as to be expected from British manufacture, the ATLANTA five-band Transceiver (a copy of the SWAN 500) and the KW2000B (which is built along the lines of the Collins KWM2), similar in appearance with the 160 metre band added—the only Transceiver with that band covered! Both sets will arrive in August with their own AC power supply-speaker units, but in limited quantities. The same applies to the YAESU MUSEN Transceivers listed, so better hurry to profit from the special offers and low prices.

—Arie Bles

<table>
<thead>
<tr>
<th>YAESU MUSEN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FT-101 AC/DC Transceiver, with the latest modifications, improvements, etc.</td>
<td>$520</td>
</tr>
<tr>
<td>FT-200 with heavy duty power supply</td>
<td>$350</td>
</tr>
<tr>
<td>FT-DX-400 AC Transceiver de luxe</td>
<td>$425</td>
</tr>
<tr>
<td>FT-DX-401 AC Transceiver super de luxe with CW filter, WWV, etc.</td>
<td>$465</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>K.W. ELECTRONICS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ATLANTA 500 watt P.E.P. Transceiver, with AC supply unit</td>
<td>$500</td>
</tr>
<tr>
<td>KW-2000-B Six-band Transceiver, with AC supply unit</td>
<td>$550</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELECTRONIC KEYERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>KATSUMI, Model EK26, with built-in monitor, 240V. AC operation, keying paddle attached, fully or automatic operation, with switching transistors and keying relay, speeds up to 65 w.p.m.</td>
<td>$60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANTENNAS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hy-Gain TH6DXX Master Tri-bander</td>
<td>$220</td>
</tr>
<tr>
<td>Hy-Gain 14AVQ Vertical</td>
<td>$52</td>
</tr>
<tr>
<td>Hy-Gain Hy-Quad, Tri-band Cubical Quad with gamma matches for single co-ax, feedline</td>
<td>$130</td>
</tr>
<tr>
<td>MOSLEY TA33 Jr Tri-band Junior Beam</td>
<td>$105</td>
</tr>
<tr>
<td>Mosley MUSTANG Tri-band Beam, 1 kW. power</td>
<td>$130</td>
</tr>
<tr>
<td>NEWTRONICS 4-BTV 4-band Vertical</td>
<td>$80</td>
</tr>
<tr>
<td>WEBSTER and MARK Helical Mobile Whips</td>
<td>$55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALVES AND TUBES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CETRON 572-B 150 W. zero-bias linear amplifier triodes</td>
<td>$45</td>
</tr>
<tr>
<td>EIMAC 3-500-Z zero-bias triodes</td>
<td>each $37.50</td>
</tr>
</tbody>
</table>

All prices quoted are net, cash with order, subject to alteration without prior notice, sales tax included in all cases. Postage, freight and insurance are extras, and transformers are heavy!

CRYSRTALS

| FT-241 type, all Channels 0 to 79, 375 to 415 KHz per box of 80 Crystals | $15 |
| Sets of six FT-241 matched for filter use, 375 to 450, and 470 to 515 KHz per set | $7.50 |

MIDLAND PRODUCTS

The Type 13-710 one-watt Transceiver, soon also available with crystals for 28.1, 28.2, 28.3, 28.4 or 28.5 MHz, for the same price | $37.50 each |

Type 23-135B Field Strength Meter, with five ranges, tunable from 1 to 200 MHz., with telescoping whip | $10 |

Type 23-136 SWR-Power Meter, dual meters 100 microamp., very sensitive for low power but good for 1 kW. maximum, up to 175 MHz., reads forward and reflected power simultaneously, 52 ohm impedance | $20 |

Type 23-126 SWR Meter, standard single meter type, 52 ohm impedance, with whip for field strength metering | $12 |

PTT Dynamic Hand Microphone, steel case, 50K ohm impedance, excellent voice quality, no rocking armature type, with coiled cord and mobile use clip | $10 |

Table Model Dynamic Microphone, with PTT bar or lock switch, 50K ohm imped., a quality bargain | $15 |

Same Table Microphone with built-in two-stage pre-amplifier, adjustable for up to 50 dB. amplification | $25 |

Co-ax. Connectors, Midland types PL-259, SO-239 females with or without flanges, PL-258 double-ended female; per connector | each 75c |

Co-ax. Inserts for PL-259 for thinner co-ax. cable; each | 20c |

Midland 5-watt Base Station Transceivers, eight-channels, 240V. AC, fully P.M.G. approved for 27.880 MHz. operation, with S meter and power-output metering, including PTT microphone, with switch to be used as 3-watt public address amplifier into separate speaker(s). All inclusive, only | $100 |

TRANSFORMERS

Still a few types of the old stock of new NATIONAL Transformers left!
plus double the deviation; i.e. if a modulation frequency of 15 kHz is applied to give full frequency deviation, then the bandwidth will be 

\[(2 \times 15) + (2 \times 50) = 130\, \text{kHz}\]

This is shown in Fig. 2b which illustrates an audio frequency modulating voltage producing a deviation of 25 kHz. Note that Figs. 2a, and 2b are not drawn to the same scale, as 2b would be ten times the size of 2a if drawn to the same scale.

The centre frequency of 100 MHz has been used for ease in explanation. In particular, any angle modulated transmitter on this frequency, the nearest to it being the sound transmitter of television channel 4 where the centre frequency is 100.75 MHz.

The effect of an inductance on an alternating current is to cause the current to lag, and the amount of the current will be dependent upon the amplitude of the voltage, the inductance, and the frequency. Should the frequency be held constant then there will be an increase of current as the inductance is decreased.

This may be restated by saying that if the inductance is held constant, then the current will increase as the frequency decreases. Mathematically this may be expressed as: 

\[I = \frac{E}{\omega L}\]

We have stated above that one property of an inductance is to cause the current in an a.c. circuit to lag behind the voltage and it is proper to consider that anything that can cause the current to lag behind the voltage may be considered to have the property of an inductance even if physically it does not resemble an inductance in any manner.

We also know from a.c. theory that the effect of a capacitance in an a.c. circuit is the opposite of an inductance, that is, a capacitance causes the current to lead the voltage.

As mentioned earlier, a valve may be connected in such a manner that it appears to be a reactance and the circuit may be arranged so that this reactance may be either positive or negative.

Fig. 3 shows the circuit of a reactance valve modulator. This reactance valve modulator will appear as an inductance to the oscillator tank circuit.

Here briefly is the manner in which this occurs.

The resistance \(R\) is made very large in comparison to the capacitive reactance \(X_C\) and as a result of this, r.f. current from the oscillator tank circuit passing through \(R\) and \(C\) is essentially in phase with the voltage across the oscillator tank. This means that the current through condenser \(C\) is in phase with the voltage across the oscillator tank circuit.

Going back to a.c. theory, we remember that the voltage across condenser \(C\) will lag behind the current by 90° and it is this voltage which is applied to the grid of the valve. Now as the voltage on the valve grid varies so does the valve's plate current in phase with the grid voltage; i.e. whenever the grid voltage decreases so does the plate current and vice-versa.

It was stated above that the voltage across \(C\) is 90° out of phase with the current (lagging) and as the valve plate current is in phase with the grid voltage (across \(C\)), then the plate valve current lags behind the oscillator tank current by 90°. Therefore the valve is, in effect, an inductance in parallel with the oscillator tank circuit.

The amount of plate current drawn by the reactance valve, and thus its effective inductance, depends on the grid bias, the voltage, and the amount of the inductance. Should the frequency be held constant then there will be an increase of current as the inductance is decreased.

A similar state of affairs exists if two inductances are connected in parallel as the resulting inductance will be less than either of the two inductances.

Inductances are impedances, mainly resistive, and we can state the parallel resistances formula for impedances like reactive, and we can state the parallel resistance formula for impedances:

\[Z = \frac{Z_1 Z_2}{Z_1 + Z_2}\]

The amount of plate current drawn by the valve modulator will appear as an inductance and the amount of the current will be dependent upon the amplitude of the voltage, the inductance, and the frequency. Should the frequency be held constant then there will be an increase of current as the inductance is decreased.

In Australia there would not be any amateur radio, August, 1971
When an Amateur picks up a catalogue and looks at the power ratings of transmitters or amplifiers, it is more than likely that he will be confused, dismayed or possibly convinced that manufacturers have a devilish habit of conforming to double or triple standards when it comes to power ratings. It is my purpose to clear up some of this confusion by discussing what some of the power ratings actually mean.

The maximum input power that a transmitter can run is usually determined by the carrier value. Thus, if the amplifier is truly linear, the amplifier will run hotter with a given maximum input on c.w. than it does for s.s.b. operation. Such factors as pauses, spaces between dots and dashes, and letters and words are of course taken into consideration. Usually a linear amplifier will run hotter with a given maximum input on c.w. than it does on s.s.b. because the usual duty cycle for c.w. is greater than it is for s.s.b. Because of this, many transmitters have c.w. ratings which are about 75% of their s.s.b. ratings.

As a second example, let's use the same amplifier rated at 400 watts p.e.p. and use it for s.s.b. operation. If a single-tone input is used, the peak power input of 400 watts which would result could not be permitted to continue for more than a very few seconds. The reason being that the input of 400 watts would mean that the tubes would be dissipating 200 watts, which is beyond the maximum allowable dissipation, would overheat somewhat. The key-down input should therefore be reduced to 75/80 of 400 watts or 375 watts on c.w. as compared to 400 watts p.e.p. on s.s.b.

Much discussion over power measurement is heard on the air, and much of it is confusing. The term "d.c. input" is often used in connection with s.s.b. equipment. Without definition or qualification this term means little or nothing. When one talks into a microphone connected to a s.s.b. transmitter with a typical linear amplifier, the amplifier plate-current meter fluctuates from its resting value to peak values which are much higher. How high these peaks actually go depends on the voice waveform; what we read on the plate meter depends on the meter characteristics. It is often assumed that the highest meter reading is one half of the actual peak value, but this could be in error by a large factor. Actually an oscilloscope in the transmitter output circuit is the only accurate method of measuring peak power. A well set up two-tone measuring system as described in the A.R.R.L. Handbook is another method.

To summarise, both p.e.p. and average power values of input should be measured and understood in order to assure that the station transmitter is operating properly and within legal limits. Normally the s.s.b. peak power rating is the largest, with the c.w. rating close behind, and the a.m. carrier rating only about 25% of the s.s.b. p.e.p. rating.

SUPPORT PROJECT AUSTRALIS!

THE POPULAR

GREAT CIRCLE BEARING MAPS

60c Post Free

Printed on heavy paper 20" x 30", Great Circle Map 16" diameter. Invaluable for all DXers and S.w.l's. Bearings around circumference allow precise beam headings to be made.

ALL PROCEEDS TO W.I.A. PROJECT AUSTRALIS

Cheques, etc., to W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

We would again wish to thank all those people who have bought Maps and who made donations over and above the advertised price.

PRACTICAL V.H.F. AND U.H.F. COIL-WINDING DATA* 

Complete Details on Inductors from 2 Nanohenries to 1 Microhenry

DONALD KOCHEN, K3SVC

This article contains computer-generated data for building inductors from 2 to 1,000 nanohenries (1 nanohenry equals 0.001 μH). Since no calculations are involved, it is a simple matter to scan the tables and select the inductor that best meets your particular requirements. The first part of the article describes single-layer solenoids from 10 to 1,000 nH; the last part describes straight-wire inductors above a chassis that range from 2 to 100 nH.

V.H.F. INDUCTORS

Many v.h.f. experimenters have developed a sixth sense for winding r.f. coils—they've had to, since there does not seem to be any convenient coil winding data for this part of the spectrum. (The A.R.R.L. Lightning Calculator stops at 1 μH, and the Allied Coil Winding Calculator stops at 0.1 μH.)

The typical design procedure is to wrap some wire around a pencil (a coil form is also permitted) and trim the coil to resonance with the aid of a grid-dip meter and fixed capacitor. However, it takes a fair amount of experience to select the proper wire size and coil diameter that will give the desired inductance and still have reasonable Q and low capacitance.

Table 1 lists inductance and coil diameter that will give the optimum. By scanning the tables you can see that any inductance can be obtained by an optimum coil.

All calculated inductances were rounded off to the nearest 10 nanohenries. This means that the error of values below 30 nH. will be ±5 nH. This seemed sufficient since adjacent objects will introduce errors into the free-space design anyway. Below 10 nH. it is usually easier to build straight-wire inductors.

USING THE TABLES

The tables are intended for air-core coils whose dimensions are indicated in Fig. 1. Each table describes coils wound with a different inside diameter. Wire size and number of turns are specified along the edge of the chart. The data within the table is inductance in nanohenries (on top) and coil length in inches (below). The use of the inductance tables is best illustrated by several practical examples.

DESIGN PHILOSOPHY

The goal is an inductor that has high Q, low capacitance and compact size. Low coil capacitance means the inductor will have a high self-resonant frequency, and therefore a more useful frequency range. This can be achieved by a single-layer solenoid with adequate turns spacing. A good rule of thumb is to have a space equal to the diameter of the wire used; as a check, the overall length of the coil to resonance with the aid of a grid-dip meter and fixed capacitor.

Example 1:

What is the inductance of 5 turns of No. 18 wire, 0.250" in diameter, wound with spacing equal to wire diameter? From Table 2, opposite No. 18, and below 5 turns, you find this coil has 90 nH. inductance and is 0.44" long.

A coil of given inductance can be easily designed by scanning the optimum regions (bold-faced type) of each table. If the exact value is not found, the inductance may be mentally interpolated by changing the turns by a fraction or by compressing or expanding coil length.

Example 2:

A 50 nH. coil is required for a 20-w. transmitter. (Possibility is given first, then a comment.)

0.125" diam., 5 turns No. 24. Poor choice at this power level.

0.250" diam., 4 turns Nos. 12 or 14. Fair choice, only slightly out of optimum region.

0.375" diam., 3 turns No. 16. Marginal at this power level.

0.375" diam., 2.7 turns No. 18. Marginal at this power level.

0.375" diam., 2.7 turns No. 10. Good choice.

Example 3:

Same 50 nH. coil as in Example 2, but this time it is required for a receiver.

0.125" diam., 5 turns No. 24. Good choice, compact size.

0.250" diam., 3.5 turns No. 16. Good choice.

0.250" diam., 3.5 turns No. 18. Good choice.

0.375" diam., 2.7 turns No. 10. Good choice, but large size may add too much capacitance to the circuit.

U.H.F. INDUCTORS

As you can see from Tables 1, 2, 3 and 4, it is impractical to wind coils less than 10 nH. For less than 10 nH., inductances are very straight patterns of wire and are sufficiently. Quarter-wavelength resonators are common in microwave work and may be considered as an inductance in parallel with distributed capacitance.

Full-sized quarter-wave resonators are useful above 1 or 2 GHz, because of their convenient size and high Q. But at 432 MHz. or even 1296, the designer may want a more compact resonator. This can be accomplished by shortening the length needed for quarter-wave resonance and making up for the decreased inductance by adding external capacitance.

Obviously this is a design trade-off resulting in a lower Q, since Q = X/R, and decreased inductance means lowered Q. However, you have gained more compact size: e.g., 432 MHz. tank circuits may be built 1 or 2 inches long as compared with a full quarter-wavelength of 7 inches. You have also avoided an impedance-matching problem since connecting circuitry will usually be capacitive anyway.

In a transistor tank circuit the collector capacitance, tuning capacitor and coil capacitance are combined. Output is taken by either capacitor-divider coupling, transformer coupling or tapping down on the coil. (Motorola has an excellent application note for r.f. transistor design.)

(Continued on Page 9)

“QST” S6.40 yearly
“CQ” S5.70 and others
Through Federal Executive at Box 67, East Melbourne, 3002

Amateur Radio, August, 1971
Page 7
TABLE 1.—Coil data for 0.125 inch diameter air-wound coils. (Bold-face values represent optimum designs)

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Number of Turns</th>
<th>Wire Length (Inches)</th>
<th>Winding</th>
<th>Winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>14</td>
<td>20</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>20</td>
<td>50</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>22</td>
<td>10</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
</tbody>
</table>

TABLE 2.—Coil data for 0.25 inch diameter air-wound coils. (Bold-face values represent optimum designs)

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Number of Turns</th>
<th>Wire Length (Inches)</th>
<th>Winding</th>
<th>Winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>60</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>60</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>14</td>
<td>20</td>
<td>60</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>60</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>60</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>20</td>
<td>50</td>
<td>60</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>22</td>
<td>10</td>
<td>60</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>60</td>
<td>0.31</td>
<td>0.31</td>
</tr>
</tbody>
</table>

TABLE 3.—Coil data for 0.375 inch diameter air-wound coils. (Bold-face values represent optimum designs)

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Number of Turns</th>
<th>Wire Length (Inches)</th>
<th>Winding</th>
<th>Winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>80</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>80</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>14</td>
<td>20</td>
<td>80</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>80</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>80</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>20</td>
<td>50</td>
<td>80</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>22</td>
<td>10</td>
<td>80</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>80</td>
<td>0.32</td>
<td>0.32</td>
</tr>
</tbody>
</table>

TABLE 4.—Coil data for 0.5 inch diameter air-wound coils. (Bold-face values represent optimum designs)

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Number of Turns</th>
<th>Wire Length (Inches)</th>
<th>Winding</th>
<th>Winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>100</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>100</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>14</td>
<td>20</td>
<td>100</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>100</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>100</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>20</td>
<td>50</td>
<td>100</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>22</td>
<td>10</td>
<td>100</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>100</td>
<td>0.33</td>
<td>0.33</td>
</tr>
</tbody>
</table>

TABLE 5.—Inductance of wire 0.25 inch above a ground plane.

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Length (Inches)</th>
<th>Winding</th>
<th>Winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>12</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>14</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>16</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>18</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>20</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>22</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>24</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
</tr>
</tbody>
</table>

TABLE 6.—Inductance of wire 0.5 inch above a ground plane. (Upper value is inductance in nH, middle value is capacitance in pF, lower value is self-resonant frequency in GHz.)

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Length (Inches)</th>
<th>Winding</th>
<th>Winding</th>
<th>Winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>12</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>14</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>16</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>18</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>20</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>22</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>24</td>
<td>1.5</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
</tbody>
</table>
Tables 5, 6 and 7 contain computed data describing a wire of diameter D and length L, spaced height H above a ground plane as shown in Fig. 2. The data within the table is inductance (nH.) on top, capacitance (pF.) in the middle, self-resonance (GHz.) on the bottom. As before, the use of these tables is best illustrated by several typical examples.

**Example 4:**

What are the characteristics of a 2" length of No. 10 wire, spaced 0.25" above a ground plane?

From Table 5, a 2" length of No. 10 wire has 21 nH. inductance in parallel with 0.7 pF. Self-resonant frequency 1.2 GHz. (1200 MHz.)

**DESIGN PHILOSOPHY**

A quick scan of Tables 5, 6 and 7 reveals some interesting phenomena that should be kept in mind when laying out circuits. For example, moving the inductor closer to a ground plane increases its capacitance. Not so obvious is the fact that this also decreases inductance. The inductor and the ground plane may be considered

---

### Tables 5, 6, and 7

**Table 5:** Inductance of wire 1.0 Inch above a ground plane.

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>0.5</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.1</td>
<td>0.3</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
<td>0.9</td>
<td>1.0</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
</tr>
<tr>
<td>3</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
<td>0.8</td>
<td>0.9</td>
<td>1.0</td>
</tr>
<tr>
<td>4</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>5</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>6</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>7</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>8</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>9</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>10</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>11</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>12</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

(Upper value is inductance in nH., middle value is capacitance in pF., lower value is self-resonant frequency in GHz.)
to be a transformer with a shorted secondary. Hence, increased coupling results in less inductance. It turns out that the capacitance changes more than the inductance, and the net result is a lower resonant frequency.

Moving the inductor away from the chassis will raise the Q. Beyond a height of one inch, however, the computed L and C rapidly approaches the free-space inductance as a limit, and the law of diminishing returns applies.

Considering the resonator as a transmission line, its characteristic impedance is \( Z_0 = \sqrt{LC} \). Thus, moving the quarter-wave resonator too far from the chassis will raise its impedance to match the approximately 377-ohm radiation resistance of space. Then the resonator will then behave more like an antenna than a resonator.

Adding additional ground planes at right angles to form a co-axial cavity around the wire lowers the resonant frequency by about 10%. This implies that L and C have changed by more than that amount since they move in opposite directions. An estimate of the inductance and capacitance of a co-axial shielded wire can be made by considering it simply as a wire that is closer to a single ground plane. U.h.f. resonators are usually made from the larger diameter wires, but data for wires smaller than No. 18 is included mainly for estimating component lead inductance. The resonant frequency given in the table sets the upper limit at which the inductor may be used; above resonance it acts like a capacitor. The inductor should be chosen so that with the added external circuit capacitance the LC combination will resonate at the desired frequency.

**Example 5:**

It is desired to design a transistor tank circuit for 430 MHz, as shown in Fig. 3. The transistor has an output impedance of 3 pF, and the two impedance-matching variable capacitors are assumed to present an average capacitance of 4 pF, at the collector. Thus, total capacitance will be 7 pF, plus inductor capacitance. An LC nomograph (Fig. 4) indicates that 20 nH will resonate with 7 pF at 425 MHz.

The data for No. 14 wire spaced 0.25" above a ground plane (Table 5) shows that a 1/4" length has 17 nH inductance and 10.5 pF capacitance. Therefore, the tank circuit consists of 19 nH, in parallel with 17.4 pF, and has a mid-range resonance of 424 MHz.

**SUMMARY**

It is one thing to design on paper but u.h.f. and microwave work always require a certain amount of "cut and try". The approximations made and factors ignored in this article would probably send chills up the spine of a physicist. However, physicists don’t have to design equipment and make things work.

Each piece of equipment is a unique problem. Armed with basic data and some mental fudge factors, the designer can obtain a quick solution of reasonable accuracy. Compared to that, an exact calculation is usually impractical.

**REFERENCES**


---

**Book Review**

**UNDERSTANDING AMATEUR RADIO**

Publisher: A.R.R.L. Cover price $5/12.50

Amateur Radio has something to interest all types of people. Amateur Radio also provides a training ground wherein newcomers can learn Electronics and Communications principles and practice. "Understanding Amateur Radio" takes the newcomer through from first principles to a complete and quite elaborate station in a clear and concise manner. See the Secretary of your Division for this and many other interesting titles, or write to Federal Executive.—VK3JSC.

---

**ANGLE MODULATION**

(Continued from Page 5)

condenser, connected across the oscillator tuned circuit and this brings the oscillator back on its centre frequency if it drifts.

In another method the two-phase motor is replaced with an automatic frequency control (a.f.c.) which produces a voltage whose polarity depends on the direction of the oscillator drift and the amplitude is governed by the amount of drift. This voltage is applied as bias to the grid of the reactance valve modulator or to the varactors if they are being used to derive the frequency modulation.

As has been stated, it is difficult to frequency modulate a quartz crystal, but the Marconi Co. developed a method using a quarter wave transmission line between a reactance valve modulator and a quartz crystal. The crystal oscillates at 1/24th of the carrier frequency and the reactance valve modulator is capable of swinging the crystal frequency ±3.125 KHz. When the crystal frequency is multiplied twenty-four times to obtain the carrier frequency the deviation is ±75 KHz. There is f.m. sound broadcasting in Britain and ±75 KHz. is the maximum deviation permitted.

(to be continued)

---

**ERRATUM**

Hints on using Meteor Trail Ionisation for Six Metre DX

WALLY WATKINS,* VK5ZWW (ZL2TCW)

In most textbooks towards the end of the chapter dealing with v.h.f. propagation, reference is made to the esoteric forms of communication. However one look at the table, which shows antenna power and receiver capabilities necessary for these forms, usually pays no heed to any idea of using them.

Meteor scatter is no mode for the casual operator. However, it is within the grasp of all v.h.f. operators in Australia who have reasonable gear, ample patience and operating skill at both ends of the path.

Since August 1970 experiments and tests have been carried out to determine power levels and antennae required for meteor scatter in Australia. The path Tennant Creek, N.H., and Adelaide, S.A., was used for primary evaluation, the distance being 1,100 miles. Antennae and receiving set-up was similar at each end of the path but transmitter power was different.

As is generally known, the meteor signal is reflected, not from the particle itself but from the stream of ionisation left by the meteor as it is heated and vapourised by friction with the atmosphere.* This takes place in the E layer, about 100 km. above the earth, so that distances worked closely correspond with those of Es propagation.

It must be pointed out at this stage that there are two sets of conditions existing for meteor scatter propagation.

Firstly random meteors exist throughout the twenty-four hours a day, reaching a maximum at 0600 local sun time and dropping to a minimum at 1800 hours. The second is when the earth passes through a belt of space debris, which is predictable from year to year, and is known as a meteor show. For those who wish to delve more deeply into the mechanics of meteor scatter, the classic article by Walt W4L7U in "QST" of April 1957 is recommended.

It has been found that the minimum transmit requirements are well within the scope of the average Amateur. A 6 element beam is quite satisfactory provided it is up high enough to clear surrounding objects. The transmitter should run a 6/40 in the final with either 600 or 1,000 volts on the anodes. It is assumed that one is running s.s.b. and the 6/40 is operating in A.B.1.

At this location the FT-DX-100 runs into a homebrew transmitter using an E80CF oscillator-buffer at 24 MHz., a 6339 mixer-driver and a 6/40 with 1,000 volts on the anodes. The converter is a VK3F3 oscillator-injector from the E80CF. The antenna is a 9 element yagi on a 30-foot boom.

Because it is possible to talk faster than the average Amateur can copy c.w., s.s.b. is superior for this type of propagation. A voice average is about 80 w.p.m. and even though only bits of words are heard at a time, the whole text can be more easily pieced together. It is not intended to denigrate c.w., for c.w. has been found to be a convenient way of station identification, especially with solid state programmed keyers. However s.s.b. is usually used for the actual exchange of reports.

WHAT IS NEEDED?

What is now needed to make an actual contact via meteor scatter? First you must arrange for someone to be on frequency at the appropriate time. Thereafter patience is needed. It is here that the phrase "esoteric communication" takes on real meaning. If one participant has had previous experience and has passed on this experience to the other, then everything will fall readily into place.

For random meteors a five-minute calling period is used with each station taking alternate turns to call and listen. The identification, call signs and/or reports are repeated for the five-minute period. I have found that pre-recorded endless tapes are ideal for this purpose. During the peak of a known shower, the technique changes. The five-minute calling periods are retained, however station identification is given followed by a key-up period of three seconds. This allows for a form of break-in operation and enables the other station to be able to make a reply. The second method can be used during random meteor attempts but it is not recommended until some experience is obtained using the first method.

Frequency readout should be capable of an accuracy of ±500 Hz. and timing of segments can be synchronised with VNG or WWV. Over most paths enough is received during the first five-minute segment to v.f.o. onto the frequency and this is desirable even though it may be slightly off the nominal frequency.

What frequency should be used? This is determined by the particular choice as would be one subject brought up when arranging skeds. Two stations at one end of the path would be advised not to transmit during the same five-minute segment as this would preclude break-in operation. It is also recommended that stations calling with an easterly component in their antenna heading should call during the odd five-minute segments of the hour and those with a westerly component listen during the odd five-minute segments. During the even segments the roles are reversed.

Identification in the form "This is VK5AA" is acceptable, but phonetics must not be used. Identification is kept up until something definite is heard, then a special reporting system is used or if a contest is on the usual cypher is given.

REPORTING

Report coding for s.s.b. is as follows (c.w. coding would consist of only the initial letter (abbreviations):

Tango (T) = Bits—not enough to identify.
Mexico (M) = Words which can be pieced together to make out call signs and/or report.
Oscar (O) = Both call signs and/or report.
Roger (R) = Report received.

Combinations of M-R and O-R should be self explanatory and are frequently used. For "break-in" type of operation, providing it has been arranged in advance, there is no need to include the word "break" in the identification as this would be a waste of valuable time. Once contact has been established much time can be saved if extraneous matter in the way of call signs is kept to a minimum. The report or cypher is the important matter to get across and must, of course, be repeated more frequently.

If you are interested in trying this form of propagation you will find it is now up to you to take that first step and arrange that first sked—you will be surprised by how much you hear.

Meteor scatter should lead to some good "Ross Hull" scores this year, especially during the "Geminids" shower in December. Ten 13th and 14th December, 1970, VK8AU and VK5ZWW swapped two cyphers via M/S using break-in operation, so it can be done.

Thank you to those who have kept skeds with me (between 0500 and 2400), namely VK8AU, VK8KK, VK4RO, VK-2ZQJ, VK2ZNS, VK2ZRH, VK1YP, VK3ASY, VK3ZQC, VK5ZDX, VK5QZ and VK5ZDY, and to those 6 metre operators in Adelaide who have put up with endless hours of endless tape giving my identification.

REFERENCES
2. Up to 30th June, 1971.
KATSUMI MODEL EK-26
ELECTRONIC KEYER

Features:
- 11 transistors and 12 diodes solid state electronic keyer.
- Variable speed key capable of 8 to 60 w.p.m., semi or fully automatic.
- Fully digital-dot-dash ratio, always perfect, and space adjustment.
- Relay or transistor switch output option. (Tr. switch: max. 110v..100 mA.
  Relay: max. 700v..500 mA.)
- Built-in break-in OSO (VOX-CW) terminal.
- Built-in monitor-oscillator with speaker, and phone jack.
- Power Supply: 230v. 50-60 Hz. AC built-in
- Small in size: 140 (w.) x 70 (h.) x 190 (d.) mm. Weight: 3 lb. 12 oz.
Price $75.00

KATSUMI MODEL MC-22
MIC. COMPRESSOR

Specifications:
- Compression level: 26 dB. (1 KHz.) with meter (comp. level variable).
- Output voltage: 50 mV. max. at input 3 mV.
- Microphone impedance: 10-100K ohms, switchable.
- Frequency response: 300 - 3000 Hz. plus or minus 2 dB.
- S/N ratio: more than —50 dB.
- Transistors used: 3 transistors and 2 diodes.
- Power source, consumption: Battery type 216 or 006P (9v.). 2 mA. max.
- Dimensions: 120 (w.) x 70 (h.) x 80 (d.) mm.
- Weight: 1 lb. 5 oz.
- Accessories: Jack and plug.
Price $28.00

AUSTRALIAN AGENT:
BAIL ELECTRONIC SERVICES
N.S.W. Rep.: STEPHEN KUHL, P.O. Box 56, Mascot, N.S.W., 2020. Telephone: Day 67-1650 (AH 371-5445)
Western Aust.: Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

SPECIAL LOW PRICES! (WHILE PRESENT STOCKS LAST)
UP-DATE YOUR RECEIVER WITH CFS-455

MODEL CFS-455 is a high class ladder type I.F. filter, which makes use of the piezo-electric effect on lead-zirconate-titanate ceramics and is the modern equivalent of the conventional I.F.T.

This filter is well suited to transistor applications, especially to high quality communications receivers. It has the advantages of high selectivity, low impedance, no alignment, plus miniature size and light weight.

The outer dimensions of Model CFS-455 are as shown at the left. A nickel-brass case is mounted on a plastic base with pins designed for printed circuit mounting.

Specifications of Models now available from stock:

<table>
<thead>
<tr>
<th>Model</th>
<th>Centre Freq. (KHz.)</th>
<th>3 dB. Bandwidth (KHz.) Min.</th>
<th>6 dB. Bandwidth (KHz.) Min.</th>
<th>60 dB. Bandwidth (KHz.) Max.</th>
<th>70 dB. Bandwidth (KHz.) Max.</th>
<th>Insertion Loss (dB) Max.</th>
<th>In, Output Impedance (Ohm)</th>
<th>Temp. Range (°C.)</th>
<th>Discount Price (+27½% S.T. if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFS-455 A</td>
<td>455</td>
<td>±13</td>
<td>±17.5</td>
<td>--</td>
<td>±30</td>
<td>6</td>
<td>1500</td>
<td>--20</td>
<td>$12.00</td>
</tr>
<tr>
<td>CFS-455 E</td>
<td>455</td>
<td>±5.5</td>
<td>±8</td>
<td>--</td>
<td>±15</td>
<td>8</td>
<td>1500</td>
<td>$12.00</td>
<td></td>
</tr>
<tr>
<td>CFS-455 G</td>
<td>455</td>
<td>--</td>
<td>±4</td>
<td>±9</td>
<td>--</td>
<td>8</td>
<td>2000</td>
<td>$16.80</td>
<td></td>
</tr>
<tr>
<td>CFS-455 J</td>
<td>455</td>
<td>--</td>
<td>±1.5</td>
<td>±4.5</td>
<td>--</td>
<td>10</td>
<td>2000</td>
<td>$16.80</td>
<td></td>
</tr>
</tbody>
</table>

Stability of Centre Frequency: Within 0.4% for 10 years; within ±0.3% from —20°C. to +80°C.

Available from:—
IRH COMPONENTS PTY. LIMITED
THE CRESCENT, KINGSGROVE, N.S.W., 2208 — 74 RAGLAN ST., PRESTON, VIC., 3072
HOME STATION ANTENNA FOR 160 METRES

Part Four—Practical Application

J. A. ADCOCK,* M.I.E. (Aust.) VK3ACA

VERTICAL vs. HORIZONTAL FOR TRANSMITTING

As can be seen from Fig. 1, the majority of signal from a vertical is along the ground and zero in the vertical direction, whereas with a horizontal the signal is zero along the ground and maximum vertically. Since surface wave propagation is by the vertically polarised mode only, only the vertical component is useful in surface wave propagation. During the day this mode of propagation may be useful over a distance of 100 miles over flat country—example, Melbourne to Coorong; propagation is poor over mountainous country being not much use more than 10 miles. At night propagation via the ionosphere is possible. With the vertical antenna signals returned via the ionosphere will be weak close to the transmitter and strong some distance away. This gives rise to a dead zone between the limits of the ground wave and the sky wave. If the lobe signal strength from a horizontal and a vertical were equal, the strength of the rays at 45° to the ground would be equal, this corresponds to a distance of approximately 350 miles. In fact if the vertical and horizontal were of equal efficiency, the peak lobe signal strength at right angles to the wire is greater for the horizontal than the vertical.

Fig. 16.—The distance in miles, from the antenna up to which the horizontal is advantageous, is plotted against comparative efficiency. The curves are for signals reflected from an ionosphere 180 miles high by a single hop. The earth is assumed to be flat and the effect is illustrated in Fig. 17.

Where the horizontal antenna is less efficient (this includes most practical cases for short antennas close to the ground) the area in which the horizontal is advantageous becomes less. A horizontal with an efficiency of only half that of the vertical will still give an advantage over a distance from 300 to 400 miles. The use of a horizontal of very poor efficiency can provide a useful signal in the dead zone (between 20 and 100 miles at night).

The distance over which the horizontal should be preferable to the vertical is shown in the graph Fig. 16. The graph is based on the assumption of an ionosphere height of 180 miles and a flat earth. (Efficiency referred to is power efficiency as calculated by the methods given in other sections.) These assumptions are reasonable for late at night and over the distances considered. If it is desired to apply the graphs to other ionospheric heights the distances can be worked out by simple proportion.

VERTICAL vs. HORIZONTAL FOR RECEIVING

For receiving surface waves the same applies to receiving as transmitting—the receiving antenna must be largely vertical for best results. For receiving signals via the ionosphere, the situation is quite different. Since a signal loses polarisation via the ionosphere it does not follow that the transmitting and receiving antennas must be of the same polarisation. The receiving patterns for the two antennas will be the same as their transmitting patterns.

Since the main concern of a receiver is signal to noise ratio, relative efficiencies of receiving antennas are of no significance (it being assumed that the antenna noise is well above the threshold noise of the receiver). The main consideration is the angle from which the noise is coming. The majority of local noises are vertically polarised. The majority of distant static is received at a low angle and therefore received best on a vertical antenna. Local storms and storms within a radius of 500 miles will probably produce a stronger noise on a horizontal antenna.

Because most noise is received best on a vertical antenna, very considerable advantages can accrue from using a horizontal receiving antenna. Another advantage of a well balanced horizontal is that it gives good rejection against strong local signals. The best mode of the receiving antenna under different noise conditions for different propagation distances are shown in Table 1.

It can often happen that an interstate or country signal can be almost inaudible on a vertical antenna and 5...9 on a horizontal.

To take full advantage of horizontal reception it is desirable that the antenna should have practically no vertical component. This is difficult to achieve because of the tendency of the vertical component to dominate. For best results the virtual ground should be parallel with the antenna. The antenna, feeders and tuning unit should be balanced and as symmetrical as possible. The position is complicated by surrounding buildings. Objects like drain pipes and iron roofs may be sufficiently coupled to the antenna to produce a considerable vertical component and thus destroy some of the properties of the horizontal.

Fig. 17.—Illustrating how a horizontal with an efficiency less than that of a vertical can produce a stronger signal in a limited area.

CALCULATIONS AND DISCUSSION

The purpose of this discussion is to examine results obtained in practice and to endeavour to make some useful conclusions. Most of the practical results agree with those obtained by calculations. Some of the conclusions drawn are largely supposition, but should be useful to anyone who is experimentally inclined and would like to try them in practice.

The antenna used by the author is a horizontal centre fed length of wire 84 feet long and 30 high. The feeders

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Low Noise</th>
<th>High Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Surface Wave</td>
<td>Vertical</td>
<td>Vertical</td>
</tr>
<tr>
<td>2. Intermediate distances up to 800 miles</td>
<td>Horizontal or sometimes Vertical</td>
<td>Horizontal</td>
</tr>
<tr>
<td>3. Long distances</td>
<td>Vertical</td>
<td>Either, depending on results</td>
</tr>
</tbody>
</table>

Table 1.

*P.O. Box 106, Preston, Vic., 3022.
are sloping but these have been considered vertical. The feeders can be fed either in parallel against ground or as a doublet. The normal earth consists of a water pipe driven into the ground close to the transmitter plus four radials at right angles averaging 20 feet long and connected at the ends to various objects such as water pipes. A counterpoise is available for erection when required. The counterpoise is parasitically tuned against ground as in Fig. 12 (b). The power input to the class C final of the transmitter was as calculated from equation (6) comparing with 658 ohms (measured) which corresponds with 0.47 from the dotted curve (point 1). The resistance at the end of the line can be found by continuing along the graph to electrical distance 0.534. The resistance at this point would be 19 ohms—point 2 on Fig. 14. From measurement, the resistance was actually 6.2 ohms. If we take 6.2 ohms at point 0.534 (point 3), this corresponds to a resistance at the centre of 16 ohms (point 4) and an s.w.r. of 1.8. If the ground were perfectly conducting the resistance should be (from Fig. 15):

\[ R = 0.505 \times 0.093 = 0.0465. \]

To sum up the following emerges:

- Radiation resistance above perfect ground = 0.465 ohm.
- Radiation resistance in space = 5.0 ohms.
- Actual resistance = 16 ohms.

The actual effect of a poorly conducting ground is impossible to determine. Is it possible to apply the same method for determining efficiency as for a vertical antenna? That is: efficiency = theoretical radiation resistance + actual resistance.

In the case being considered,

\[ \text{Efficiency} = 0.465 + 16 = 0.029 \times 16 = 0.29 \%

As with the vertical antenna a check was made to see if the measuring point was as calculated. To check this, the reactance can be obtained from Fig. 9 at point 0.534 as 300 ohms which compares with 6.2 ohms (measured) which corresponds with 0.47 from the end. This represents an error which, if correct, would make little difference to the feed point resistance calculations. It probably indicates that the antenna proper had a characteristic impedance greater than 600 ohms.

Comparing the efficiency of the horizontal with that of the vertical, the result is:

\[ \text{Efficiency} = 0.029 + 0.175 = 0.165. \]

Some results obtained from reports when comparing the horizontal with the vertical for transmitting were as follows:

(Continued on Page 15)
George came on to Federal Executive early in 1967, firstly on Intruder Watch activities and later with the I.T.U. portfolio. An early article on this subject by him appeared in "A.R." of July 1967. Since that date he had been keen and active in Federal affairs and it is a tribute to his great personality that all the members of Federal Executive attended the funeral and wreaths were sent from afar.

Born in Victoria, George was 62 years of age, having devoted his life to the R.A.A.F. which he joined on passing out from Duntroon. From the beginning of the war he was concerned with radar and was the prime mover in setting this up in Australia and in Darwin and the North in particular during hostilities. After the war years had passed into memory he became Superintendent of the Woomera rocket range and held this post for several miles. From Fig. 16 the distance should be between 200 and 230 miles. This may indicate that the horizontal was even less efficient than calculated: The actual results were rather variable, suggesting considerable differences in conditions, but the final results would appear to confirm the calculations so far.

Fantasy

The rather rash assumption that efficiency for a short low horizontal can be worked out by such a simplified formula would appear to work out in theory. The assumption can be broken down into further assumptions.

Loss resistance in a lossless wire above a lossy ground equals radiation resistance above a perfectly conducting ground plus induced loss resistance above a lossy ground.

In most cases of a short low antenna above a lossy ground where the wire is also lossy, the induced loss will be the greater. A further rash assumption is made. It is likely that the resistance of a lossless antenna above a very lossy ground will be somewhere about its free space resistance, leading to the further rash breakdowns. Efficiency of a lossless antenna above a lossy ground = radiation resistance above a lossy ground + radiation resistance in free space. Therefore actual efficiency of a horizontal antenna = radiation resistance above a lossy ground + (radiation resistance in free space + wire loss resistance).

Note.—It is not intended that the above should be applied to a high, resonant antenna.

From the latter rash formula it is apparent that the efficiency cannot be greater than the ratio given in the former formula.

The above rash conclusions are offered as a guide to anyone who wishes to test them in practice. If anyone can provide practical analysis of the above they are welcome to try, but who but a Radio Amateur would try to use a short low antenna above a lossy ground.

Conclusions from Results

1. The efficiency of a vertical antenna is fairly easy to determine.
2. It is suggested that the efficiency of a horizontal antenna can be determined in a similar manner.
3. The results have been cross checked with results in practice and would appear to be correct.
4. The comparison between the efficiency of the horizontal and the vertical is useful in determining the area in which the horizontal would have advantage over the vertical.

ANTARCTICA RESEARCH

Further to the paragraph in July "A.R." page 32, the tentative programme for the proposed Symposium includes (a) a review of communications requirements and statements of main practical difficulties affecting fixed and mobile (including position determination by radio) services within Antarctica and externally thereto and therefrom; (b) operational technical problems (co-ordination, maintenance, antenna, noise, snow static); (c) review of advantages and disadvantages of various transmission media (all frequencies and scatter), and use of satellites; (d) scientific results and developments likely to improve Antarctica communications and consideration of papers thereon (predictions, scatter, propagation, antennas in snow, poor earth, unmanned stations, modulation and data systems, etc.), and ending with policy and cost discussions and recommendations.

INDONESIA LICENSING

Notes from VK2AOI received from YB0BY

The Central A.R. organisation is:-

Organisasi Radio Amatir

YB0—The capital Djakarta.
YB1—W. part of Java Is. Box 288, Bandung.
YB2—E. part Java Is., C/o. YB2AB, Surakarta.
YB2E—E. part Java Is., C/o. YB2EVT, Surabaya.
YB3—S. part Sumatra Is., C/o. YB3GA, Palembang.
YB5—W. part Sumatra Is., C/o. YB5AI, Padang.
YB5M—S. part Sumatra Is., C/o. YB5BA, Medan.
YB7—Bornea Is. (Indonesian part).
YB8—Melanesia (Mad. etc.).
YB9—Ball to West Irian.

* Addresses are available.

LICENSED AMATEURS IN VK

MARCH 1971

<table>
<thead>
<tr>
<th>Callsign</th>
<th>Full</th>
<th>Lim.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK0</td>
<td>87</td>
<td>10</td>
<td>97</td>
</tr>
<tr>
<td>VK1</td>
<td>150</td>
<td>13</td>
<td>163</td>
</tr>
<tr>
<td>VK2</td>
<td>132</td>
<td>12</td>
<td>144</td>
</tr>
<tr>
<td>VK3</td>
<td>111</td>
<td>11</td>
<td>122</td>
</tr>
<tr>
<td>VK4</td>
<td>109</td>
<td>11</td>
<td>120</td>
</tr>
<tr>
<td>VK5</td>
<td>103</td>
<td>11</td>
<td>114</td>
</tr>
<tr>
<td>VK6</td>
<td>101</td>
<td>11</td>
<td>112</td>
</tr>
<tr>
<td>VK7</td>
<td>99</td>
<td>11</td>
<td>110</td>
</tr>
<tr>
<td>VK8</td>
<td>97</td>
<td>11</td>
<td>108</td>
</tr>
<tr>
<td>VK9</td>
<td>96</td>
<td>11</td>
<td>107</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Callsign</th>
<th>Full</th>
<th>Lim.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VKQ</td>
<td>103</td>
<td>11</td>
<td>114</td>
</tr>
</tbody>
</table>

W.I.A. BROADCASTS

7146 KHz.

VK2WI, Sundays, 1100 hrs. E.A.S.T.
VK3WI, Sundays, 1030 hrs. E.A.S.T.
VK4WI, Sundays, 0900 hrs. E.A.S.T.
VK5WI, Sundays, 0900 hrs. C.A.S.T.
VK6WI, Sundays, 0930 hrs. W.A.S.T.
VK7WI, Sundays, 1000 hrs. E.A.S.T.
AUSTRALIAN FLYING CORPS No. 1 SQUADRON IN EGYPT 1917

In foreground, with cane, is Major Richard Williams, who will be giving the opening address for the R.D. Contest as Air Marshal Sir Richard Williams, K.B.E., C.B., D.S.O., R.A.A.F. (retd.).

(Photograph by courtesy of R.A.A.F.)

3 SQUADRON AMATEURS AT RICHMOND, N.S.W., 15th July, 1940

Back (left to right): John Parr, VK3OM; Ned White, VK2HA; Ron Horne, VK4RR; J. Perooz, VK2PE.
Centre: Frank Carey, VK2AM; Bill Smith, VK2BS; George Fenton, VK2GV; Snow Campbell, VK2MR; George Curl, VK2AJB/VK6NO (Silent Key); Jim Edwards, VK2AKE.
Front: Ken Williams, VK2XD; Arthur Wipnell, VK2ALK (Silent Key); Rex Corthorn, VK2VG; now VK3VG; Vic Jarvis, VK2VJ (Silent Key); Ern Catt, VK2FU; Daddy Gibson, VK2GH; and Geoff Thornton, VK2IP.

Not in photograph: Ted Aked, VK2AEU; Tim Teehan (ZL) (Silent Key).

LOW DRIFT CRYSTALS

1.6 Mc. to 10 Mc.,
0.005% Tolerance, $5

10 Mc. to 18 Mc.,
0.005% Tolerance, $6

Regrinds $3

THESE PRICES ARE SUBJECT TO SALES TAX

SPECIAL CRYSTALS:
PRICES ON APPLICATION

MAXWELL HOWDEN
15 CLAREMONT CRES.,
CANTERBURY,
VIC., 3126
Phone 83-5090

LOG BOOK
AVAILABLE IN TWO TYPES—VERTICAL OR HORIZONTAL
Larger, spiral-bound pages with more writing space.
Price 75c each plus 25 Cents Post and Wrapping
Obtainable from your Divisional Secretary, or W.I.A., P.O. Box 36, East Melbourne, Vic., 3002
NEW CALL SIGNS
MARCH 1971

VKGC—G. Cochrane, 37 Devonport St., Lyons, 2606
VKISR—S. N. Graves, 26 Glynn Pl., Hughes, 2621
VK1ZSR—R. B. Staddon, 11 Melrose Dr., Mawson, 2606
VK2WZ—W. G. Rayner, 12 Barrawarn Pl., Lyneham, 2606
VK2QC—F. A. O'Donnell, 20 Wood Rd., Griffith, 2620
VK2QF—G. W. Rayner, 12 Barrawarn Pl., Castle Hill, 2154
VK2XJ—D. P. Wickens, 53 Hill St., Roseville, 2069
VK2YK—E. J. Pickles, 108/61 Osborne Rd., Manly, 2095
VK2BAG—A. R. Eckersley, 46 Alexander St., Southport, 2603
VK2BCV—A. H. Sandilands, 5/29 Mimosa St., South Bexley, 2207
VK2BD—D. Miller, 1/21 Aubin St, Neutral Bay, 2089
VK2BVD—S. D. Surland, 3/100 Wallis St., Woollahra, 2025
VK2BET—E. Trimingham, 149 Somerville Rd., Hornsby Heights, 2071
VK2BGV—G. Voron, 7/30 Arcadia St., Coogee, 2034
VK2ZSN—D. G. Rowe, 57 Carlingford Rd., Hornsby, 2077
VK2ZRX—W. S. Baynes, 10/42 Orpington St., Leichhardt, 2200
VK2ZVI—R. F. Worthington, 65 River St., Campbelltown, 2560
VK2ZQZ—S. M. Garnham, Jilliby Rd., Wyong, 2259
VK2BMM—M. S. McKenzie, 16 George St., Launceston, 7250
VK2BME—J. Mack, 78 The Crescent, Cheltenham, 2119
VK2BGV—G. Voron, 7/30 Arcadia St., Coogee, 2034
VK2BQA—E. Garrett, 5 Balyata Ave., Caringbah, 2229

CANCELLATIONS

VK2ASR—S. N. Graves. Now VK2QF.
VK2BBP—J. H. Mowtell, 16 Ian St., Rose Bay, 2029
VK2UL—R. F. Frost. Transferred to Vic.
VK2YK—A. Greenberg. C/o. 295B, Edgecliff Rd., Woollahra, 2025
VK2PV—J. J. Roos. Flat 218, Block 2-B, Willandra, 2621
VK2UH—R. E. Lewis. Flat 257, Block 2-E, Willandra, 2629
VK2UB—D. J. Bainbridge, 23 Locke St., Essendon, 3040
VK2UAU—B. A. Austin, R.A.A.F. Base, Lavington, 2610
VK2UL—R. F. Frost. Transferred to N.S.W.

APRIL 1971

VK2B—R. S. Conte, 26 Clontarf St., Seaford, 5125
VK2AC—A. F. Cutting, 7/2 Andover St., Caloundra, 4551
VK2BD—R. Morgera, C/o. 295B, Edgecliff Rd., Woollahra, 2025
VK2UN—D. G. Rowe. Now VK2QF.
VK2ZK—J. S. Forrester, Now VK3CDX
VK2IZM—F. Richelme. Now VK5ZFY
VK2ZLU—R. A. Piner. 13 Sheales St., Dandenong, 3125
VK2ZVU—R. R. Alexander, 62 Pat Rd., Thirroul, 2515
VK2ZVD—J. Van den Bro. 32 Bilga St., Kirra, 2223
VK2ZVU—R. R. Alexander, 62 Pat Rd., Thirroul, 2515
VK2ZVV—R. A. Vanston, Lot 2, Ivanhoe St., Ashfield, 2131
VK2ZVU—R. R. Alexander, 62 Pat Rd., Thirroul, 2515
VK2ZVQ—K. G. McCracken, 13 Malcolm Crt., Baulkham Hills, 2153
VK2ZWS—J. D. Dickson, 4 Broughton Rd., Homebush, 2140
VK2ZVZ—R. A. Vanston, 47 Jervois St., Wollongong, 2221
VK2ZZM—H. K. F. Vun, 30 York St., Tuart Hill, 6062
VK2ADB—G. L. Thomson, 131 Westbury Rd., Riverside, 2119

A.R.D.

ALL SET TO GO?
A BRIEF SPECIFICATION . . .

INOUE SOLID-STATE 2 METRE F.M. TRANSCEIVER

MODEL IC-20 $295 inc. S.T. + Two Channels


Dimensions: Height 23/4", width 6 1/4", depth 7 1/4"; weight 43/4 lbs.


See and hear at:—

INDUSTRIAL & MEDICAL ELECTRONIC CO.
6th Floor, 288 LIT. COLLINS ST., MELBOURNE, VIC. Phone 63-9258, A.H. 848-3018

COMING! 430 MHz. SOLID STATE TRANSCEIVER, C.W. KEYERS, MONITORS, MIC. COMPRESSORS, MOBILE ANTENNAS.

REMEMBER! INOUE for the finest Amateur and Commercial V.h.f.-U.h.f. Communications Equipment.

WAYNE COMMUNICATION ELECTRONICS

Catering specially for the Amateur with Components, Receivers, Transmitters, Test Equipment. Everything from Resistors to 100 MHz. Frequency Counters

ALL AT UNBEATABLE PRICES

- COLLINS ART13 AUTO-TUNE TRANSMITTER. 2-18.1 MHz. AM or CW. 813 PA, 2 x 811 Modulators. Complete with all tubes. In good condition. $30 each. Freight forward.
- COMPUTER BOARDS. Removed from functional equipment. Contain 4 VHF transistors, 12 high speed switching diodes, 2% metal oxide resistors. $1.50 each.
- CERAMIC 1625 SOCKETS. Suit also 3AP1 CRO tube. 15c each.
- POWER SUPPLIES. 230v. 50 Hz. input, 300v. 100 mA. DC output. Manufactured by A & R. Brand new. $10 each.
- WIRE WOUND RESISTORS. Range: 1.8 to 620 ohms. 6 watt. New. 5c each.
- SPECIAL! TRANSFORMERS: Primary 230v. 50 Hz., Secondary 27v. 3 amp. This month only. $3.00 each.

Come and inspect the full range of equipment and components at

WAYNE COMMUNICATION ELECTRONICS
757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122 Phone 81-2818
**Overseas Magazine Review**

This is different but it uses material supplied by VKASC and VK7RG.

Any comments? See end for key.

**ANTENNAS:** Simple vertical arrays (6); plain facts for tyro and beginner also feeders (2); wet string fallacy (17); trans-matches (16); portable (41); Kirk helicoidal beams (11); 440 single boom (10); 2 mx parallel fed vertical collinear (9); microwave paraboloids (13).

**MASTS:** A-frame (41); 10 extra feet on the tower (13).

**ROTATORS:** Simple (perhaps too simple) (1); delayed action braking (6).

**CHANGE-OVER APP.:** Sol. state switch (8).

**TRANSMITTERS:** Beginners' 1-valve high power (7); transistor 12w. for 10 mx (12); solid state 10 mx d.s.b. (13); power level comparisons (10); p.c.b. ATR-2 modulator (18); lazy man's v.f.o. for 2 mx (11); stability without xtal with solid state module (12); "rubber" xtal (18); portable (41); Kirk helicoidal beams (11); 440 single boom (10); 2 mx parallel fed vertical collinear (9); microwave paraboloids (13).

**RECEIVERS:** Latest techniques in new design "plagiarise and hybridise" (2 to 5); direct conversion heterodyne (8); freq. counter (6); xtal calibrator (13); Drake 2B mod. for 160 mx (17); R1155 modernising (18); AR5B S meter (3, 51); SB503 review (10); LTV converter (6); re-vamping old rx (11); xtal WWV for Swan Cygnet (9); FET for a.m. b.c. rx (18); noise blankers (9, 12); solid state preselectors (12); FET dual gate pre-amp. for 2 mx (13).

**TRANSCEIVERS:** One-tube cheap 2 mx (13); ZL100B tribanders (8); 2 mx f.m. f.m. (12); SIC handi-talkie mods. (12); Drake TR3 break-in c.w. mod. (11).

**AMPLIFIERS:** Switching remote lines (12); low power design concepts (13); high power for 85-10 mx (15); higher power tripler for 70 cm (12); 500w. 2 mx pentode linear (9); grounded grid pair (13); using SL610/12 r.f. (1); ensuring transistor stability (1).

**REPEATERS:** (12 to 15).

**KEYERS:** IC (8, 17); touch-coder one-letter memory (6).

**POWER SUPPLIES:** Auto current overload protection (8); solid state protective devices (11); SCR regulated (19); dual input design (8).

**TEST EQUIP.:** All sorter tester (3); simple r.f. wattmeter (7); simple freq. std. (4); noise generator (21); f.m. low cost vco signal source (12); meter evaluator (12); simple s.w.r. device (18); r.f. magnetometer and f.s. meter (10, 11).

**MICROWAVES:** (4 to 5, 12, 18).

**COMPONENTS:** Variable capacitor do's and don'ts (2); compact band-pass filter for 2 mx (5); low-pass filter for P.D. (18); tuning diodes (9); v.h.f./u.h.f. practical coil winding date (15); ferrite inductors (15); DIY "computer" (19); f.m. net alert bell (13).

**OTHER:** Blind operators' aid (11); graphs of power, volts, impedance (15); FET symbols (19); cheap 24-hr. digital clock (3); dry cells re-charger (looks interesting) (5).

**KEY (all are 1971)**

"Radio Communications": Feb. (1); Mar. (2), Apr. (3), May (4), June (5).

"QST": Apr. (7), May (8).

"Break-In": Apr. (7), May (8).

"QO": Apr. (9), Apr. (10), May (11).

"73": Apr. (12), May (13).

"Ham Radio": Apr. (14), May (15).

"Short Wave Mag.": Feb. (16), May (17).


---

**PREDICTION CHARTS FOR AUGUST 1971**

(Prediction Charts by courtesy of Ionospheric Prediction Service)
VISITING AUSTRALIA
9J2HE—During September
M.V. "Canberra"
Perth, eastwards.

GOLDEN JUBILEE

Congratulations! and Many More
Happy Days to VK4DO for 50 Years
in Amateur Radio

Hal Hebler, North Rockhampton,
built his first crystal set in 1921 and
has progressed from a 1923 10-watt
240 metre R/T rig made out of com­
pletely home-made components (except
the valves) using a coupled Hartley
oscillator and loop (absorption) modu­
lization right through to the present day
s.s.b. gear with home-brew power
supplies.

The receivers included a “lo-loss”
2-valve model with a quarter inch plate
glass panel, the holes of which had to
be drilled with rat-tail files.

Antennae in use are a 2 el. quad for
14 MHz, a dipole for 7 MHz, and a 3
el. yagi on 53 MHz which, with a con­
verted ex taxiphone, is used for JAr
contacts when openings occur.

Hal considers the W.A.Z. certificate
the highest award in Amateur Radio
—he has three: c.w., a.m. and s.s.b.
In 1926 he made two-way contacts
with 48 watts and on phone in 1948 in
W.A.C. in 1936 was made in 50 minutes
rx tube and was heard in ZL on phone.
W.A.C. in 1936 was made in 50 minutes
with 48 watts and on phone in 1948 in
28 minutes.

The holder of numerous Awards—
going back to 1924—Hal is active in the
R.D. and VK-ZL contests. His most
difficult things to do in Amateur Radio?
To copy a 500-word c.w. Trans-Pacific
Test message in 1926 and to get QSL
cards from Zone 23 before the JTs
went there.

FEDERAL CONTEST COMMITTEE

For the past six years the Federal
Contest Committee has been located in
Perth, Western Australia under the
leadership of the Federal Contest,
Manager, Neil Penfold, VK6ZDK. Neil
and his group have done an excellent
job as members will know, but the time
has come for a change.

At the last Federal Convention the
Queensland Division volunteered to
take over the administration of our
Contests and the VK1 Federal
Councillor has now advised that his
Division has appointed Peter Brown,
VK6FJ, as the new Federal Contest
Manager. Peter's address becomes—

FEDERAL CONTEST MANAGER,
G.P.O. BOX 638,
BRISBANE, QLD., 4001.

and logs for all local Contests will go
to G.P.O. Box 638 for the next three years
at least. However, VK6ZDK will, for the
present, remain administrator for the
VK-ZL Contest and consequently
contestants should look carefully
at the rules to determine the correct
address for their Contest logs.

Hy-Q

CRYSTALS
FOR AMATEUR USE

A full range of high stability close
tolerance crystals especially made
for Amateur use is now available.

These crystals are made on the
same equipment, with the same
care, and subjected to the same
exacting tests as those manu­
factured by us for Military and
industrial applications.

100 KHz., 0.02%
Style QC13/X holder .... $9.00
300 to 500 KHz., 0.02%
Style QC6/C (D) holder $6.50
1000 KHz., 0.01%
Style QC6/A (D) holder $8.50
2 to 20 MHz., 0.005%
Style QC6/A (D) holder $4.70
20 to 60 MHz., 0.005%
Style QC6/A3 (D) holder $5.30
60 to 100 MHz., 0.005%
Style QC6/A5 (D) holder $5.95

Other frequencies and tolerances
can be quoted for on request—
send for technical brochure.

Postage/Packing:
Victoria 20c, other States 30c

The above prices are Nett Amateur to
which should be added Sales Tax if
applicable at the rate of 27½% for
Receiver use, or 15% for Transmitter
or Transceiver use.

Hy-Q

Electronics Pty. Ltd.

10-12 Rosella Street, Frankston, Vic., 3199
P.O. Box 256
Telephone 783-5611, Area Code 03.

AGENTS:
N.S.W.: General Equipments Pty. Ltd., Artarmon.
Phone: 429-2705.
Phone: 63-4844.
W.A.: Associated Electronic Services Pty. Ltd.,
Morley. Phone: 76-3858.
Phone: 6561.

VISITING AUSTRALIA
9J2HE—During September
M.V. "Canberra"
Perth, eastwards.

We seem to have very little exchange
of news about visiting Amateurs to
our shores. Is this symptomatic of
something? Extremely knowledgeable
and interesting recent visitors to come
are WAF8SC (VR5DK, ZL1ATC,
386DK, ZL2AMJ, V99DC, G3UJE,
G2FUX, CE6DR, SMS5EQ, VU2JD,
VU2OV and K21XP.

Perhaps, of greater interest to the
reader than those who have been here
are those who will be visiting Australia.
There is, then, a fair chance that we
can welcome our visitors with a mes­
ure of hospitality, twist their arms to
give a group talk perhaps and gener­
ally to exchange a yarn or two. Is
there a feeling that news of visits must
be jealously guarded?—"He is my
friend, I will not share his company
with any Tom, Dick or Harry"; "I
alone will take pleasure in sharing his
pleasure of new scenes and fresh faces".
Or is it perhaps apathy? "I have my
own group of friends, to heck with
strangers." "Too busy." Shy? Afraid
of him patting your pocket-book per­
haps?

Most of us were brought up in the
true Amateur spirit. Is there any real
difference between talking to "Bob
over the air and an "eye ball" when he
is a visitor? If you visit Timbucto or
Athens, would you like to meet the
local Amateurs in a friendly way?

Would we, therefore, like to have
news of visitors who plan to be with
us for a brief visit in the future? As
a starter, a panel is appended. Why not
write in when you know about visitors
shortly to arrive. Many of us can then
join in with a welcome of some kind—
be it ever so humble.

Although the Amateurs’ interests
seem limitless, many of the DX
fraternity speak in glowing terms of our
wonderful country. No better tourist
ambassadors could be found anywhere.
In this way they take pleasure in per­
suading overseas Amateurs to visit
Australia or even local Amateurs to
visit places they would otherwise by­
pass. Very excellent contacts and
made, good friends are acquired and the
talk even encompasses such things as
the unique quality of the red and black
soils of the Downs.

Some people have asked if we can
and should do more. For example,
sending to ships and radio officers
aboard ship a printed note of how to
contact a local Amateur or local groups
for the benefit of the travelling Ama­
teur. Most of these would welcome a
couple of hours ashore next to a rig in
genial company or even some advice
on what sight-seeing should be done.
Most of them would jump at the idea
of a contact "back home". Is there
then a need for a visitors’ column? W rite

to the Editor and we shall soon see.
NOVICE LICENCE

Editor "A.R." Dear Sir,

In the letter "A.R." from VK3JRN, there was a brief reference to frequency allocations proposed for them, otherwise I am afraid of Novice licensing-for what reason? It seems that the top operators are afraid of Novice licensing for what reason? If the Novice operator causes QRM or interference to yourself, please teach him better ways.

Those of us who hope to see Novice licensing in the Amateur Service like it to apply to the young and the old, and thus reviving c.w. net activities. Novices will surely bring a new breed of operators back into the c.w. parts of the bands which would stay with the mode.

Having read VK3JRN's article there is no problem about the disposal of the equipment in the Novice's possession after the year end; it would be sold, dismantled or used in VK- QRP contests. A Novice licence will not be adding new people into the Amateur fraternity.

Finally, I think the full licensee must show more friendliness to the beginner in the true Amateur spirit. The air should not be used by some for their own pleasure.

F. T. Hine, VK2QL.

---

NOVICE LICENCE

Editor "A.R." Dear Sir,

I have been following the discussions about Novice licences with interest and wish to place on record that I favour the introduction of Novice licensing. To my mind, there has been complete "Novice" licence to a large extent. The recommendation of the allocation of the frequency spectrum proposed for them, otherwise I am afraid of Novice licensing-for what reason? It seems that the top operators are afraid of Novice licensing for what reason? If the Novice operator causes QRM or interference to yourself, please teach him better ways.

Those of us who hope to see Novice licensing in the Amateur Service like it to apply to the young and the old, and thus reviving c.w. net activities. Novices will surely bring a new breed of operators back into the c.w. parts of the bands which would stay with the mode.

Having read VK3JRN's article there is no problem about the disposal of the equipment in the Novice's possession after the year end; it would be sold, dismantled or used in VK-QRP contests. A Novice licence will not be adding new people into the Amateur fraternity.

Finally, I think the full licensee must show more friendliness to the beginner in the true Amateur spirit. The air should not be used by some for their own pleasure.

F. T. Hine, VK2QL.
A plea for help. An answering call. But yours truly tackles this column this month without much aid from anyone at the time of going to press. Everyone is DX-ing on the square-eyed monster!

During June there were enough DX-peditions to satisfy most DX hunters and July seems no exception either. VK8NQP portable Wills Island and we understand that his very merry men as set out in July “A.R.” QSLs to K3RLY. Unfortunately sea conditions had deteriorated after the first trip did not eventuate. Operations from Willsi were on all bands and the operating fire-class.

Darleen WA8FSC, etc., passed through Melbourne and Perth early in June on her way to Mauritius where she was active as 3B6DK, for a short spell before embarking for Rodrigues Island where she activated 3B6DK from the last week of June and the first week of July developed with the 15 mx part of the rig and the signals on 20 mx suffered for a time until the antenna locals districts the day but the ship. She is due to leave Rodriguez late in July to continue her sail to NZS and the NH. At the time of writing, a 5144 call seems possible, but the 5X5 might be a little doubtful although in the latter case the licensing there has been restored. QSLs to VE6AVK.

An examination of the sunspot predictions shows that conditions on 10 mx will become extremely spasmatic, 15 mx will probably be open most of the time during daylight hours, 20 mx should be open during the day, sometimes at night, and deep dips to fade-out around sunset and sunrise. 40 mx trouble during the day but opening by darkness—if you can find the holes between the Intruders. Early in July the avid DXers had the pleasure (ie) of chasing Martin as J6HEQ on the Island of Fernando de Noronha but the QSLs to W37GRT, etc., have been lost.

For S.W.Ls comes a note that the EDP system will introduce a catalogue in the S.W.I. number by the addition of a 8 between the State numeral and the existing three numeral personnel number. Thus SWL-1.70777 will become SWL-1.70777. This assumes that the EDP system has been fed with the correct number. So there could be some changes in the numbers which I am told, the EDP processing boys wish to avoid particularly where S.W.I. has had cards printed.

Are you anti-list, pro-list or don't care? It seems there are demonstrators against everything if the performance on the afternoon of 19th June is any criterion. This probably resulted in ZK1MA going QRT, much to the chagrin of the enormous pile-up of Ws awaiting their turn to be called in KG6UF as MC. The demonstrator, a VK2C, did not work ZK1MA. He was too busy calling the Ws having a quick conference agreeing to let him in. Most DX operators explore any kind of financial list and any rare DX station working to such a list would soon find himself in the middle of a pile-up. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

During June there were enough DX-peditions to satisfy most DX hunters and July seems no exception either. VK9NP ported through Willis Island by Larry Pace and his friends, Mayon Island, Vanuatu and the Island of Annobon in Equatorial Guinea and the Island of Annobon through well. On 15, WRs and JAs are still plentiful with 3B8CZ still consistent. On 20, VK9RII. Incidentally VK7FB worked from Norfolk Island, not DX1 John used a 14AVQ and spaced 4 weeks delay must be allowed for the issue of the licence.

For S.W.Ls calls a note that the EDP system will introduce a catalogue in the S.W.I. number by the addition of a 8 between the State numeral and the existing three numeral personnel number. Thus SWL-1.70777 will become SWL-1.70777. This assumes that the EDP system has been fed with the correct number. So there could be some changes in the numbers which I am told, the EDP processing boys wish to avoid particularly where S.W.I. has had cards printed.

For PX hunters July should bring two new ones: 5C5OPE, Great Mammoth Mountain, 5C5, Mammoth Mountain, Kansas 5G50. A letter received from Mac VK9NI on Norfolk Is. takes issue with June “A.R.” being incorrect. He says there are not three, not one of the Amateur fraternity resident on the island and it is a Radio amateur’s paradise in anyone using the bands when open can expect a pile-up. The other two are of course VK9JA and VK9RII. Incidentally, VK7FB worked from Norfolk Is. from 23rd May to 6th June and greatly enjoyed his DX. He then gathered his QSLs, s.s.b. and c.w., obtained W.A.C. on both and experiencing very courteous pile-ups on c.w. He also says that a VK3 reckoned VK9 Norfolk Is. was not DX! John used a 14AVQ and spaced 4 weeks delay must be allowed for the issue of the licence.

For S.W.Ls calls a note that the EDP system will introduce a catalogue in the S.W.I. number by the addition of a 8 between the State numeral and the existing three numeral personnel number. Thus SWL-1.70777 will become SWL-1.70777. This assumes that the EDP system has been fed with the correct number. So there could be some changes in the numbers which I am told, the EDP processing boys wish to avoid particularly where S.W.I. has had cards printed.

Are you anti-list, pro-list or don't care? It seems there are demonstrators against everything if the performance on the afternoon of 19th June is any criterion. This probably resulted in ZK1MA going QRT, much to the chagrin of the enormous pile-up of Ws awaiting their turn to be called in KG6UF as MC. The demonstrator, a VK2C, did not work ZK1MA. He was too busy calling the Ws having a quick conference agreeing to let him in. Most DX operators explore any kind of financial list and any rare DX station working to such a list would soon find himself in the middle of a pile-up. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.

Ample DX is active there. In dire trouble. Most listeners who are fortunate lately see the days of the VQs and even 5X5 (previously very frequent calls heard) to be as rare as the former French Colonies in Africa. From that area QAAA is heard sporadically, frequent 9X5s, seldom any 9X6s and 9X5s, the occasional 9X6 but several 9X7s.
TV to Brian VK3BB in Traralgon. Peter VK3TR and David VK3ABC, both of Sale, are building a v.h.f. gear, while Dave VK3YEC has an a.m. repeater up and running, and is currently developing a 432 MHz. v.h.f. gear for the network.

Bob further advises increased activity in Mildura where there are now at least seven stations on 144 MHz. He also states that good news as their activity during band openings includes the transmission of a v.f.f. signal from the v.h.f. activity here, but there is a possibility of some enhancement from tropospheric modes.

The following information has been supplied by George VK3HSV of Morwell and is a band reporting from the Eastern Zone of VK3. It is submitted for the interest of all the stations that are currently active on 144 MHz. In particular, it involves the activity on the "hundred MHz" band.
IF YOU ARE STILL A "HOME-BREW" AMATEUR SEE US FOR YOUR COMPONENTS!
- Air-Wound Inductances
- G8KW Antenna Loading Inductances
- Glazed Ceramic Strain Insulators
- Transistorizers—Fixed and Variable
- Transformers—Power and Audio
- Chokes—R.F. and Filter
- Antennas—Wide-Spaced Transmitting
- Microphones and Microphone Transforms.
- Cables—Audio and R.F. (Co-axial and Flat Line)
- Speakers—Communication and Hi-Fi.
- Modulation—Inter-Com., Hi-Fi.
- Receivers—Potentialmeters—Wound and Carbon.

Ring, Write or Call
WILLIAM WILLIS & CO.
PTY. LTD.
77 CANTERBURY ROAD, CANTERBURY, 3126
Phone 836-0707

SILENT KEYS
It is with deep regret that we record the passing of—
VK2NP—C. F. L. Fryar
VK3VX—A. G. Pither
VK6XG—C. W. C. Sirl
VK7ML—M. L. Loveless.

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, does not fit into the nature. Copy must accompany the advertisement.


FOR SALE: A.m. Pye Bantam, all transistorised portable, output 1/2 W., suitable for 52 or 154 MHz. Excellent condition with leather case and mike $95. VK5ZVEI, 24 Seafield Ave., Kingswood, S.A. Phone 4729-9041.

FOR SALE: Complete a.s.b station including: Heath SR120 Transceiver $330, Heath SB660 10 watt, SB662 loudspeaker $50, extra heavy duty power supply $85. Will accept $50 for the complete outfit, but I am interested in offers at these bargain prices. The equipment is as new and can be viewed in operation by appointment. Phone T. Dinsen VK3DL, Melb. 783-9611 or 787-1407 A.H. or write C/o. P.O. Box 256, Frankston Vic.

FOR SALE: Dummy load. Heath HN31 50 ohm non-inductive dummy load. Has diode rectifier and filter circuit. Outputs with standard multimeter. In can, filled with 1 gallon of transformer oil. For R.F. or V.F. work. Phone 475-4767, DARLINGTON ST. PORT SORELL, TAS. Phone 28-6133.

FOR SALE: Estate late Dale West, Vic. A.E. Trio Transceiver type TS510 with crystal calibrator. Matching supply type PS510. Instruction booklets for both units. Dynamic Microphone DM10, $380 the lot or nearest offer. Contact VK4IK, 6D3 Phone 392-0970, Port Melbourne, Vic.

FOR SALE: Hallicrafters SX-117 triple conversion Receiver and Hallicrafters HT44 Transmitter Matching pair. Will trade. All modes. Full facilities. Transceiver, matching station, with manual Transmitter and all other cables, power supply, speaker and 500w. 110 volt A.C. $495.00, O.N.O. Vickery, VK4KX, 20 Inglis St., Grange, Qld., 4051.

FOR SALE: Hills heavy duty three-section Tele­scopic Tower, 72 ft., three sets guys, turnbuckles, etc., $150. Also extra heavy duty 80-40 mx Inverted vee Antennas, 1250 watts. TH6DX Tribander, BN86 Basale, TR-44 Rotator with supporting cage, coax and connections. $400.

NEW MEMBER:
Cert No Call Total
97 VK4KR 248/263 VK2AHJ 137/145
156 VK4KB 18/20 VK4PH 12/12

OPEN
Cert No Call Total
194 VK6G 313/343 VK6MK 303/324
206 VK2AHJ 340/350 VK2AP3 302/314
223 VK2AGI 314/323 VK2ARX 301/323
207 VK2AV 309/328 VK3ARX 299/308
203 VK3TJ 308/328 VK2ARQ 298/308
220 VK4TQ 295/325 VK4JF 292/308

NEW MEMBER:
Cert No Call Total
134 VK3J 107/108 VK3LV 102/102
135 VK3J 107/108 VK3LV 102/102

Wireless Institute of Australia
Victorian Division
A.O.C.P. THEORY CLASS
commences
MONDAY, 16th AUG., 1971
Theory is held on Monday evenings from 8 to 10 p.m.
Persons desiring of being enrolled should communicate with Secretary, W.I.A., Victorian Division, P.O. Box 38, East Melbourne, Vic., 3002.

Phone 41-3535, 10 a.m. to 3 p.m.)

REPAIRS TO RECEIVERS, TRANSMITTERS
Constructing and testing: txatl conv., any frequency; Q5-ers, R9-ers, and transistoriised equipment.

ECCLESTON ELECTRONICS
146a Coatham Rd., Kew, Vic. Ph. 80-3777

Amateur Radio, August 1971
BAIL ELECTRONIC SERVICES

(Proprietors: Fred and Jim Bail)

Our business is to cater for the Radio Amateur with SSB equipment and accessories. It is not a sideline. As the sole authorised agent in Australia for the Yaesu Musen Co. Ltd. since 1963, it is our responsibility, and ability, to provide both general and warranty service, in a properly equipped workshop, with a comprehensive range of spare parts.

Personnel, including Interstate Representatives, are active licensed Hams, with business experience. Thus there is familiarity with Amateur requirements, and the value of service is realised.

Sets are checked before sale. A three-conductor AC power cord with 3-pin plugs is installed in place of the twin cord (usually provided on imported equipment).

A protective RF choke, where necessary, is installed at the antenna output socket.

CURRENT YAESU MODELS:

- FT-200 Transceiver, latest version with provision for external VFO connection, and factory installed key click filter. S160.
- DC-200 Matching 12V DC Power Supply for FT-200. S120.
- FT-101 Transistorised Transceiver, incorporating the latest modifications. S675.
- FTDX-560 Transceiver, similar to FTDX-400, as produced for the U.S.A. market. Latest model, incorporating modified heterodyne frequencies. S595.

★ FT-200 Transceiver, latest version with provision for external VFO connection, and factory installed key click filter. S350.
★ DC-200 Matching 12V DC Power Supply for FT-200. S120.
★ FT-101 Transistorised Transceiver, incorporating the latest modifications. S675.
★ FTDX-560 Transceiver, similar to FTDX-400, as produced for the U.S.A. market. Latest model, incorporating modified heterodyne frequencies. S595.

All prices inc. S.T. and our personalised 90-day warranty. Prices and specs. subject to change without notice.

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 67-1650 (AH 371-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

Amateur Radio, August, 1971
Distributors
For Australian and
International
Manufacturers . . .

TEST EQUIPMENT:

RAPAR • BWD
SWE-CHECK • HORWOOD
Call and see our big range of test equipment

SEMI-CONDUCTORS:

TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

1971-72 CATALOGUE NOW AVAILABLE, $3

radia parts
GROUP

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!

Amateur Radio, August, 1971
amateur radio
LAFAYETTE SOLID STATE HA600 COMM. RECEIVER


Price $109.50 net.

LAFAYETTE HA820 solid state, as above but Ham Band only. SS5-AM-CW. Price $195 net.

TRIO COMM. RECEIVER MODEL 9R-59DS

Four-band receiver covering 550 KHz. to 30 MHz. continuous and automatic bandspread on 10, 15, 20, 40 and 80 metres. 8 valves plus 7 diode circuits. 4/8 ohm output and phone jack. SSB-CW-AM. ANL, variable BFO. S meter. Stop bands: equal. r.f. gain control. Size 7 x 1 1/2 x 10 in. With instruction manual and service data.

Price $178.50 including sales tax.

Speaker to suit, type 5PSD, $15.30 incl. tax.

“REALISTIC” DX150 COMM. RECEIVER

Solid state, four bands covering 535 KHz. to 30 MHz., fully transistorised, SW/c.w. Control for 3 and 6 watts. Block volume, extra high. Sensitivity: 150 umv; bandwidth: 5 KHz; supply voltage: 9V. Sensitivity: 150 umv; bandwidth: 5 KHz; supply voltage: 9V. Sensitivity: 150 umv; bandwidth: 5 KHz; supply voltage: 9V. Sensitivity: 150 umv; bandwidth: 5 KHz; supply voltage: 9V.

Price $243.20 incl. tax.

Matching speaker to suit, $13.60.

BROADCAST BAND TUNER

Locally made, Model 401 uses a shielded 3-stage F.F. Modulator with a single transistor mixer-codc. An AGC voltage is developed and applied to the 1st I.F. stage. High sensitivity is obtained with a ferrite rod. 8-in. long. 3/8-in. diam. Sensitivity: 150 umv; bandwidth: 5 KHz; supply voltage: 9V. Sensitivity: 150 umv; bandwidth: 5 KHz; supply voltage: 9V. Sensitivity: 150 umv; bandwidth: 5 KHz; supply voltage: 9V. Sensitivity: 150 umv; bandwidth: 5 KHz; supply voltage: 9V.

Price $29.20 nett. Postage 20c.


GREEN CAP CONDENSERS

Sizes: 0.001, 0.0022, 0.0033, 0.0047, 0.0056, 0.0068, 0.0082 uF. Price 12c each.

Sizes: 0.01, 0.022, 0.033, 0.039, 0.047, 0.056, 0.068 uF. Price 15c each.

Sizes: 0.1, 0.15, 0.22, 0.33, 0.39, 0.47 uF. Price 18c each.

RESISTORS

1/2 watt 8c each. 1 watt 10c each.

POCKET CRYSTAL RADIO Type ER22. Set complete. Price $1.50.

A.C. ADAPTOR—BATTERY SAVER Type P564—240 volts to 6 or 9 volts, 300 mA. $12.50

Type P565—240 volts to 12 or 24 volts, 100 mA. $8.50

Postage 30c.

NEW HEADPHONES AND MIKE

Phones 8 ohms, Mike 25 ohms. Postage $1.75.

THE NEW PEAK HS-250 SPEAKER

A completely new speaker designed to complement the best stereo equipment. Featuring a 10-inch two-way woofer and mid range cone speaker with ferrite magnet and a coaxial 3 1/2-in. horn-type tweeter. Resonant frequency 40 plus or minus 10 Hz.; frequency range -70,000 Hz.; maximum power, 25 watts; nominal diameter, 10 inch; mounting diameter, 9-29/64 inch; voice coil impedance, 8 or 16 ohms; net weight 35 lb. For the best in sound, fit the Peak HS-250!

Priced at a reasonable $34.50. Postage 50c.

TELEPHONE INTER-COM. SETS

Telephone Inter-communication Set with signal bulb, two U2 batteries. Ideal for children. Price $6.75. Postage 30c.

EGG INSULATORS

For your Aerial. 8c each.

VARIABLE CONDENSERS


LOW PASS FILTERS

A “Cabena” Low Pass Filter will fix T.V.I. Cut-off frequency, 30 MHz.; attenuation at 60 MHz. better than 30 dB; insertion loss, negligible Impedance 50-72 ohms.

Price $11.50. Postage 10c.

SOLID STATE STEREO AMPLIFIER

8 watts r.m.s. per channel. Input for magnetic, crystal and ceramic type microphone, F.V. cartridges, tape recorder input and output, tuner input, stereo headphone jack.

Reduced to $55.00. Postage $1.20.

FIVE-CORE CABLE

5 x 5/036. Ideal for Intercoms., Telephones, etc. New. 100 yd. rolls, $17 (postage 75c), or 20c yd.

STEREO HEADPHONES

Professional quality (well known brand). Large earpads, standard stereo plug, 6 ft. lead.

Price $5.75. Postage 50c.

CRYSTAL CALIBRATOR No. 10

Nominal range: 500 KHz to 30 MHz, 505 KHz, st.st. and 250 KHz/100 KHz, BFO. Provides heterodyne output in steps of 1 MHz. Dial driven by machine cut strip gears, calibrated in 2 KHz. div. Easy read to 250 cycles. Outlet “spiked” approx. 1 sec. intervals. Identifies beat note. Power requirements: 12v. DC at 0.3 amp., 250 volts at 15 mA. This is a precision instrument. Complete with crystal.

Price $23.50.

EXTENSION SPEAKERS

Type T350 Tubular Extension Speakers, 8 ohms. New. Complete with lead and two plugs 2.5 and 3.5 mm. Price $4.30. Postage 20c.

RADIO SUPPLIERS

323 ELIZABETH STREET, MELBOURNE, VIC., 3000

Phones: 67-7329, 67-4286 All Mail to be addressed to above address

Our Disposals Store at 104 HIGHLAND ST., RICHMOND (phone 42-0135) is open Mondays to Fridays, 10.30 a.m. to 5.00 p.m., and on Saturdays to midday.

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.
## CONTENTS

### Technical Articles:

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle Modulation—Lecture No. 14C</td>
<td>4</td>
</tr>
<tr>
<td>Home Station Antenna for 160 Metres: Part Five—Inverted &quot;L&quot; and Sloping Antenna</td>
<td>3</td>
</tr>
<tr>
<td>The &quot;Z&quot; Match</td>
<td>7</td>
</tr>
</tbody>
</table>

### General:

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correspondence: Novice Licensing</td>
<td>17</td>
</tr>
<tr>
<td>Customs Import Duties</td>
<td>10</td>
</tr>
<tr>
<td>Divisional Notes</td>
<td>15</td>
</tr>
<tr>
<td>DX</td>
<td>19</td>
</tr>
<tr>
<td>Federal Awards:</td>
<td></td>
</tr>
<tr>
<td>W.A.V.K.C.A. Award</td>
<td>20</td>
</tr>
<tr>
<td>Cook Bi-Centenary Award</td>
<td>20</td>
</tr>
<tr>
<td>W.I.A. 52 MHz. W.A.S. Award</td>
<td>20</td>
</tr>
<tr>
<td>W.I.A. V.H.F.C.C.</td>
<td>20</td>
</tr>
<tr>
<td>Federal Comment: Customs Duties</td>
<td>2</td>
</tr>
<tr>
<td>Key Section</td>
<td>20</td>
</tr>
<tr>
<td>Licensed Amateurs in VK</td>
<td>11</td>
</tr>
<tr>
<td>New Call Signs</td>
<td>12</td>
</tr>
<tr>
<td>Obituary</td>
<td>13</td>
</tr>
<tr>
<td>Observation Post</td>
<td>7</td>
</tr>
<tr>
<td>Overseas Magazine Index</td>
<td>13</td>
</tr>
<tr>
<td>Prediction Charts for September 1971</td>
<td>12</td>
</tr>
<tr>
<td>Repeater News</td>
<td>16</td>
</tr>
<tr>
<td>Silent Key</td>
<td>20</td>
</tr>
<tr>
<td>Space Conference Report</td>
<td>9</td>
</tr>
<tr>
<td>Sun's X-Rays to be Mapped</td>
<td>20</td>
</tr>
<tr>
<td>VHF</td>
<td>16</td>
</tr>
<tr>
<td>9M8 Licensing</td>
<td>19</td>
</tr>
</tbody>
</table>
The Commonwealth of Australia sets a customs tariff rate of 45% on the f.o.b. value (or in some cases, the current domestic value) of nearly all Amateur equipment originating in countries other than the United Kingdom and certain other Commonwealth countries. In the case of these preferential countries, a rate of 27½% is applicable. To these Customs Duties must be added sales tax, the general rate being 27½%, which is payable on the sum of the customs value plus the customs duty plus 20%.

For many years the Wireless Institute of Australia has believed that these duties and taxes are far too high and that the Federal Council has repeatedly reaffirmed the Institute policy to seek a reduction in both Customs Duties and Sales Tax.

Over the years numerous attempts have been made to obtain reduced rates. These attempts to date have been totally unsuccessful, though occasional by-law applications have been successful. I would refer you to the article on customs duty that appeared on page two of the September 1967 issue of "Amateur Radio". This details the case put forward at that time to the Minister and the various matters that were taken into consideration.

At that time it seemed that the Institute was on the verge of success. Unfortunately this application was again rejected.

During 1970 various individuals submitted cases to the Minister in respect of isolated importations and a number of ad hoc concessions were granted under the by-law provisions of the customs tariff. Some of these individuals have co-operated with the Federal Executive through their Divisions by making available copies of the relevant materials relating to their individual cases. The Federal Executive has devoted a considerable amount of time since these ad hoc decisions were made to the question of customs duty, as it seemed from them that the time was again right for the submission of a general case.

There is sometime, I think, some misunderstanding on the application of the customs tariff and the imposition of sales tax. In this issue there is an article by Peter Dodd, VK3CIP, the Federal Manager, outlining the mechanics by which customs duties are imposed and setting out the present position in this country.

In the past the Institute's case has been directed to the application of the by-law provisions. Because one manufacturer of s.o.b. equipment has maintained that he could produce Amateur equipment, our case has failed. It seems to me that the law in this area is less than satisfactory for the Customs Department does not seem to be required in any case to make a value judgment of the legitimacy of the assertion made by the local manufacturer when opposing by-law entry. In the case of the manufacturer to whom I have referred, it would appear that his commercial interests are directed to other channels. He has never, to my knowledge, advertised the availability of Amateur Radio equipment manufactured by himself. I believe that this manufacturer has, over the years, not changed his position either in relation to opposing by-law admission of foreign manufactured Amateur equipment, or, in manufacturing Amateur equipment himself. It is significant that in the period 1966-1967, when the Institute investigated the claims of numerous local manufacturers of electronic equipment, no manufacturer except this one, purported to offer anything for Amateur use. This manufacturer did, in fact, give a quotation at a price that was so high that one could fairly assume that it was for the production of a single piece of equipment.

Earlier this year it appeared as if a breakthrough had been achieved by a local importer, for he advertised significantly reduced prices. It may be reasonable to assume that this importer received a by-law concession, though, noting the lack of follow up advertising, it is also reasonable to assume that this concession was withdrawn.

The Federal Executive has made further enquiries and believes that the manufacturer to whom I have referred to above, again blocked the attempts by suppliers of overseas manufactured equipment to Amateurs to secure concessions.

Very relevant in this context is that a second local manufacturer is about to produce and release on the Australian market, commercially designed Amateur Radio equipment. We do not know, of course, the price structure of this equipment, or indeed when it will be delivered. No doubt, however, this manufacturer would claim to have a legitimate objection to the admission under by-law of foreign made equipment in competition with his equipment.

Whatever are the claims of a local manufacturer for protection, the Institute firmly asserts that the present customs tariff and sales taxes imposed on Amateur equipment are too high.

The Institute believes that the Amateur market (which is a relatively small market in any event) can justify special concessions by the very nature of the Amateur Service itself. The loss of revenue involved would be infinitesimal and the Institute believes that it has a proper case to put in this area.

We are given heart in our present efforts by the apparent change in attitude to the tariff rates evidenced by various press statements made in recent times by the Minister for Customs and others. It seems from these statements that many people believe that the present protective rate platforms are too high. If these investigations enter the field of electronics, probably the main concentration will centre on broadcast and television receivers and the various items of mobile equipment used commercially. No doubt severe pressure can be expected to maintain existing levels in the face of overseas price levels for these types of apparatus. Whatever the result in the commercial field, the Institute maintains that Amateur equipment does, and should, fall into a separate category justifying substantially reduced rates of duty and tax. The Institute, on behalf of all Amateurs, will ensure that the best possible case will be submitted.

—MICHAEL J. OWEN, VK3KI.
Federal President, W.I.A.
HOME STATION ANTENNA FOR 160 METRES

Part Five—Inverted "L" and Sloping Antenna

J. A. ADCOCK,* M.I.E. (Aust.) VK3ACA

In general this type of antenna will produce mainly vertical polarisation and a little horizontal polarisation. It will produce more horizontal polarisation than an antenna with a balanced top. This type of antenna has been dealt with last as some of the conclusions depend upon earlier results.

For the purpose of discussion we will consider the horizontal polarisation component of Fig. 18. Consider the vertically polarised component of Fig. 18a. The form factor of the current on the vertical section is 0.9 (Fig. 7). From equation (6):

\[ R_v = 98.75 \times (0.5 \times 0.9)^2 = 20 \text{ ohms.} \]

Considering the horizontal section, the form factor in relation to the base can be worked out as follows:

\[ F = \frac{\text{Average Current}}{\text{Base Current}} \]

From Fig. 6

\[ F = \frac{1 - \cos \alpha}{\text{radian} \alpha \times \text{sine} (a + b)} = 0.373 \]

The radiation resistance of the top section at the base of the antenna will be:

\[ R_h = 98.75 \times (0.5 \times 0.373)^2 = 3.44 \text{ ohms.} \]

This resistance will be reduced by the presence of a perfectly conducting ground by a factor of 0.42 (Fig. 15).

\[ R_n = 3.44 \times 0.42 = 1.45 \text{ ohms.} \]

Above a perfectly conducting ground, considering horizontal radiation as loss, the vertical efficiency is 20/21.5 = 0.93 (93%).

From Part Four, the resistance, including radiation and loss, is equal to the free space resistance above a lossy ground, then—

Vertical efficiency above a lossy ground = 20/23.4 = 0.855 (85.5%).

The above, of course, are maximum efficiencies and do not include antenna loss. The proportion of horizontal radiation to vertical radiation in both cases is—

\[ 1.45 \div 20 = 0.072. \]

Comparing the inverted "L" with the "T" it is obvious that the radiation from the top in both cases is small. The horizontal component and the loss from the top will be greater in the case of the inverted "L". The inverted "L" top will have a greater capacitance load for a given total length than the "T" (Fig. 9).

For example, in the case in question as an inverted "L" with the same length top \( X_c = 600 \text{ ohms,} \) in the case of a "T" with the same top \( X_c = 700 \text{ ohms} \) (not a large difference). It can therefore be considered that the top section in both cases is only a load and not a radiator.

Considering the sloping antenna in Fig. 18b and take the vertical component first. The current distribution on the effective vertical component of the antenna will be the same as that of an antenna equal in length to the whole wire (sinusoidal), but the effective height will be equal to that of the end of the antenna. In this case, from Fig. 7, form factor = 0.635.

From equation (6):

\[ R_h = 98.75 \times (0.5 \times 0.635)^2 = 10 \text{ ohms.} \]

The radiation of the horizontal component without considering ground loss (this is a hypothetical situation since a horizontal monopole with a horizontal ground plane is impossible):

\[ R_h = 98.75 \times (0.866 \times 0.635)^2 = 30 \text{ ohms.} \]

These results do not include losses due to series resistance.

In both cases the proportion of horizontally polarised radiation to vertically polarised radiation would be:

\[ 1.6 \div 10 = 0.16 \]

It would appear that a sloping antenna is not very efficient.

CONCLUSION

Considering these antennas for receiving they would give some horizontally polarised pick-up as well as vertically polarised. This would have the effect of making audible signals which contain little vertical polarisation, however they would not have the advantage of a completely balanced horizontal. Used as a vertical, the inverted "L" would be comparable in performance with a "T" of the same dimensions.

SUPPORT PROJECT AUSTRALIS!

THE POPULAR

GREAT CIRCLE BEARING MAPS

60c Post Free

Printed on heavy paper 20" x 30", Great Circle Map 16" diameter. Invaluable for all DXers and S.w.l's. Bearings around circumference allow precise beam headings to be made.

ALL PROCEEDS TO W.I.A. PROJECT AUSTRALIS

Cheques, etc. to W.I.A., P.O. Box 67, East Melbourne, Vic., 3002

We would again wish to thank all those people who have bought Maps and who made donations over and above the advertised price.

*P.O. Box 106, Preston, Vic., 3022.

Amateur Radio, September, 1971
ANGLE MODULATION

LECTURE No. 14C

PHASE MODULATION

Major Armstrong's original f.m. transmitters used phase modulation in order to obtain frequency modulation.

Phase modulation is still used in some high-quality f.m. transmitters and is used extensively in mobile transmitters.

In order to understand phase modulation it is necessary to understand the meaning of the word phase.

In electrical engineering the word phase is usually taken to mean the difference in angles between the current and voltage in an a.c. circuit. If the current and voltage each reaches the maximum and minimum in each cycle the current and voltage are exactly in phase, but if the current lags or leads the voltage then there is a phase difference.

However, the word phase may also mean the time difference between two or more currents in the same a.c. circuit. For instance in a three-phase alternator three lots of current are produced with each revolution of the alternator rotor and these currents are spaced 120° apart in time and they remain spaced this amount irrespective of the speed of the alternator rotor. Fig. 2c illustrates this.

![Phase Modulation Diagram]

<table>
<thead>
<tr>
<th>Modulating Voltage</th>
<th>Modulating Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude 10%</td>
<td>Amplitude 100%</td>
</tr>
<tr>
<td>100-250 kHz</td>
<td>100-250 kHz</td>
</tr>
<tr>
<td>Deviation ± 5 kHz</td>
<td>Deviation ± 5 kHz</td>
</tr>
</tbody>
</table>

This may be only a few watts, and is sometimes referred to as a "synchronous condenser".

As the alternator is at rest it is disconnected from the a.c. mains. Before it can be connected to the mains its rotor must be rotating at the correct speed for the particular mains frequency and if it is to deliver power then the current it will produce must be in exact phase with that in the a.c. mains.

Alternators used in power generation are of the synchronous type.

Amongst other things this means that they will not commence rotation (as a motor) if they are connected to the a.c. mains.

However, if they are rotating at sufficient speed to be very close to the mains frequency they will "pull-in" to the correct speed if the incoming mains are applied.

It must be remembered that one of the factors governing the frequency at which an alternator works is the speed of rotation of the rotor.

One of the problems in the generation of a.c. power and its distribution is that when this has been done the current to that of the a.c. mains current. The alternator phase will slowly change in phase. The alternator, being synchronous, will pull into correct speed if the incoming mains and from the alternator, and compares the phase of the alternator current to the phase of a.c. mains current and when the pointer points to 0°, if the circular dial is calibrated 0-360°, then there is no phase difference between the alternator and the a.c. mains.

Let us assume that the synchroscope shows a phase difference, say 180°, as this is about the worst condition. The operator will slowly alter the speed of the alternator, usually to speed it up, so that the phase difference will increase and as soon as the synchroscope reads 0° phase difference, the operator will close the mains switches to connect the alternator to the mains. If a small power is produced this is a few degrees the alternator, being synchronous, will "pull-in" to the correct phase and frequency. The operator then increases the alternator excitation and power to drive so that the alternator produces power to feed into the a.c. mains.

Now, from our viewpoint, the most important part of all this is that whilst the alternator he was changing the frequency as well because the only way he could change phase was to alter the speed of the alternator, and alteration of speed means an alteration of frequency.

However, as soon as synchronism was obtained the phase ceased altering, as did the frequency and the alternator frequency would remain constant.

This description has been made to show that during the time that the phase was changing in the alternator the frequency also was changing and the sooner as the phase stopped changing the frequency stabilised at the a.c. mains frequency.

This is the basis of phase modulation.

The amount of frequency modulation which can be produced by phase modulation depends on the amount of phase shift and the rate of change of phase.

Any shift in the phase of an r.f. carrier will cause the effective frequency to change. This means that the frequency of the r.f. carrier will change if the phase of the r.f. carrier is changing. Moreover, as soon as the phase stops changing, the carrier frequency will return to its original frequency.

In the discussion on frequency modulation it was stated that the frequency deviation was determined by the amplitude of the modulating audio frequency voltage and the rate of deviation is governed by the frequency of the modulating voltage.

There are several methods which may be used to achieve synchronism. Three of these are the use of three lamps connected in a special circuit, a meter device known as a synchronoscope, and a cathode-ray oscilloscope.

Let us assume that the operator is using a synchronoscope. This is a meter device in which the pointer can revolve continuously in either direction or stop still. When it is fed with a small amount of power, both from the incoming a.c. mains and from the alternator, and compares the phase of the alternator current to the phase of a.c. mains current and when the pointer points to 0°, if the circular dial is calibrated 0-360°, then there is no phase difference between the alternator and the a.c. mains.

Let us assume that the synchroscope shows a phase difference, say 180°, as this is about the worst condition. The operator will slowly alter the speed of the alternator, usually to speed it up, so that the phase difference will increase and as soon as the synchroscope reads 0° phase difference, the operator will close the mains switches to connect the alternator to the mains. If a small power is produced this is a few degrees the alternator, being synchronous, will "pull-in" to the correct phase and frequency. The operator then increases the alternator excitation and power to drive so that the alternator produces power to feed into the a.c. mains.

Now, from our viewpoint, the most important part of all this is that whilst the alternator he was changing the frequency as well because the only way he could change phase was to alter the speed of the alternator, and alteration of speed means an alteration of frequency.

However, as soon as synchronism was obtained the phase ceased altering, as did the frequency and the alternator frequency would remain constant.

This description has been made to show that during the time that the phase was changing in the alternator the frequency also was changing and the sooner as the phase stopped changing the frequency stabilised at the a.c. mains frequency.

This is the basis of phase modulation.

The amount of frequency modulation which can be produced by phase modulation depends on the amount of phase shift and the rate of change of phase.

Any shift in the phase of an r.f. carrier will cause the effective frequency to change. This means that the frequency of the r.f. carrier will change if the phase of the r.f. carrier is changing. Moreover, as soon as the phase stops changing, the carrier frequency will return to its original frequency.

In the discussion on frequency modulation it was stated that the frequency deviation was determined by the amplitude of the modulating audio frequency voltage and the rate of deviation is governed by the frequency of the modulating voltage.
In phase modulation the faster the phase is changed, the greater is the frequency shift. When the phase is changed at an audio frequency rate, then the change is greater at the high frequencies than at the low frequencies, i.e. a frequency of 10,000 cycles in the output carrier would have varied 100 times as fast as a frequency of 100 cycles.

For a given amount of phase shift, the amount of frequency modulation increases directly in proportion to the audio frequency rate. This fact, of course, would not hold if the modulating frequency were sufficiently high for the insertion of a simple resistance-capacity filter as described in earlier.

...insertion of a simple resistance-capacity filter in the audio frequency input to the phase modulator. This filter makes the frequency modulation independent of the audio frequency and proportional only to the amplitude of the modulating voltage. The filter causes the amount of phase modulation to decrease, linearly, as the modulating voltage decreases, retaining a true frequency modulated signal.

...probably the greatest advantage that phase modulation has over direct methods of producing frequency modulation is that it is possible to use a quartz crystal oscillator with regard to the inherent stability of the quartz crystal to hold constant the carrier central frequency.

However, there is a penalty to be paid in that the amount of f.m. that can be produced by phase modulation is very small, and considerable multiplication must be used to obtain the necessary deviation at the carrier frequency, whereas it is possible, in 1970, to produce direct carrier f.m.

As mentioned previously, the first practical wide-band f.m. transmitters were developed by Major Armstrong and may be relevant here to give a brief description of one of these transmitters.

A very stable quartz crystal, oscillating at about 200 KHz, was used to generate the r.f. carrier frequency. The output of this oscillator, at a low power output, was fed simultaneously to a linear amplifier then to a balanced modulator. The output from the balanced modulator was a double sideband suppressed carrier signal at the quartz crystal frequency. By re-combining the carrier and sidebands in the proper phase, a small phase shift was produced.

In order to prevent excessive distortion, the audio frequency modulating voltage was pre-distorted as described earlier and the effective phase shift was obtained to be 48° at the reactance valve-modulator. The maximum frequency change was only ±24.4 Hz. at the frequency of approx. 200 KHz.

In order to produce a frequency swing of ±75 KHz. at the final carrier frequency of 432 MHz., a multiplication of 3,072 times (in round figures, 75 KHz. × 24.4) was needed.

However, the small amount of deviation, at the quartz crystal frequency, would not permit full modulation of the lower audio frequencies, so it became necessary to use a new centre frequency of 10.8 KHz. (43.2 MHz. ÷ 3,072) and figure 2 and figure 3.

...to do this the original 200 KHz. phase modulated signal was multiplied 64 times to give a frequency of 12.8 MHz. ±1562 Hz. (200 KHz. × 64 ÷ 24.4 Hz.)

...this was then heterodyned in a mixer, against another quartz crystal on 11.9 MHz.

...Remember that a multiplier will multiply not only the radio frequency but the deviation as well, but heterodyning changes only the radio frequency. The frequency difference of 900 KHz. was selected, 12.8 - 11.9 MHz. = 900 KHz.

...Thus the output of the frequency mixer was 900 KHz. ±1562 Hz. This was then multiplied 48 times to give a final carrier frequency of 43.2 MHz. ±75 KHz. (to nearest significant figure).

...Also note that direct multiplication of the 200 KHz. quartz crystal frequency by 3072 times would not produce the correct output frequency, but by multiplying 64 times, heterodyning and then re-multiplying (total multiplication 3072) both the correct output frequency 43.2 MHz. and deviation of ±75 KHz. were obtained. This is a good exercise in frequency multiplication and heterodyning.

...This method of obtaining phase modulation can be described briefly in this manner. Phase modulation may be derived by amplitude modulating a constant frequency carrier-wave, removing the a.m. sidebands thus produced from the carrier, shifting the phase of either the carrier or the sidebands by 90° and re-combining the sidebands with the carrier so that a 90° phase shift has occurred.

Phase Shift Exciter

Here are details of a practical phase shift exciter designed along the above lines. Let a quartz crystal oscillator use a 6C4 valve with a shunt-fed balanced tank. This tank is to excite two 6BE6 valves in push-pull. The centre tap of the tank will go to earth through a grid bias resistor. The plates of the two 6BE6 valves are to be connected in parallel.

...Because the grids are in push-pull and the plates are in parallel, there will be no r.f. output at the plates if the input r.f. signal is exactly 180° out of phase between the two grids, and the valves are perfectly balanced.

...A condition is almost impossible to attain, there will be a slight amount of r.f. signal get through.

The No. 3 grids of the 6BE6 valves should be fed with an audio frequency signal, which is in push-pull (through a resistance-capacity filter as described earlier).

...The output of the pair of 6BE6 valves will now be a double-sideband suppressed carrier signal.

...The next step is to connect a resistor and small condenser in series across the oscillator tank circuit. The reactance of the condenser must equal the waveform of the resistors so that at the junction there will be a phase shift of 90° between this point and earth.

...Following the pair of 6BE6 should be a class C r.f. amplifier used for isolation. This can be a 6A6U valve. A grid is fed from the junction of the phase shift network whilst its plate (tank circuit) is connected to the paralleled plates of the 6BE6s. In this manner the carrier is re-inserted into the sidebands 90° out of phase with its original phase, and the signal in the tank circuit of the 6A6U valve has become a frequency modulated signal.

...The two 6BE6 valves are part of a circuit known as a balanced modulator.

...A reactance-valve modulator may be used to phase modulate a constant carrier by connecting it across a tuned circuit. The variation in reactance of the reactance-valve modulator will produce a phase shift and a small change in phase shift across a tuned circuit also gives a frequency change, hence frequency modulation occurs.

...A reactance valve modulator may be placed across a quartz crystal oscillator to produce phase modulation. However, there will be some amplitude modulation as well and this may be removed by passing the resulting signal through one or more limiters (these are valves which pass f.m. but reject a.m.).

SERRASOID MODULATION

During World War II Major Armstrong developed another method of producing phase modulation through the generation of a saw-tooth wave form. This method was named Serrasoid, from the Latin Latin word for saw.

...This is a very complicated system but has the great advantage that much less frequency multiplication is required than in other forms of phase modulation for a given deviation of say 3 kHz. per mili volt.

...The basic oscillator is quartz crystal controlled and operates at 1/864th of the final carrier frequency.

...The oscillator drives a buffer stage for isolation to give a constant load on the oscillator. This isolator feeds a pulse shaper which triggers a saw-tooth oscillator. The saw-tooth wave goes into a modulator, which is essentially an electronic switch and this produces a square wave at its output.

...Application of an audio frequency voltage causes the leading edge of the square wave to be slightly advanced or retarded in phase.

(Continued on Page 6)
Today's sophisticated communications equipment calls for crystals that meet the most exacting standards of the art. Standards that were acceptable a few years ago cannot meet the requirements of design engineers today. Today's tight tolerances demand quartz blanks with precision selected angles of cut, and Hy-Q use X-ray diffraction equipment to determine this most important factor. Long term stability is assured by close engineering control of all processing in an air-conditioned environment. The blanks are then checked to determine the frequency change over the temperature range. The crystal is then precision calibrated to frequency using a crystal impedance meter which simulates the manufacturer's oscillator specifications. Hy-Q crystals are custom manufactured to meet all these exacting requirements. It is for these reasons that Hy-Q crystals have been readily accepted as a standard by the Communications Industry and why we can guarantee them against defective material and workmanship or any deterioration in performance when they are used in equipment for which they were specifically made.

Australia's largest independent crystal manufacturers.

Write for details.

Hy-Q Electronics Pty. Ltd.

AGENTS:

NSW: General Equipments Pty. Ltd., Artarmon. Phone 438-2705.
SA: General Equipments Pty. Ltd., Norwood. Phone 63-4844.
NT: Combined Electronics Pty. Ltd., Darwin. Phone 6661.

REFERENCES
5. N.A.B. Handbook (price is about $40). American F.C.C. regulations and descriptions of F.M. transmitters are included in this huge book.
6. Sound and Television Broadcasting (Sturley), Iliffe, B.B.C. training manual. Section on F.M. is very good.

"V.H.F. COMMUNICATIONS"
The International edition of the West German publication UKW-BERICHTE
NOW AVAILABLE ON SUBSCRIPTION through
FEDERAL EXECUTIVE PUBLICATIONS DEPARTMENT,
P.O. BOX 67, EAST MELBOURNE, V.I.C., 3002
Quarterly. $4.20 per annum

"V.H.F. COMMUNICATIONS"
THE "Z" MATCH

RON HENDERSON,* VK3ARV

A centre fed antenna, being balanced to ground, obviously requires a balanced feed-line, which is not the case when co-ax is used and hence high s.w.r. often results to the detriment of output valves. Imbalances and high s.w.r.s are often result in severe interference to nearby receivers. Using a tuner, however, reduces this and helps to peak the antenna for the band in use. The Z match is the only tuner found at this QTH of reducing the s.w.r. to acceptable levels on all bands.

Construction is simple. Use a three-position ceramic switch (from a 609 tx, etc.) for: (a) Z match, or (b) dummy load, 52 ohms. The dummy load consists of 3-watt carbon resistors of 18 ohms and 15 ohms in series/parallel (two legs of 101 ohm) immersed in a gallon tin of transformer oil.

The ability to switch from 80 metres to higher bands without changing antenna terminals is very handy; 10 to 40 metre band tuning is done on one position of one coil, and 80 metres on the larger coil.

Coils are 14 s.w.g. wire. L1 consists of 5 turns, 2½" diameter; L2 is 5 turns, 2 diameter equally spaced over L1. L3 is 8 turns and L4 is 6 turns spaced centrally over L3—same diameters as for L1/L2.

Capacitor C1 can be a single of 350 pF, and C2 is 250 pF. dual stator; good insulation, preferably ceramic. Short leads result when the coils are mounted on the capacitors. PL259 connectors were used—4½" spacing for 600 ohm feeders.

The antenna in use is a standard size 3.5 MHz. dipole (468/F MHz., or 133 ft. 7 in. long), fed with 90 feet of 600 ohm open-wire feeders (14 s.w.g. wire, spaced 4½"), high in the air and clear of obstructions.

See you on the DX bands, especially 20 metres.

TRANSISTORS

CO-AX. FITTINGS, DIODES, RESISTORS, CAPACITORS

These and many other new components are available from the Victorian Division of the Wireless Institute of Australia. Members of any Division wishing to take advantage of this service may obtain a Components List by sending an S.A.S.E. (preferably 4" x 9") to:

DISPOSALS COMMITTEE
P.O. BOX 65, MT. WAVERLEY, VIC., 3149

Tuning capacitor gangs were from an 1154 tx. In the diagram, C1 comprises two gangs, approximately 180 pF., connected in parallel. The whole unit is one piece of the old tx panel with added-on sides. Coils are mounted on the back of the gang and at right angles to one another.

Coils are as described in the R.S.G.B. Handbook, Section 13 (Z Match article). Home-made coils were first wound on cardboard forms, then removed and with a screwing action the wire is fed through holes in perspex [polystyrene is better—Ed.] sheets (two pieces 4" x 3½") and cemented on each hole.

The ability to switch from 80 metres to higher bands without changing antenna terminals is very handy; 10 to 40 metre band tuning is done on one position of one coil, and 80 metres on the larger coil.

OUTCOMER POST

By H. F. EVERTICK

Communications—the key to our hobby.

It was amazing to read the other day the high percentage of school children who cannot communicate in English. Right here in Australia. Would you believe—children! Older migrants are set in their ways, yes. But school kids!

What would Amateur Radio communications be like without English as a common language? Luckily, we have taken over so much formalised material—the Q code, N.A.T.O. phonetics, c.w. abbreviations. To this we have added bits of own own, "My receiver is double conversion, transmitter is 100 watts, aerial is dipole 15 metres high, wx is cold and rainy, please QSL."

Do we understand this may be the limit of the English spoken? Or do we think they sign off for fear of entering fields of discussion, perhaps verboten? In fact the first is nearer the truth. Evidently elsewhere points to language being the barrier to further conversation.

How many of us could converse in their language? Even to the minimum extent to qualify for a QSO? How many of us could understand call signs in Spanish, French or anything except English?

A few of us, even from the older brigade, are busy learning a foreign language—Italian, Japanese, Portuguese maybe. Others of us can converse in English and a "mother tongue": Dutch, German, French, Polish even. But would you believe it, there is even an Amateur Radio interpreter book. Pick your language, listen on the bands and practice your pronunciation. Do it yourself in fact.

Some other areas come to mind where interests can be channelled. There are scores on the periphery of Amateur Radio in Australia who cannot pass the exam. because their English is inadequate. Can we rally round to make them at least feel at home in Amateur Radio? Are they in sufficient numbers to warrant short technical English classes by groups or individuals? Would the multi-choice answer type of exam, solve these problems? What price reciprocal licensing? Then there are overseas students here. Kindly Amateur Radio acts could recruit potential Amateurs or ambassadors in countries where the hobby is not flourishing. Perhaps our efforts now could affect the voting in a future Space Conference because someone highly placed knows what Amateur Radio is and does.

Do we exercise patience and tact when we hear Amateurs struggling on the DX bands in unfamiliar English? Maybe these are from near neighbours of ours for whom we discuss "Aid" in other fields. Here is one area of aid.

Further elaboration seems pointless in this language essay. What a wonderful way to meet others half way.

Auf wiedersein, au revoir, tot siens.

* 132 The Boulevard, Thomastown, Vic., 3074.

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. Drawings will be done by "A.R." staff.

Please address all articles to:
EDITOR "A.R.,"
P.O. BOX 36,
EAST MELBOURNE,
VICTORIA, 3002

Amateur Radio, September, 1971
SIDEBAND ELECTRONICS ENGINEERING

Sorry to have to announce that my attempts to also import KW ELECTRONICS Transceivers at attractive prices have failed. Unnecessary delays occurred in U.K. in loading a consignment on a freighter that could have arrived in Sydney in time before the deadline imposed on me.

I was better serviced by my suppliers of YAESU MUSEN sets and there still is some stock available at the low prices advertised last month. But they are going very fast, so don't delay ordering if you want to benefit by my streak of luck in the import business!

YAESU MUSEN—

FT-101 AC/DC Transceivers, latest improved models ........................................ $520
FT-200 Transceivers with heavy duty AC supply-speaker units ...................... $350
FT-DX-400 AC Transceivers ...................................................................................... $425
FT-DX-401 AC Transceivers, with CW filter, type FT-101 noise blanker, WWV coverage and final amplifier cooling blower, front panel lay-out as the FT-DX-560   $465

For further accessories, check last month's advertisement. All prices include sales tax, net cash with order, subject to change without prior notice.

WAYNE COMMUNICATION ELECTRONICS

Catering specially for the Amateur with Components, Receivers, Transmitters, Test Equipment. Everything from Resistors to 100 MHz. Frequency Counters

ALL AT UNBEATABLE PRICES

- COLLINS ART13 AUTO-TUNE TRANSMITTER. 2-18.1 MHz. AM or CW. 813 PA, 2 x 811 Modulators. Complete with all tubes. In good condition. $30 each. Freight forward.
- COMPUTER BOARDS. Removed from functional equipment. Contain 4 VHF transistors, 12 high speed switching diodes, 2% metal oxide resistors. $1.50 each.
- CERAMIC 1625 SOCKETS. Suit also 3AP1 CRO tube. 15c each.

- POWER SUPPLIES. 230v. 50 Hz. input, 300v. 100 mA. DC output. Manufactured by A & R. Brand new. $10 each.
- WIRE WOUND RESISTORS. Range: 1.8 to 620 ohms. 6 watt. New. 5c each.
- SPECIAL! TRANSFORMERS: Primary 230v. 50 Hz., Secondary 27v. 3 amp. This month only. $3.00 each.

All items plus pack and post.

Come and inspect the full range of equipment and components at

WAYNE COMMUNICATION ELECTRONICS
757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122

Phone 81-2818
SPACe CONFERENCE REPORT

Notes on a talk given by Mr. Tom Clarkson, ZL2AZ, on his attendance at the I.T.U. (Space Conference) of the I.T.U. in Geneva in June/July, 1971, as the representative of I.A.R.U. Region 3 Association.

Tom Clarkson said he had been part of the I.A.R.U. team in Geneva headed by I.A.R.U. President Bob Denniston, WODX. This team included John Huntoon, W1RU; Dick Baldwin, W1RU; Noel Eaton, VE3CJ; and Win Dalmijn, PA0DD. In addition, Dr. Perry Klein, K3JTE, of AMSAT had attended for part of the time. Many other Amateurs were discovered in the Delegations, including Roy Stevens, G2BVN (Secretary, I.A.R.U. Region 1), who was known beforehand to be part of the U.K. Delegation. Tom had found his status as an Amateur and a volunteer extremely useful.

At the Conference were 91 official country Delegations, 2 private organisations, 5 United Nations agencies, and 17 international organisations including I.A.R.U. A total of about 700 participants. The I.A.R.U. team was, of course, present in the observer role in common with most of the international organisations. The work of the Conference was channelled through various committees. Many of these committees were further split up into working groups. In some instances there were 90, 100 participants in the working groups.

Of particular interest to Amateurs was Working Group 5C. This was part of the Allocation 5 Committee. Group 5C dealt with the use of frequency sources, Time Signals and the Amateur Service. There were points of interest for Amateurs in other committees as, for example, the Technical and Regulations Committee, and attention therefore had to be paid to the work going on elsewhere.

At the outset it became clear that an influential European policy of some rigidity on assignments formulated in advance and the Delegates concerned were well briefed. At the core of this was the fear of possible interference with other services and frequency requirements for such items as television, broadcasting, other satellites, radio astronomy and so on. The existing alliance on a shared basis between the Amateur Service and radio location proved sound despite later failures. A prepared Amateur Service’s paper was read out at an early stage of the Plenary and at all times good mileage was made out of the origins of Oscar 5.

In the Regulations Committee new definitions came into being. These included the “Amateur Satellite Service” as “a service using satellites to carry on a service with the same definition as the Amateur Service”. The latter is an extension. Some doubt exists about the technical requirements affecting the Amateur Satellite Service which can only be resolved when the final documents of the Conference come to be published. The work of the Conference was of considerable complexity although the launching country appears to be the responsible authority for the life of the satellite. It appears that the general provisions affecting the use of satellites will also apply to Amateur Satellites.

The report of Working Group 5C merely recorded that the principle of the Amateur Service to possess satellite operating rights in the shared bands could not be agreed. Surprise and dismay were expressed at the intensity of the opposition. The use of the exclusive Amateur bands for the Amateur Satellite Service was accepted though not without some discussion. It was towards the end of the sessions of this Working Group that a proposal came up that 435 to 438 MHz. might be set aside for Amateur Satellite Services on a world-wide basis. This proposal was made some time after the Chairman had permitted I.A.R.U. to present a statement justifying the demonstrated practicability and previous experience of command procedures in Amateur Satellites.

The stage was set therefore for further discussions on the subject in the main committee. As events turned out, the voting of the Working Group was merely recorded. Almost no discussion was permitted. The situation therefore appeared hopeless because the Plenary merely rubber-stamps Committee Reports.

On the very last day (15th July) of the Conference the Agenda listed papers for discussion which had been ruled out at an early stage. The obvious lack of new ideas was a sign that the Conference had not been adequately prepared for this field. A stage where the Amateur Service won the battle, not the war. A stage where the Amateur Service was permitted. The situation therefore appeared hopeless because the Plenary merely rubber-stamps Committee Reports.

The results of this Conference provide considerable material for considerable discussion. Many authors appeared to believe that the next International Conference would be held about three or four years time. This is admitted as being overdue at the present time.

The results of this Conference provide considerable material for considerable discussion. Many authors appeared to believe that the next International Conference would be held about three or four years time. This is admitted as being overdue at the present time.

SUMMARY

The Amateur Satellite Service is authorised to operate in the bands:—


Finally, the Oscar programme seems essential to our cause.
CUSTOMS IMPORT DUTIES

Customs Duties along with Excise Duties form the major part of a group classed as indirect taxation. Income Tax forms the larger part of the direct taxation group. Customs Duties are charged levied on the importation of goods for home consumption. Excise Duties are imposed on certain locally produced goods for domestic consumption. These are broad definitions.

Customs Duties are charged according to rates set out in the Customs Tariffs which forms a part of the general legislation pertaining to Customs and Excise. In order that the charges may be levied in a uniform manner at the same rates when goods are imported through any port or by air or parcel post, it is essential that all articles of commerce are adequately and precisely classified.

In the very early days Customs Import Tariffs were based more or less on rule of thumb principles. For example, tobacco goods, alcoholic beverages and certain other kinds of goods were listed and rates could be applied uniformly. All other imports would then come under a "rag bag" or "blanket" item.

As international trade continued to develop the national tariffs became more and more complicated. This began in the 18th century. It is an axiom that the greater the number of words used in a legal definition the greater will be the possibilities of differing interpretations.

Various efforts began to be made to introduce classification lists divorced from those produced solely for purposes of rates of customs duties applications. Several other factors also began to emerge more strongly, such as state interference to protect local industries or production and so on.

A classification listing of goods on an international level called the S.I.T.C. was devised for statistical purposes and was taken over by many countries for their Customs Tariffs. This classification was (and is) based on the principle of sections beginning with the simple raw materials and working through to the more complex manufactures more or less on the basic ingredient or material.

However, for a number of reasons this kind of listing was found to fail short of Customs requirements and another kind of classification was devised in Europe under the auspices of the Customs Co-operation Council in Brussels. This, produced in 1947, the so-called B.T.N. Tariff, was the first attempt to sub-divide into other manufacturing fields.

It enables local officers of Customs to classify goods with reasonably uniform precision without simultaneously having to consider (in general) if a different classification might result in a higher or lower duty charge. In other words, the applications of various duty rates become more and more a matter for centralised policy decisions. It also enables, or should enable, the importer to calculate in advance the rate and amount of duty he will have to pay on his imports and he should know that his competitors will have or should have the same applied in their case also.

The present over-all Australian Customs Tariffs procedures do not, however, completely achieve these results despite an enormously complex system. The reason stems not only from the Tariff itself, but from the By-Law provisions which have grown up as a by-product of protectionism.

You see, it works this way—in much simplified terms. It may be submitted to the government by a manufacturer or group that the radio and electronics industry cannot flourish against imports of cheap radios or TV receivers. The government agency concerned—namely the Tariff Board—examines the facts revealed from an investigation made by them. It may then decide that certain rates of import duty are desirable in order to give the local manufacturer a fair chance to compete on the local market. These rates of duty, if approved by parliament, are then applied and become protective duties and may be slightly higher or very considerably higher than the rates of duty which would normally have applied solely for revenue producing purposes.

Unfortunately, further complications begin to manifest themselves. This applies not only to protective duties which are imposed to protect an existing industry, but also to duties which might be imposed to encourage the establishment of a new industry or to allow an existing industry to expand into other manufacturing fields. The protective umbrella may, therefore, be a small one or a very large one.

You will ask why so much time is devoted to the classification history. The answer is comparatively simple. It enables local officers of Customs to introduce classification lists divorced from those produced solely for purposes of rates of customs duties applications. Several other factors also began to emerge more strongly, such as state interference to protect local industries or production and so on.

A classification listing of goods on an international level called the S.I.T.C. was devised for statistical purposes and was taken over by many countries for their Customs Tariffs. This classification was (and is) based on the principle of sections beginning with the simple raw materials and working through to the more complex manufactures more or less on the basic ingredient or material.

However, for a number of reasons this kind of listing was found to fail short of Customs requirements and another kind of classification was devised in Europe under the auspices of the Customs Co-operation Council in Brussels. This, produced in 1947, the so-called B.T.N. Tariff, was the first attempt to sub-divide into other manufacturing fields. The B.T.N. Tariff, radiotelephonic and radiotelegraphic transmission and reception apparatus are classified under heading (or item) No. 85.15. In other countries the headings are sub-divided in accordance with each country's individual requirements.

Thus, one country might want to separate out broadcast receivers for one rate of duty and all the other goods of that heading for another rate; thus you would see "85.15.01 (or 85.15A) radio broadcast receivers 50%, 85.15.99..."
So we have the By-Law provisions and the supplementary By-Laws. These green paper publications are well over 3" thick and the regular re-printed pages of revisions can run into thick wads of paper. These are published and are available for anyone to peruse in the right places. The provisions of these By-Laws and the supplementary By-Laws apply to all parts of importation. Some of the provisions include a security clause whereby end usage is restricted under official control.

But these two sets of published By-Laws are by no means the end. An additional series of Ministerial ad hoc decisions are exercised in favour of specific importers for imports through a specified port in respect of specific goods (sometimes restricted over a period of time). These are not published and are, therefore, known only to the Customs, the importer and the importer's customs agent. It is a customs maxim that the affairs of one importer must be resorted to if the situation is to be rectified.

And, as importers who enjoy concessional import rates of duty do not ordinarily discuss their "advantages" with other people, it is not known who can get what at any particular time. No criticism is levelled at officials, but the system itself appears to merit closer examination. It is this system which has caused so much confusion in Amateur Radio circles.

EXAMPLES OF DUTY

Turning now to the size of the umbrella used for protection under Tariff Item 85.15 (and associated spare parts and components items), the present sub-divisions extend to six sub-headings which, briefly, are:

85.15.100—Radio b.c. receivers 45% + 27½% + $10 ea. + 10% ea. 
85.15.200—T.v. receivers 45% + 27½% + $50 ea. + 12½% on pict. tubes 
85.15.300—T.v. chan. tuners 45% 30% 
85.15.400—T.v. camera pick-up heads Free Free 
85.15.500—Parts for goods in 85.15.100/200 45% 27½% 
85.15.900—Other 45% 27½% 

The second of the two columns of duties (the preferential column) refers to the goods of the origin of the United Kingdom, Canada, N.Z. (except Trade Agreements), F.P.N.G. (Tokelau's generalisation but is correct for 85.15). The first column refers to goods of any other country of origin. The same applies to the By-Laws previously quoted here. In short, by a process of elimination, the unassertion by the importer of the "made in Origin" clause, closely defined by the importers and conforming to a minimum country content if preferential rates of duty are claimed by the importer. It so happens that our ordinary Amateur Radio transceivers and transmitter parts are classified under Item 85.15.900. This is a high rate of duty. When coupled with Sales Tax of 15%, the tax man takes a good mouth of this and the result is that the importer is not out of pocket. But this does not end here. Importers must base their selling prices on landed costs which, of course, include duties and taxes, freight and other on costs.

Finally, in a short article of this nature it is possible only to have a look at the functioning of the discretion allowed to the Minister. The criterion is that a suitable local equivalent is not reasonably available. The decision rests with the Minister. This is based on the submissions made by an applicant and the comments put up by the official experts. The Minister's discretion has not hitherto been exercised where a local manufacturer states he is in a position to supply the goods concerned from his own production. This is where there is considerable room for manoeuvre by local manufacturers.

Officialdom endeavours to analyse all such claims but there is a limit. It is, therefore, quite obvious that pressures from manufacturers on the one hand (whether or not truly justified in terms of actual production at any given moment in time) are offset against pressures from importers on the other hand. If the manufacturer wins, we pay more for the apparatus concerned. If the importer wins, we pay less.

LICENSED AMATEURS IN VK

APRIL 1971

<table>
<thead>
<tr>
<th>VK</th>
<th>Full</th>
<th>Lim.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>11</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>X1</td>
<td>84</td>
<td>29</td>
<td>113</td>
</tr>
<tr>
<td>X2</td>
<td>1404</td>
<td>474</td>
<td>1878</td>
</tr>
<tr>
<td>X3</td>
<td>1253</td>
<td>656</td>
<td>1909</td>
</tr>
<tr>
<td>X4</td>
<td>512</td>
<td>197</td>
<td>709</td>
</tr>
<tr>
<td>X5</td>
<td>522</td>
<td>232</td>
<td>754</td>
</tr>
<tr>
<td>X6</td>
<td>368</td>
<td>130</td>
<td>500</td>
</tr>
<tr>
<td>X7</td>
<td>150</td>
<td>66</td>
<td>216</td>
</tr>
<tr>
<td>X8</td>
<td>21</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>X9</td>
<td>92</td>
<td>10</td>
<td>102</td>
</tr>
</tbody>
</table>

4521 1816 6337 Grand Total

MAY 1971

<table>
<thead>
<tr>
<th>VK</th>
<th>Full</th>
<th>Lim.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>11</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>X1</td>
<td>84</td>
<td>29</td>
<td>113</td>
</tr>
<tr>
<td>X2</td>
<td>1418</td>
<td>484</td>
<td>1902</td>
</tr>
<tr>
<td>X3</td>
<td>1310</td>
<td>66</td>
<td>1376</td>
</tr>
<tr>
<td>X4</td>
<td>519</td>
<td>202</td>
<td>721</td>
</tr>
<tr>
<td>X5</td>
<td>518</td>
<td>231</td>
<td>750</td>
</tr>
<tr>
<td>X6</td>
<td>366</td>
<td>130</td>
<td>500</td>
</tr>
<tr>
<td>X7</td>
<td>158</td>
<td>66</td>
<td>224</td>
</tr>
<tr>
<td>X8</td>
<td>30</td>
<td>12</td>
<td>42</td>
</tr>
<tr>
<td>X9</td>
<td>91</td>
<td>11</td>
<td>102</td>
</tr>
</tbody>
</table>

4521 1856 6359 Grand Total

"7 3" MAGAZINE

PRICE INCREASES EFFECTIVE NOW

New Prices for Subscriptions:

<table>
<thead>
<tr>
<th></th>
<th>ONE YEAR</th>
<th>TWO YEARS</th>
<th>THREE YEARS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S6.50</td>
<td>S11.00</td>
<td>S15.00</td>
</tr>
</tbody>
</table>

Available from—

W.I.A. Federal Executive
P.O. Box 67, East Melbourne, Vic., 3002

Your first issue will be acknowledgment, allow 6/8 weeks.
### NEW CALL SIGNS

**MAY 1971**

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK1MP</td>
<td>R. Miles</td>
<td>34 McCawley St., Watson, 2602</td>
</tr>
<tr>
<td>VK1ZVT</td>
<td>D. S. Thomas</td>
<td>23 Fox PI., Lyneham, 2601</td>
</tr>
<tr>
<td>VK2KJ</td>
<td>K. L. Finney</td>
<td>1 Hill St., Baulkham Hills, 2153</td>
</tr>
<tr>
<td>VK2VC</td>
<td>D. Kelly</td>
<td>3/99 Leyland Pde., Belmore, 2153</td>
</tr>
<tr>
<td>VK2AP</td>
<td>P. E. Stavye</td>
<td>19 Balmclava Rd., Berowra, 2081</td>
</tr>
<tr>
<td>VK2AT</td>
<td>W. R. Taylor</td>
<td>“Yarrawonga,” Mac’s Recif Rd., Sutton,</td>
</tr>
<tr>
<td>VK2BSV</td>
<td>S. I. Shimell</td>
<td>120 Maxwell St., Turramurra, 2174</td>
</tr>
<tr>
<td>VK2BTJ</td>
<td>B. R. Hartley</td>
<td>42 Erle Pl., Seven Hills, 2147</td>
</tr>
<tr>
<td>VK2BCO</td>
<td>P. E. Stayte</td>
<td>19 Balaclava Rd., Balgowlah, 2103</td>
</tr>
<tr>
<td>VK2AWT</td>
<td>W. R. Taylor</td>
<td>“Yarrawonga,” Mac’s Recif Rd., Sutton,</td>
</tr>
<tr>
<td>VK2BSV</td>
<td>S. Voron</td>
<td>60B Dutruc St., Randwick, 2074</td>
</tr>
<tr>
<td>VK2BWP</td>
<td>1st West Peakhurst Boy Scouts Association, 21 Johnstone St., Peakhurst, 2210</td>
<td></td>
</tr>
</tbody>
</table>

### PREDICTION CHARTS FOR SEPTEMBER 1971

*Prediction Charts by courtesy of Ionospheric Prediction Service*
VK4YG—E. G. Gabriel, 3 Corkhill St., Freshwater, Sydney.
VK4ZGC—G. C. Lovell, 42 Jolly St., Clayfield, Qld., 4011.
VK4ZNM—M. A. Clarke, 8 Kefford St., Kingaroy, Qld., 4610.
VK4ZMM—M. J. W. Mitchell, 3 Morehead St., Toowoomba, Qld., 4350.
VK4ZCV—C. V. Rohlaeh, 9 Coronation Ave., Elizabeth Vale, S.A., 5112.
VK5ZTD—T. M. Dixon, 36 Coppleridge Dr., Mount Eliza, Vic., 3930.
VK5ZMM—M. J. W. Mitchell, 3 Morehead St., Toowoomba, Qld., 4350.
VK5ZCV—C. V. Rohlaeh, 9 Coronation Ave., Elizabeth Vale, S.A., 5112.
VK6WE—W. T. Widmann, 1 Learmonth St., S.E. Melbourne, Vic., 3215.
VK6JX—J. A. Large, 51 Lionel St., Kalgoorlie, W.A., 6430.
VK6ZBV—J. E. McKenna, 111 Lyndon Cres., Caulfield North, Vic., 3161.
VK5ZAY—K. R. Bone, Station: Jervois, 4610.
VK3LL—M. V. Busch, 42 Goold St., Bairnsdale, Vic., 3875.
VK3ZUR—L. Janes, 10 Barclay Close, Tullamarine, Vic., 3043.
VK3MM—M. P. Marschall, 2 Parker St., Preston, Vic., 3076.
VK2ZQZ/T—S. M. Garnham. Addition of /T.

OBITUARY
W. E. (EDDY) HAGARTY, VK1WH
A link with early Amateur Radio in North Queensland severed with the recent death in Townsville of Eddie Hagarty, VK1WH, who died at the age of 67 years. He was licensed at an early age in Longreach and experimented extensively with all types of receiving and transmitting equipment. He was credited with a few "firsts" in radio while at Longreach. He was a keen supporter of the Townsville Amateur Radio Club and held the position of Secretary and Treasurer for many years.

Active throughout his years in Townsville, I am sure many Australians in Australia and overseas will remember Eddie Hagarty.
Bring in the whole wide world
REALISTICALLY
with the
REALISTIC DX 150
Communications Receiver

SW/CW/SSB/AM

This is the BIG performance set that obsoletes tube receivers...a professional-looking set that appeals to amateurs and short wave listeners alike. The DX 150 gives long-range, world-wide realistic reception on 4 bands, including Broadcast. Fully transistorised—all solid state—no warm-up delays; the DX 150 will run on dry cells if current fails or is not available; will operate from a car's cigarette lighter or any 12V DC service. A 240V AC power supply is also built in. Over 30 semiconductors—product detector for SSB/CW, plus fast and slow AVC—variable pitch BFO—illuminated electrical bandspread, fully calibrated for amateur bands—cascade RF stage—ANL for RF and AF—zener stabilised—OTL audio—illuminated "S" meter—built-in monitor speaker plus front panel jack for external (optional) matching speaker.

Realistic Performance
Realistic Price

$229-50

Attractive silver extruded front panel, solid metal knobs, grey metal cabinet, size 14½" x 9½" x 6½".

CONSULT YOUR LOCAL RADIO DEALER, OR MAIL THIS COUPON TODAY
Please forward free illustrated literature and specifications on Realistic.

MAIL THIS COUPON TODAY

LOW DRIFT CRYSTALS

1.6 Mc. to 10 Mc., 0.005% Tolerance, $5

10 Mc. to 18 Mc., 0.005% Tolerance, $6

Regrinds $3

THESE PRICES ARE SUBJECT TO SALES TAX

SPECIAL CRYSTALS: PRICES ON APPLICATION

MAXWELL HOWDEN
15 CLAREMONT CRES., CANTERBURY, VIC., 3126
Phone 83-5090

LOG BOOK
AVAILABLE IN TWO TYPES—VERTICAL OR HORIZONTAL
Larger, spiral-bound pages with more writing space.

Price 75c each
plus 25 Cents Post and Wrapping

Obtainable from your Divisional Secretary, or W.I.A., P.O. Box 36, East Melbourne, Vic., 3002

Page 14 Amateur Radio, September, 1971
DIVISIONAL NOTES

NEW SOUTH WALES

This marks the re-introduction of Divisional Notes in “Amateur Radio”. Club Secretaries and Publicity Officers are reminded that these notes and material for the Calendar should reach the sub-editor at the VK2 rooms on or before the 1st of each month. Deadline for Nov. “A” is Sept. 24.

VK2AJE has tendered his resignation from Council. His place has been taken by Mike Farrell, VK2ZNA (now Secretary, V.h.f. Group). Programmed transmission on 6 and 2 mx as well as Sec. V.h.f. Group.

At Sept. 24 gen meeting we hope Mr. C. All will be up to see us, and give us some report on his.......

The VK2 Division has a new member: J. Rope, VK2HEX, who will be installed. We hope the new h.f. tx's will be acceptable. Please leave gear at the rooms or Mr. E. Trebilcock, 340 Gillies St., West Perth; Gen. Mtg., 3rd Tues.; Council, last Thurs.; Y.R.C.S. Friday before and Thurs. after Gen. Mtg.; W.I.C.E.N., Box 10, Grong Grong, N.S.W., 2593, for QSL cards; VK5RX. This information will assist you in keeping in contact with the VK2 Division.

The new VK2QX Channel 1 is now on the air. It is a low power channel, but the new equipment should improve the reception considerably.

The VK2 Division has a new member: J. Rope, VK2HEX, who will be installed. We hope the new h.f. tx's will be acceptable. Please leave gear at the rooms or Mr. E. Trebilcock, 340 Gillies St., West Perth; Gen. Mtg., 3rd Tues.; Council, last Thurs.; Y.R.C.S. Friday before and Thurs. after Gen. Mtg.; W.I.C.E.N., Box 10, Grong Grong, N.S.W., 2593, for QSL cards; VK5RX. This information will assist you in keeping in contact with the VK2 Division.

DIVISIONAL CALENDAR

Listen to Divisional broadcasts also.

NEW SOUTH WALES

Sept. 10: Opening Ceremony at Sydney Technical College, School of Applied Electricity from 1000-1600 hrs. Exhibits in class rooms in Building 37, 39 and 41 and also Building 1. There will be demonstrations of the equipment used in the College, including a full range of power supply and control equipment. The Division is collecting notes land material for the Calendar. All notes may be confined to general topics provided they are submitted by the 1st of the month. (Awaiting his full call). Mike is active on 6 EU, 7 MD.


Oct. 2: South-West Area Convention (Area 3) at Grogeon Clubroom, 3855 and 3857 Grogeon Road, South Burnett. Write to W.I.C.E.N., P.O. Box 10, Grong Grong, N.S.W., 2593, for details. (Courtesy VK2AEC).

Oct. 17: Hunter Branch Annual Field Day at Mornong Park from 1000 hrs.

Oct. 29: 2 mx Fox Hunt.

VICTORIA

Sept. 19: V.h.f. Group Rally at Gembrook Sports Ground from 0900 to 1830 hrs. (VK3AOT, P.O. Box 889, G.P.O., Melbourne, Vic., 3139; phone 277-8295).

Oct. 2: Eastern and Mt. Districts Rad. Club Annual Field Day at VK2WI, Quarry Road, Dural, 0930 to 1615 hrs.

Oct. 3: “Open Day” for their own internal classes are requested to attend. Associate members of such advice, a new copy will be despatched.

Oct. 22; 2 mx Fox Hunt.

So, all amateurs are requested to attend. Associate members of such advice, a new copy will be despatched.

Correspondence Courses

The VK2 Course Supervisor reports that Stage 2 of the Correspondence Course has been re-written and considerably improved upon. These new forms have been previously issued with complimentary copies for the members of the VK2 and VK3 Clubs. A letter is being sent to the Course Supervisor via the VK2 rooms advising the approximate date on which the forms will be available. The new forms of such advice, a new copy will be despatched. Stay tuned for further information, as is also available. Stage 1, very much in need of substantial editing, will be available later in the year. (C. Bardwell, Course Supervisor)

R.D. CONTEST

Have you sent in your Log?
read in the 18 pages presented in the first issue, which arrived on time and in good quality. Pleased to note VK South-East area of VK5 rates a mention and it is to be hoped this segment will continue with interest. There’s an interesting letter from VK3AFW for a proposal on medium frequency transceivers. It is quite thought provoking and worth reading! George VK3ASV describes a mobile antenna (5/8 wave length which load and works well on both 8 and 2 metres! George also gives details of the Eastern Zone 2 metre band plan; and so it goes. My copy from Mr. Cook, VK3AFW, and I hope there will be items of national interest which I can select for “A.R.” from time to time.

BEACON FREQUENCIES

The idea of having an exclusive beacon allocation appears to be gaining in popularity, and beacons in the 52 MHz band have gained the most attention. This idea is quite worth considering! -'VK5LP)

All there are some comments to the beacon list this month. I notice that interest in concern operations in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

There are some changes to the beacon list this month. I notice that interest in concern operations in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

Therefore, the VK5 operators have extended their interests in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

Therefore, the VK5 operators have extended their interests in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

Therefore, the VK5 operators have extended their interests in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

Therefore, the VK5 operators have extended their interests in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

Therefore, the VK5 operators have extended their interests in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

Therefore, the VK5 operators have extended their interests in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

Therefore, the VK5 operators have extended their interests in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.

Therefore, the VK5 operators have extended their interests in the Antarctic region. Firstly, Mike VK5ZHM reports from the Antarctic Peninsula that the beacon originally known as VKGR has now been taken over by Phil VK5PP and operates under that call signs. This gives us a station at 5 w.p.m. Transmitting runs 120 watts d.c. into a pair of 6146 valves. A new m.c.w. identifier in form of IC keyer which is nicely placed for the second 500 KHz. portion of the past month of course I was puzzled by reports of people having been concerned with the “sighters”. There were some very puzzling reports of people having been chasing signals, and it was quite as if a mode more suited for beacons, is being a mode more suited for South Africa from the southern States, and a Great Circle path to South America.
Any opinion expressed under this heading is the
CORRESPONDENCE:
Editor Dear Sir,

I would like to suggest that the people who are
in favour of Novice licensing have listed
countries like France, Germany, England, Italy,
more attractive so that that dreadful deficiency
of the W.I.A. should be to make membership
The attitude of the office-bearers and members
of the W.I.A. then, worrying about increasing lev­
. The sub-committee has suggested that if we
had Novice licence holders, they should be
accepted as Associate members of the W.I.A.
All we know that this fee is insufficient to
swell the finances of our W.I.A. and a full
member must know the problem.
I think Ron has put the finger on the spot
when he suggests that the Radio Inspectors'
Branch would have to further increase licence
fees very considerably to cover the administra­
new). They will remind you about the increase in b.c.i.
and t.v. radio licences. Don't feel too bad, if
experience and who could be less experienced
than a Novice.
I believe to school boys taking an inter­
Amateur Radio as an extra activity is fine,
but tell you that there are many "old timers" who
don't need a Novice licence of lower standard
to encourage the boys to sit for the Amateur
licence. I call it an insurance policy. I know on
number of boys who in the course of doing their
Leaving or Matriculation course, for a high
school have sat for the A.O.L.C.P. and
passed without any preparation whatsoever if
they were doing physics at school. Any intelli­
Heard a lot of emotional argum ent on
A.O.C.P. and pass if he learns Morse, and the
Novice licensing to Australia, why not then
above frequency allocation states, and I
report No. 13). This agreem ent made at the
Conference concerns only those Hams in Region I
that Novices will form approx. 8% of the Ham
population in VK and that the relatively small
number of 136 will become W.I.A. members
within a period of low sunspot activity, which
The strong anti-N.L. stand taken by VK3RN
calls for a comment, or two. Mr. R. Higin­
botham raises one or two very pertinent points,
which stem from the costs of the existing opera­tions. As for
ther, viz. the method of N.L. examinations and the
number of states and territories to which
representatives of the W.I.A. is, for me, too assum­

No extra 25 KHz. on selected bands
feasibility of losing band portions allocated to

strongly retarded (as
doing the idea.

lack of balance in the published correspond­
VK3RN which you published in "Am ateur
Radio" July '71 is over-reactive and few of the
issues on frequency allocation states, and I
report No. 13). This agreem ent made at the
Conference concerns only those Hams in Region I
that Novices will form approx. 8% of the Ham
population in VK and that the relatively small
number of 136 will become W.I.A. members
within a period of low sunspot activity, which
The strong anti-N.L. stand taken by VK3RN
calls for a comment, or two. Mr. R. Higin­
botham raises one or two very pertinent points,
which stem from the costs of the existing opera­tions. As for
ther, viz. the method of N.L. examinations and the
number of states and territories to which
representatives of the W.I.A. is, for me, too assum­
It may be that initially there will be a rush
of Novice applicants before things settle down.
their own house

Although a few short comments on further points on R.H. VK3RN: Code
at 5 w.p.m., yes, a little more impatient, rather than
rushed. Most ops, soon go from 5 to 10 w.p.m. in a matter of a few
weeks.

Re amateur jitters, and the lack of ability to
communicate via the written or oral words:
that Novice, with his QRM, does not have to compete
with the Novices.

The strong anti-N.L. stand taken by VK3RN
calls for a comment, or two. Mr. R. Higin­
botham raises one or two very pertinent points,
which stem from the costs of the existing opera­tions. As for
ther, viz. the method of N.L. examinations and the
number of states and territories to which
representatives of the W.I.A. is, for me, too assum­
It may be that initially there will be a rush
of Novice applicants before things settle down.
their own house

Although a few short comments on further points on R.H. VK3RN: Code
at 5 w.p.m., yes, a little more impatient, rather than
rushed. Most ops, soon go from 5 to 10 w.p.m. in a matter of a few
weeks.

Re amateur jitters, and the lack of ability to
communicate via the written or oral words:
that Novice, with his QRM, does not have to compete
with the Novices.

For your own good, take a necessary fundam ental from the Ama­
ateur Radio, September, 1971 Page 17
operate their own stations? If our "layman" technicians and intellectuals. If our "layman" is employed on the production line of a motor assembly plant, or wherever, chances are that he will never enter the Amateur Service. If our friend is engaged by an electronic industry he will receive the basic grounding in electrical theory and practice so necessary as a background to Amateur Radio. How many lads employed by the P.M.G.'s Department operate their own stations?

In short I am convinced that there should be some legal and easier way for all persons interested in radio communication to become Amateur radio operators of some designation.

Okay, so I've heard the argument, "If you fail the theory, sit again and again," and so on.

The writer is an acquaintance of two television servicemen who are proprietors of two very successful businesses which has set for the A.O.C.P. and failed; one is adept at c.w. and a.m., f.m. or a.m. emission; beams giving operators the ability, therefore the Service would be self policing for the most part. Doesn't Commercial Radio work this way? The restricted power and higher frequencies would encourage the intelligent operator to study for the A.O.C.P. to make use of the DX bands.

American C.B. operators rarely try for their full ticket because they have the use of the "skip" frequencies, hence the term, given them by the laws, "amateur". When the American business fraternity realised that the u.h.f. frequencies wouldn't "bend"; they influenced the F.C.C. to lower the C.B. band to 11 metres. The results are well known to most of us; we learn from their mistakes.

I would be pleased to see the Wireless Institute get behind these proposals. I realise that International Agreements have to be considered with respect to the code if this proposed Service is to V.H.F. or U.H.F. bands we will have failed to take the initiative by not campaigning earlier for a similar service within the Amateur frequencies.

It should be obvious that this type of service can be better controlled within the Amateur bands and a stepping stone to full licensing. I believe the code should not be of any consequence. No code or theory but a rigid test on station discipline, regulations and safety. Good quality equipment would have to be P.M.G.-approved. A Call Book is a necessity. The result is a very successful business. Each has sat for the "73" magazine, came up with an idea last year to encourage radio as a hobby for all and a stepping stone to full licensing. I believe it will work! An Amateur Hobby Class licence on part of 420-450 MHz. or perhaps part of 144-148 MHz, on a.m., f.m. or c.w. emission; beams giving operators extra range and interest to c.w. and strict v.h.f. and u.h.f. antennas, etc.

No code or theory but a rigid test on station discipline, regulations and safety. Good quality u.h.f. transceivers are now available for around $300 and within a few years there will be codeless rigs on the market at prices the beginner can afford; v.h.f. rigs are always available at reasonable prices. All station

"I Read You Loud and Clear"

Confident, Positive Contacts

... with a EDDYSTONE EC10 Mk. II.

Communications Receiver

Check these Features

★ NOW ... WITH "S" METER
★ FINE TUNING
★ SOLID STATE
★ BATTERY or AC

EDDYSTONE COMMUNICATIONS RECEIVERS

Send Coupon for Technical Details

Page 18 Amateur Radio, September, 1971
pressed my views perhaps like many others. I also found Mr. Higginbotham’s views, which are undoubtedly the result of a considerable amount of research, most enlightening and aptly provoking.

It would appear to me there are quite a number of the Amateur fraternity who look upon Novice licensing as inevitable, to whom I would ask, look again and find a realistic answer to these questions.

What is the expected cost of Novice licensing in dollars alone for all amateurs, excluding manpower of which they are already in dire need, and what bearing will these costs have on future licence fees?

Will the status Amateurs now enjoy be decreased with the introduction of a lower stand (need) and what bearing will these costs have upon Novice licensing as inevitable, to whom official clearance through the Sarawak Tourist Malaysia arrangements between Australia and Malaysia.

Arrangements between Australia and Malaysia.

VK team to demonstrate by way of a DX eventuate later in the year.

VK5MS 340.

VK6KK. 5X5NA—G3LQP

5X5NA—G3LQP

DXCC endorsements—VK5MS 340.

Contest Results (“CQ” Mag.): 1970 “CQ” W. V.R. and DX. A.A. (annual card) Single op. all band. AX6ID. 2. 181 240 pts.; AX6BR 1 121 951: AX2APK 607 128 (won by KV4FX) 861 551 JFL4X. VK5HH. In the three weeks back to S. Pole.

Darlene 3B9DK, writing from Rodrigues Island on 13th July, said in the three weeks the ship over 200000 for 135 countries with the Swan 5000 to an inverter, ve ep. 70 ft. She plans a DX party from the Island on 13th July, said in the three weeks back to S. Pola, R. S. G. B. 1000. R. S. G. B. 21/28 MHz. phone.

Willis Island issued its own go card, who recently activated Willis Is. among the half are missionaries. She gave a thumbnail sketch of the island as round by a coral reef. Population about

A V. H. F. Rally—Sponsored by the VK3 V.H. F. Group

Programme: Events for the OMs, XYLs & Harmonics. Lunch provided.

Contest Results ("CQ" Mag): 1970 "CQ" V. R. and DX. A. A. (annual card) Single op. all band. AX6ID. 2. 181 240 pts.; AX6BR 1 121 951: AX2APK 607 128 (won by KV4FX) 861 551 JFL4X. VK5HH. In the three weeks back to S. Pole.

Darlene 3B9DK, writing from Rodrigues Island on 13th July, said in the three weeks the ship over 200000 for 135 countries with the Swan 5000 to an inverter, ve ep. 70 ft. She plans a DX party from the Island on 13th July, said in the three weeks back to S. Pola, R. S. G. B. 1000. R. S. G. B. 21/28 MHz. phone.

Willis Island issued its own go card, who recently activated Willis Is. among the half are missionaries. She gave a thumbnail sketch of the island as round by a coral reef. Population about

A V. H. F. Rally—Sponsored by the VK3 V.H. F. Group

Programme: Events for the OMs, XYLs & Harmonics. Lunch provided.

Contest Results ("CQ" Mag): 1970 "CQ" V. R. and DX. A. A. (annual card) Single op. all band. AX6ID. 2. 181 240 pts.; AX6BR 1 121 951: AX2APK 607 128 (won by KV4FX) 861 551 JFL4X. VK5HH. In the three weeks back to S. Pole.

Darlene 3B9DK, writing from Rodrigues Island on 13th July, said in the three weeks the ship over 200000 for 135 countries with the Swan 5000 to an inverter, ve ep. 70 ft. She plans a DX party from the Island on 13th July, said in the three weeks back to S. Pola, R. S. G. B. 1000. R. S. G. B. 21/28 MHz. phone.

Willis Island issued its own go card, who recently activated Willis Is. among the half are missionaries. She gave a thumbnail sketch of the island as round by a coral reef. Population about

A V. H. F. Rally—Sponsored by the VK3 V.H. F. Group

Programme: Events for the OMs, XYLs & Harmonics. Lunch provided.

Contest Results ("CQ" Mag): 1970 "CQ" V. R. and DX. A. A. (annual card) Single op. all band. AX6ID. 2. 181 240 pts.; AX6BR 1 121 951: AX2APK 607 128 (won by KV4FX) 861 551 JFL4X. VK5HH. In the three weeks back to S. Pole.

Darlene 3B9DK, writing from Rodrigues Island on 13th July, said in the three weeks the ship over 200000 for 135 countries with the Swan 5000 to an inverter, ve ep. 70 ft. She plans a DX party from the Island on 13th July, said in the three weeks back to S. Pola, R. S. G. B. 1000. R. S. G. B. 21/28 MHz. phone.

Willis Island issued its own go card, who recently activated Willis Is. among the half are missionaries. She gave a thumbnail sketch of the island as round by a coral reef. Population about

A V. H. F. Rally—Sponsored by the VK3 V.H. F. Group

Programme: Events for the OMs, XYLs & Harmonics. Lunch provided.

Contest Results ("CQ" Mag): 1970 "CQ" V. R. and DX. A. A. (annual card) Single op. all band. AX6ID. 2. 181 240 pts.; AX6BR 1 121 951: AX2APK 607 128 (won by KV4FX) 861 551 JFL4X. VK5HH. In the three weeks back to S. Pole.

Darlene 3B9DK, writing from Rodrigues Island on 13th July, said in the three weeks the ship over 200000 for 135 countries with the Swan 5000 to an inverter, ve ep. 70 ft. She plans a DX party from the Island on 13th July, said in the three weeks back to S. Pola, R. S. G. B. 1000. R. S. G. B. 21/28 MHz. phone.
Sun's X-Rays to be Mapped

A daily x-ray map which will show the rough intensity level of x-ray activity on the sun is one major objective of a satellite package being developed by Lockheed Missiles and Space Co. X-ray activity on the sun can be associated with solar flares and sunspots, with these phenomena indicating indicators of great energy storms on the sun. But even more, a study of how and where these x-rays are generated, and their energy levels, could lead to a new knowledge of the physical nature of the sun.

Described as a "mapping x-ray, hemilimeter," the package is being prepared under contract to NASA's Goddard Space Flight Center for flight aboard OSO-1 (Orbiting Solar Observatory, Mission "eye"), which will scan the sun.

General objectives of the mapping x-ray hemilimeter are to make detailed observations of x-rays emitted by the sun. The studies are aimed at:

- Determining more about solar behavior, including how frequently x-rays arise from particular regions of the sun.
- How much x-ray activity is correlated with optical and ultraviolet observations.
- What makes x-ray activity rise and fall.
- How soon x-rays can be detected after sunspots appear.

The satellite studies will be correlated with research being done at Lockheed's Bay Canyon Solar Observatory.

"These objectives in themselves are not new," said Dr. John Acton, of Lockheed's Palo Alto Research Laboratory, and principal investigator on the hemilimeter experiment. "But in the past, experiments have been limited by detection systems with less resolution and speed. With OSO-1 we can track into a detailed x-ray map, these observations would be possible.

The Lockheed hemilimeter consists of three independent x-ray detection systems, and a data accumulator and processor, which prepares the collected data for the OSO transmission system. The detectors are mounted within the flight package on the rim of a wheel, which slowly scans the sun.

X-ray pulses from each of these three detection systems will be fed into 15 energy channels which span the range of x-ray energy being measured—in this case, from two to 30 KeV (thousand electron volts). An analysis will be made of these pulse heights so as to compute the x-ray spectrum and intensity emanating from defined areas on the sun.

Because a better understanding of the sun's x-ray activity is of great interest to the scientific community, another two solar x-ray maps by OSO-1 will be a valuable instrument for researchers. These maps will be distributed to other solar research groups, and to solar forecasting centres, providing an additional means for correlated solar studies.

The mapping x-ray hemilimeter is being developed under a three-year contract by Lockheed's space astronomy organization, headed by Dr. Acton, staff scientist at the Research Laboratory. The experiment will make use of a number of previous studies conducted by this organisation.

OSO-1, scheduled for launch from Cape Kennedy about six months from now, will have an orbit of 300 miles. It is one of NASA's new series of orbiting observatory satellites. Previous OSO satellites had pointing accuracies of 1/120th of a degree (30 arc seconds). The new series of OSO's has improved pointing accuracies of 3 arc seconds—10 times better. OSO-1 will carry more than 150 other experiments in addition to the Lockheed mapping x-ray hemilimeter.

REPAIRS TO RECEIVERS, TRANSMITTERS

Constructing and testing: txal conv. any frequency; Q5-ers, R9-ers, and transistored equipment.

ECCLESTON ELECTRONICS

146a Coatham Rd., Kew, Vic. Ph. 80-3777

Page 20

Ham Radio, September, 1971
SOLID-STATE BREAK THROUGH

from YAESU

FT-101 Dual Power Supply TRANSCEIVER

Perfect choice for car, caravan, boat, aircraft, field day activity, etc.

FEATURE CHECK LIST

- Built-in AC and DC power supplies
- Built-in WWV 10 MHz. band
- Noise Blanker
- 25 and 100 KHz. Calibrators
- Built-in VOX
- ±5 KHz. Clarifier
- Built-in CW with Side Tone
- 1 KHz. Dial Read Out
- Selectable SSB
- AM Capability
- Built-in Speaker
- Microphone
- Dual VFO Adaptor
- Crystal Channel Oscillator

ACCESSORIES (optional extras)

External VFO ..... Model FV-101
External Speaker .. Model SP-101
Mobile Mounting Bracket
CW Filter (600 Hz.)

SPECIFICATIONS

Maximum Input Power: 300W. speech peak SSB, 180W. CW, 80W. AM.
Sensitivity: 0.3 microvolt for 10 dB. S/N.
Selectivity: 2.4 KHz. (6 db. down), 4.2 KHz. (60 db. down).
CW Filter: 0.6 KHz. (6 db. down), 1.2 KHz. (60 db. down).
Frequency Range: 3.5 to 4, 7 to 7.5, 10 to 10.5, 14 to 14.5, 21 to 21.5,
27 to 27.5, 28 to 30 MHz.

GENERAL

Frequency Stability: Less than 100 Hz. drift in any 30-minute period.
Antenna Impedance: 50 to 100 ohms - SWR 2:1 or less.
Audio Output: 3 watts, 350-2200 Hz., 4 ohms impedance.
Devices and Tubes: 10 FETs, 3 IC, 31 Si Tr, 38 Si Diodes.
- One 12BY7A driver, two 6JS6A final amp.
Power Source: 12 volts DC, or 100, 117, 200, 220, 234 volts AC.
Power Consumption: AC: Receive 0.5A., Transmit 3A.
- DC: Receive 0.5A., Standby 5A., Transmit 20A. max.
Dimensions: 13½" wide, 8" high, 11¾" deep.
Weight: 30 pounds.

All sets are pre-sales checked for operation on all bands, and covered by our 90-day warranty. Full facilities are available for after-sales service.

Latest model with factory-installed modifications, complete with power cables, plugs and P.T.T. noise-cancelling microphone.

Price $675 incl. S.T. [Price and specifications subject to change].

Sole Authorised Australian Agent:

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 67-1650 (AH 371-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

Amateur Radio, September, 1971
Distributors
For Australian and
International
Manufacturers . . .

**TEST EQUIPMENT:**

RAPAR • BWD
SWE-CHECK • HORWOOD

Call and see our big range of test equipment

**SEMI-CONDUCTORS:**

TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

1971-72 CATALOGUE NOW AVAILABLE, S3

---

**radio parts GROUP**

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!
AMERICAN RECORDING TAPE
(New, in sealed boxes)
1500 feet, 7-inch, Acetate, 1/2 mil. ... $3.50
1500 feet, 7-inch, Mylar, 1/2 mil. ... $4.25
1200 feet, 5%-inch, Acetate, 1 mil. ... $2.25
1200 feet, 5-1/8-inch, Mylar, 1 mil. ... $2.50

Postage 10c.

LAFAYETTE SOLID STATE HA600 COMM. RECEIVER

Five bands, a.m., c.w., s.s.b., Amateur and Short Wave, 150 to 400 KHz. and 550 KHz. to 30 MHz. with two mechanical filters. High gain Product detector. Crystal calibrator. Variable BFO. Noise limiter. S meter. 24 In. bandspread. 220v. a.c./12v. d.c. operated. Complete with all accessories. Price $195.00 net.

LAFAYETTE H800, solid state, as above but Ham Band only. S.S.R.-AM-CW. Price $195.00 net.

TRIO COMM. RECEIVER MODEL 9R-59DS

Four-band receiver covering 550 KHz. to 30 MHz. continuous, and all bands spaced on 10, 15, 20, 40 and 80 metres. 8 valves plus 7 diode circuits. 4-8 Ohm output and phone jack. S.S.B.-CW-AM, A.N.I., variable BFO. 5 meter, 3 screen bands, RF and AF gain controls. 10 in. overall size. Complete. Price $8.50 net.

EOG INSULATORS

For your aerial. 8c each.

LOW PASS FILTERS

A “Caben” Low Pass Filter will fix T.V.I. Cut-off frequency, 30 MHz.; attenuation at 50 MHz. better than 20 dB.; insertion loss, negligible Impedance 50-72 ohms.

Price $11.50. Postage 10c.

SOLID STATE STEREO AMPLIFIER

8 watts r.m.s. per channel. Input for magnetic, crystal and ceramic type microphone. P.V. cart-ridge, tape recorder input and output, tuner input, stereo headphone jack. Reduced to $55.00. Postage $1.20.

FIVE-CORE CABLE

5 x 5/0076. Ideal for Intercoms., Telephones, etc. New. 100 yd. rolls, $17 (postage 75c.), 200 yd. $45.45 (postage 30c.).

STEREO HEADPHONES

Professional quality (well known brand). Large earpads, standard stereo plug, 6 ft. lead. Price $5.75. Postage 50c.

CRYSTAL CALIBRATOR No. 10

Nominal range: 500 KHz. to 30 MHz. 500 KHz. xtal and 250 KHz./500 KHz. BFO. Provides heterodyne output in steps of 1 MHz. Dials driven by machine cut strip gears, calibrated in 2 KHz. div. Easily read to 250 cycles. Output “spikes” approx. 1 sec. intervals. Identifies best note. Power requirements: 12v. DC at 0.3 amp., 250 volts at 15 MA. This is a precision instrument. Complete with crystal. Price $23.50.

EXTENSION SPEAKERS

Type 1550 Tubular Extension Speakers, 8 ohms, new. Complete with lead and two plugs 2.5 and 3.5 mm. Price $4.30. Postage 20c.
CONTENTS

Technical Articles—

A Bit of Light Nonsense ............................................. 5
Development of an All-Band Vertical ................................ 11
Erratum ......................................................................... 12
Japanese Transistors ..................................................... 12
Notes on the R.F. Bridge ................................................. 4
The "Sentinel" ............................................................... 3
The Solar Link .................................................................. 8

General—

Blind Operators ........................................................... 24
Cook Bi-Centenary Award ............................................... 22
Correspondence: Novice Licensing .................................... 16
Divisinal Notes ............................................................. 23
DX ............................................................................... 22
Getting to know your Neighbour ........................................ 12
Licensed Amateurs in VK ............................................... 14
New Call Signs ............................................................. 20
Obituary ......................................................................... 19
Observation Post ........................................................... 14
Prediction Charts for October 1971 .................................... 13
Project Australis Report .................................................. 11
Repeater Secretariat ....................................................... 13
Silent Keys ...................................................................... 24
The Southern Cross Award ................................................. 14
VHF ............................................................................... 21
W.I.A. D.X.C.C. .............................................................. 22

Contests—

Distance Table for Ross Hull Memorial VHF/UHF Contest ...... 14
Ross Hull Memorial VHF/UHF Contest, 1971-72 ..................... 15

COVER STORY

The new Yaesu Musen model FTDX-401, which is basically similar to the FTDX-400/560 circuitry, with same p.a. output power. Front panel layout follows that of the FTDX-560. Features introduced in the new model include a noise blanker, c.w. filter, and a cooling fan attached to the p.a. section.
Versatility plus! . . . in a

2 METRE FM TRANSCEIVER

THE ICOM IC20—BY INOUE!

THE BEST FROM JAPAN—
NOW AVAILABLE IN AUSTRALIA

• 12 Channels, 10 Watts output.
• Backed by Maico Electronics.
• Includes Microphone, Mobile Cradle and English language Service Manual.
• Choice of two Channels: R1, R4, A or B.
• Built-in 2” x 3” Speaker.
• Modular construction.
• Complete package for . . .

$295.00 INC. TAX
or NO DEPOSIT, $3 WEEKLY

SPECIFICATIONS:

GENERAL
Frequency Coverage: 144 to 148 MHz.
Semiconductors: 33 Transistors, 5 FETs, 1 IC, 20 Diodes.
Power: 13.5V. Nominal Negative Earth.
Current Drain: Tx—10w., 2.1 amp. hi power;
Rx—150 mA.
Antenna: 50 ohm.
Size: 2-9/32” x 6-1/8” x 8-1/2”.
Weight: 4.5 lbs.
Modulation: Variable reactance phase.
Number of Channels: 12.
Voltage Regulator: Built-in for freq. stability and protection.
Final Protection: Automatic protection of final to guard against antenna deficiencies or mistuning.
Modular Construction of all Tx and Rx sub-functions. Out-of-guarantee service available on an exchange module basis.
AC Supply for base (optional).

TRANSMITTER
Crystals: \( f_{TAL} = f - 10 \times 10^3 \) MHz.
Deviation: \( 3-16 \text{ KHz} \), adjustable.
Final Output: Built-in VSWR Bridge controls APC circuit.
Power Output Meter and S Meter on receive.
Test Points for all major circuits.
Low Power Switch for driving Linears.

RECEIVER
Sensitivity: Better than 0.4 \( \mu \text{V} \), for 20 dB. quieting. \( S + N/N \) at 1 \( \mu \text{V} \), input 30 dB.
Filters: Two at 10.7 MHz., one at 455 KHz.
Spurious Response: —50 dB.
Spurious Gain: —60 dB. or less.
Bandwidth: ±15 KHz./—6 dB. point; ±25 KHz./—50 dB.
Squelch: Adjustable, 5 to —15 dB.
Audio Output: 1.5 Watts.
Frequency Control: \( f_{TAL} = (f - 10.7) \div 9 \).
Calibration Tolerance: 0.0025%.
Load Capacitance: 20 pF.
Individual Trimmers: Both Tx and Rx.


ENQUIRIES AND INSPECTION—

INDUSTRIAL & MEDICAL ELECTRONIC CO.
6th Floor, 288 LIT. COLLINS ST., MELBOURNE, VIC.

Phone 63-9258, A.H. 848-3018

Distributors for—

MAICO ELECTRONICS

A Textron COMPANY

Division of
W. A. SHEAFFER PEN CO. (AUST.) P/L
Mount Street, Heidelberg, Victoria, 3084

Note: Interstate Distributor Enquiries Welcome
THE "SENTINEL"
(or what you can do with your semiconductors)

I. E. HUSER,* VK5QV

This can readily be overcome by the inclusion of another diode in the centre tap of the transformer, as shown in Fig. 2. If now the fuse blows, then both the 600 volts and the 300 volts will be completely removed.

By incorporating a switch or relay at point X in Fig. 1, it is now possible to switch both high tension voltages with one pair of contacts without interrupting the supply to the filaments of the valves.

If we arrange this switch to have a time delay of approximately 30 seconds, and at the same time, interlock it with the negative bias in such a way that the high tension voltages are removed if the bias is lost, then the disadvantages of the circuit in Fig. 1 will have been overcome.

Fig. 3 shows the circuit of a simple arrangement which allows the high tension to be interlocked with the bias voltage without the use of a relay or switch.

The high tension is switched by an SCR in the negative return of the bridge rectifier circuit. This SCR requires a continuous signal on the gate to maintain conduction. As soon as the signal ceases, the SCR is switched off and the high tension is thus removed.

The signal for the SCR is obtained from a UJT relaxation oscillator controlled by resistor Q2 which senses the bias voltage applied to the linear amplifier.

With the bias voltage present, Q2 is forward biased, thus completing the charging circuit, allowing the timing capacitor C1 to charge. When the voltage across the capacitor reaches the intrinsic stand-off ratio of the UJT, it is quickly discharged through the UJT and the transformer primary, causing a pulse to be applied to the gate of the SCR. The windings of the transformer are phased so that the pulses to the gate are positive in relation to the cathode.

The OA91 diode across the secondary of the transformer ensures that only positive pulses are applied to the gate.

The RC time constant of the oscillator has been chosen to provide a signal high enough in frequency to trigger the SCR early in each half cycle and maximum output from the power supply thus obtained.
state, and after further development, the circuit in Fig. 4 was evolved.

A spare 6.3 volt winding on the transformer was pressed into service, thus enabling a bridge rectifier to be used as a trigger and high tension obtained from the 10K resistor in the base circuit of transistor Q2. For 100 volts bias, Rx would be approximately 500K.

The control transistor Q2 is initially biased off by the voltage across the 2.2K emitter resistor. This voltage is obtained from the 9 volt supply via the 470 ohm resistor and being greater than the forward bias obtained from the negative bias supply, the emitter-base junction of Q2 is therefore reverse biased.

Once the triggering of SCR1 has been achieved, the bridge can be removed from R2 and the time delay checked. Once again, if the time delay is found to be inoperative, then it is likely that the phasing to T2 is incorrect.

I was so pleased with this article, and having used noise bridges in the past, I built this one straight off. However, to make the device work satisfactorily in this country there are a number of tips which should be passed on fairly quickly so that the dustman will not be removing loads of defunct transistors from the VK Amateur shack.

Briefly, I recommend changes as follows:

1. Revise the amplifier circuit to use capacitive coupling between the transistors.
2. Increase the collector load resistance to 1.2K for Q1, and 820 ohms for Q2. This gives more gain from the amplifier. The 47 ohm load on Q2 in the original, I think, is a mistake.
3. Q2 is biased with 14K from collector to base.
4. Coils may be wound on modified Q2 material ferrite cups designed to go around Neosid miniature slug tuned coil formers which are readily available in Australia for less than 5 cents each. Simply file out the internal lip at the top, leaving a uniform cylindrical torroid. The resultant transformer is wound as per the article and works from 1.8 to 50 MHz.

5. 1000 pF. coupling capacitors were used to improve the output on 1.8 MHz.
6. A locally available BZY88 — 6.2 volts rating — was used with a 2.2K resistor to give adequate noise output with a 9-volt battery.

With the above modifications, the device draws 10 mA from the battery — originally, it took over 200 mA., which damaged two 2N3563s and flattened the battery—$3 worth of damage.

As a general rule, directly coupled transistor circuits as shown in the article by Nelson in "Ham Radio" are to be avoided, particularly when substitution of types is contemplated. I used 2N3563 transistors as specified, but any silicon NPNs with F2 of 400 MHz should work just as well in a simple wideband noise amplifier.

Finally, although I have been somewhat critical of the circuit, the end result is very pleasing. To all those people struggling with s.w.r. meters I thoroughly recommend the noise bridge. Setting up a GSRV with Z-Match to operate on all bands, to present 70 ohms to the transmitter on any nominated frequency is so quick and easy that the other methods are obsolete. The same GSRV is now field against earth on 1.8 MHz, and for the first time in history now looks like 70 ohms on 1815 KHz.


A BIT OF LIGHT NONSENSE

J. L. SINCLAIR, VK8SZJ

Does the atmosphere affect light in the same way as it causes "reflection" of v.h.f. signals? Obviously the atmosphere does affect light quite markedly at times, hence mirages, but the problem is to decide whether the action is the same in both cases.

Some time ago I lived in a spot that had been selected for its view, an expanse of Adelaide's southern suburbs and Gulf waters with Yorke Peninsula some times visible on the horizon. It was a good spot for v.h.f. DX, too, although I must admit I did not make full use of it. I had often wondered whether the atmosphere would affect light in the same way as it caused "reflection" of v.h.f. signals. Obviously the atmosphere does affect light quite markedly at times, hence mirages, but my problem was to decide whether the action was the same in both cases.

Preliminary thought about the subject led me to several conclusions, such as:

(a) Propagation of v.h.f. is not normally a reflection?

A true reflection will have the characteristics of the normal h.f. bands such as skip zones, propagation over long distances with very little loss, and fading due to mutual path working. The normal v.h.f. signal exhibits none of these characteristics and so I ventured to suggest that most so called DX working (150-300 mile range) is by a type of refraction in the lower atmosphere rather than by the more commonly accepted theory of tropospheric inversion layers. I have no doubt that inversion reflections do occur, but they account for the very much rarer path inversion reflections do occur, but they account for the very much rarer path inversion layers. I have no doubt that inversion reflections do occur, but they account for the very much rarer path inversion layers. I have no doubt that inversion reflections do occur, but they account for the very much rarer path inversion layers. I have no doubt that inversion reflections do occur, but they account for the very much rarer path inversion layers. I have no doubt that inversion reflections do occur, but they account for the very much rarer path inversion layers. I have no doubt that inversion reflections do occur, but they account for the very much rarer path inversion layers. I have no doubt that inversion reflections do occur, but they account for the very much rarer path inversion layers. I have no doubt that inversion reflections do occur, but they account for the very much rarer path

(b) Weather conditions that cause mirages occur much too rarely to be the same effect as causes v.h.f. DX but it was possible that a bending effect might be observable that could be correlated with radio propagation over a particular path.

(c) The exact nature of refraction had to be understood. I had to sit down and explain it to myself along the following lines:

(i) Hugyens Principle says in effect that a wave motion will always travel at right angles to the plane of the wave front.

(ii) Refraction occurs when a wave hits a medium of different density at an angle and is therefore slowed on one side of the wave front more than the other. In fact when you work it out light does not really travel in straight lines so much as it passes between any two points along the path that takes the least time.

(iii) A definite surface is not really necessary for refraction, a wave front travelling in a medium with any sort of uneven slowing effect will be refracted so long as it is not travelling exactly at right angles to the gradient.

(iv) Such a graduated medium exists in the atmosphere merely by the fact that air pressure is greatest near the ground and shades off eventually to nothing. A wave travelling parallel to the surface will be bent such more by the denser air near the ground and so will always normally have a tendency to dip towards the surface of the earth.

(v) What is important is the pressure gradient which is sometimes less marked than normal, but quite often, more than normal at very low altitudes (up to 200-300 ft. above ground level). The books say that on cloudy, windy nights the gradient is least because the atmosphere is all more or less at the same temperature. On still sunny days for instance the pressure can change quite rapidly with heights for the first few hundred feet.

This was where my perch on the hillside started to appear useful. It seemed to me that the horizon we saw 40 odd miles away should move up and down very slightly with changing weather conditions.

I used the rifle sight principle to prove that it did in fact happen that way. One "sight" was a bolt on the t.v. aerial (it shows the "monster" is useful for something!), and the other was a graduated scale I attached to my antenna tower 50 odd feet away. Graduations were to the nearest minute of arc and I found a variation of up to 10 minutes between maximum and minimum readings. Later I moved the sight to a pair of posts the same distance apart because the t.v. aerial seemed to be a bit too floppy for such a thing, but got substantially the same results.

After taking readings of the position of the horizon for most of one summer, I went looking for radio signals to compare them with. Two series of records of real use that I found were contacts between Mick VK5ZDR and Herb VK3NN, and signals from Mick and George VK5GG to Jim VK5ZMJ. Several other people round the Adelaide area were able to give me reports that filled in gaps in the series. From the figures I was able to prepare graphs of:

- Height of the horizon on each day;
- Signal strength over the path VK5ZDR to VK3NN on each day;
- Signal strength over the path VK5ZDR to VK5ZMJ.

Since VK5ZDR had been by far the most consistent, I used other peoples' reports to fill in gaps that occurred, reducing all reports to the signal strength that VK5ZDR would most probably have given in the circumstances.

Gaps in the graphs were many and varied, but there were about 40 points in the western path and about 20 points in the northern path that could be used to test my theory that v.h.f. radio and visible light would be similarly affected by day to day weather conditions.

With a book of instructions on statistical methods in one hand and a pencil in the other, I started preparing tables and testing the coefficient of correlation of each set of figures. My first try was to compare signal strengths on one path with that of the other. It yielded the disappointing figure of —0.003, which was not significant. Correlation coefficients are a measure of the chance of one quantity varying in step with the other; they vary between +1 and —1, the figure of +1 indicates that both quantities will always be in step, —1 means that as one gets bigger the other will always get smaller, and 0 or low numbers mean that the two are not really related to each other.

Since the weather in South Australia comes from the west and moves to the east, I reasoned that the reports from the northern path may correlate better with reports from the eastern path at a later time, so I tested a series of tables with respective time differences of 12, 24, 36 and 48 hours. The results I got were:

<table>
<thead>
<tr>
<th>Time Difference</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 hours</td>
<td>—0.093</td>
</tr>
<tr>
<td>12 hours</td>
<td>+0.255</td>
</tr>
<tr>
<td>24 hours</td>
<td>+0.066</td>
</tr>
<tr>
<td>36 hours</td>
<td>—0.001</td>
</tr>
<tr>
<td>48 hours</td>
<td>+0.079</td>
</tr>
</tbody>
</table>

The best estimate I can make of these figures is that all except the 12-hour difference figure are not related and the 12-hour figure is only slightly probable. None of the results showed a high enough correlation to allow me to conclude the two sets of results.

My next sets of figures concerned a comparison between the path to VK3NN and the horizon measurement. In this case there were several occasions when Mick had recorded contacts on 432 MHz, as well as on 2 metres. In this case, I wished to give some weight to the 432 MHz conditions so I divided the "S" number given by four and added it to the "S" number recorded for 144 MHz. The graph I made was of this composite "S" number with some other minor changes when conditions were obviously exceptional. In the same way as before I worked out cor-

\*C/o H.F. Broadcast Project, P.M.G. Dept., Darwin, N.T., 5700.
Sidebar Electronics Engineering

Still a few Yaesu Musen Transceivers in stock at Reduced Prices, slightly above those previously advertised for additional air freight charges paid to import them before my imposed deadline of 31st August, 1971. Sorry, all FT-200 and FT-DX-400 Transceivers already sold out. Their prices and those of all others after selling my present stock will go back to pre-June 1971 levels or higher due to the re-valuation of the Japanese Yen.

Yaesu Musen FT-101 AC/DC Transceivers .. $550
FT-DX-560 AC Transceivers .. $450
FT-DX-401 AC Transceivers .. $490
ELECTRONIC KEYERS, Katsumi EK-26 .............. $60
HY-GAIN Beams TH6DXX ............. $220
Vertical 14AVQ ............. $52
MOSLEY TA33JR ............. $105
Mustang ............. $130

Further, all Midland Products as previously advertised, bar Field Strength Meters. Also still in stock Cetron and EIMAC final zero bias triodes.

SPECIALS: Demonstration Transceivers, still as new, which have never left my premises—Yaesu Musen FT-DX-400, $400; FT-DX-400-S, converted to FT-DX-560, $400; Frontier Digital 500, $500; Frontier Super 1200-GT, $350.

All prices quoted are net, cash with order, Springwood, N.S.W., sales tax included, subject to change without prior notice. Postage, freight and insurance are extras.

144 MHz. Dual Conversion AM Receiver Kit

SPECIFICATIONS:
Frequency coverage: 144 - 145 MHz.
Sensitivity: 0.3 uV. for 6 dB. S + N/N.
Bandpass Filter at 455 KHz.
Input Impedance: 50 - 75 Ohms.
Audio output: 1 watt r.m.s. into 8 ohms.
Audio output impedance: 8 or 15 ohms.

Incorporates BFO and Noise Limiter.
Supply voltage: 9 - 16 volts; negative earth.
Varicap tuned VFO.
Kit includes all Capacitors, Resistors, I.F.'s, Pots, Switches and 14 Transistors.
Front end uses TIS88s; I.F., Dual Gate Mosfets.

Complete with Instructions and pre-drilled and etched Circuit Board

Special Introductory Price $42.00

SPECIAL! 2N3055 115 watt 15 amp. 60 volt silicon NPN Power Transistors $1.50 ea.

Come and inspect the full range of equipment and components at

Wayne Communication Electronics
757 Glenferrie Road, Hawthorn, Vic., 3122
Phone 81-2818

Proprietor: Arie Bles
The book had directions for testing the significance of these results and to the best of my knowledge it seems that most of the results are not significant, but a few of the higher ones probably are. The highest figure (-0.469) was only possible by chance once in about 200 to 300 times. The accuracy of the result increases with increasing numbers of trials and in this case there were 35 reports that could be compared. Other figures were:

(a) When the western radio path was compared 24 hours before horizon measurement it gave a figure of -0.378 with 31 comparisons which had one chance in twenty of being random occurrence;

(b) When the northern path was compared 12 hours before horizon measurement it gave -0.357 in 18 trials which could have happened by chance.

All the other measurements were less significant and therefore not worth talking about as they stood.

I worked the same procedure with contacts to VK5ZMJ although in this case there were no contacts on 432 MHz. and no others really unusual circumstances. The figures I obtained were:

(a) A d.c. component of 0.035 volts positive;

(b) An a.c. component with a wavelength of 24 hours and amplitude 0.383 volt peak to peak;

(c) An a.c. component with wavelength 56.5 hours and amplitude 0.506 volt peak to peak.

In this case the errors of the respective points are:

1st point 0.020 (20 millivolts)
2nd .. 0.000
3rd .. 0.001
4th .. 0.000
5th .. 0.000
6th .. 0.024

In the graph of the northern path, the figures are small for accurate calculation to be meaningful, but roughly it seems to me like a composite of:

(a) A d.c. component in the range of 0.1 to 0.2 negative;

(b) An a.c. component of 24 hours wavelength, amplitude of 0.247 peak to peak;

(c) An a.c. component of 55 hours wavelength, amplitude of 0.18 peak to peak.

After having done all these calculations I am left wondering just what, if anything, I have discovered. I had expected that the graph of correlation against time difference would have shown a strong positive peak in one spot at about 12 hours delay instead of the negative peak found. This would have tallied fairly well with the movement of weather patterns across South Australia.

I also wonder whether I am justified in making graphs of graphs and calculations as I have done, or whether the whole thing is just so much high sounding nonsense. I would like someone of good mathematical authority to pass judgment on this point and also the significance of the method of fitting the correlation graphs to a pair of sine waves. One point I am fairly sure of is that the figure -0.469 is too high to have occurred by pure chance and requires some explanation, but just what it means has me tricked.

The time intervals between them are respectively: 23½ days, 40 days, 12½ days, 2½ days, 10½ days, 29 days, 17 days and 22 days. There appears to be a suggestion of repetition in these figures of a time period about 20 days or a little longer, or may be two trains of events at 40-day intervals, for instance, 10½ and 29 make 39½ days, 17 and 22 make 39 days, and one 40-day period occurs. I think what I am suggesting is that weather patterns conducive to v.h.f. DX are capable of persisting long enough to make a complete circuit of the globe and take either twenty or forty days to do it and (not sure which). The circumference of the earth at the latitude of Adelaide is 20,480 miles, which means that a speed of 500 to 1,000 miles per day would be required. Of the two,
The Solar Link*

R. A. HAM, F.R.A.S.

INTRODUCTION

The sun, like many other stars, is a nuclear furnace consuming its reserves of fuel and radiating energy in many forms. The apparent yellow disc on its surface, the photosphere, has a temperature of around six million degrees, and it is surrounded by a gaseous atmosphere, the corona, which extends a million miles into space and has a temperature of one million degrees. Periodically, dark patches appear on the photosphere; these are called sunspots and are some 2,000° cooler than the surrounding photosphere. Some sunspots are scarcely visible and have a short life, while others are measured in thousands of square miles and can survive a full 27-day solar rotation. Radio energy from the sun may be detected by a radio telescope; when the sun is "quiet" the radio noise detected is of thermal origin but with a lower burst amplitude; by contrast, the latter extending from 40 to 200 MHz. The radio telescope aerial could be seen on the sun, getting stronger on the 14th, and the continuous noise storm lasting several days. As time went by this ability to separate and identify the two events proved most valuable when making reports to the British Astronomical Association and the R.S.G.B.

An individual solar burst, illustrated in Fig. 3, is less likely to strike the earth's atmosphere because of the time lapse between the origin of the event and the particles reaching the earth, by which time the earth has moved further along its orbital path. On the other hand a long series of individual bursts or a continuous noise storm lasting several days must bombard the earth's atmosphere somewhere. Contact with the earth's atmosphere by a huge stream of solar particles can cause an aurora at either of the earth's polar regions, and a particle stream can also disturb the Appleton layer of the ionosphere and cause a temporary total loss of h.f. band radio signals, known as a Delineger fade-out.

The author has observed many examples of solar activity and the consequent disturbance to the earth's atmosphere and has selected two of these examples from his records.

Solar recordings for 1st March, 1970, showed several large individual bursts which sent the pen full scale, plus a slight increase in the general noise level. Solar recordings for the 2nd and 3rd also showed similar bursts, but with a lower burst amplitude; by the 4th a full scale noise storm was in progress which died down on the 5th. Many individual low amplitude bursts were recorded on the 6th and 7th. The climax of this period of solar activity was the great aurora on 8th March which was fully reported by Ray Flavell in the September, 1970, issue of "Radio Communication" and by the author in "Electronics Weekly" of 29th April, '70.

The second example came when a mammoth sunspot appeared on the photosphere around 11th November, 1970, and remained there until the solar rotation carried it out of view on the 21st. On the 12th the radio telescope showed a marked increase in the solar noise level and the polar diagram of the telescope aerial could be seen on the chart. By switch-on at 1130 GMT on the 13th, a noise storm was raging on the sun, getting stronger on the 14th and giving almost full scale deflection on the 15th. The solar noise was so strong on the 16th that the pen was at full-scale deflection for the whole period of the observation, and this was repeated on the 17th and 18th. On the 19th the noise was three-quarter scale; on the 20th down to half scale; and on the 21st a few tiny bursts above the receiver noise level. The earth's atmosphere was bathed for 10 days in solar ejected matter and according to reports there were three Delineger fade-outs on the 15th and 16th—from the author's observations the atmospheric noise level was very high after sunset on the 16th.

Two examples do not do justice to the value of a solar radio telescope, but they will explain what happens at the time of solar activity and the events which can follow.

THE IONOSPHERE AND THE TROPOSPHERE

Terrestrial radio communication relies upon two regions of the earth's atmosphere; one is named the troposphere and the ionosphere, the former occupying the first 10 miles above the surface and the latter extending from 40 to 200 miles above the earth. (See propagation section of the Radio Communication Handbook for details of atmospheric reflection of radio signals.) The Heavy-side (E) layer of the ionosphere forms at sunrise and disperses at sunset, but sometimes solar activity will cause the E-layer to form or break up into patchy clouds of dense ionisation. This latter phenomenon, called Sporadic-E, will be known to the users of the 4 mx band when its normal peace is disturbed by Continental broadcast stations which use the band nearly 1,000 miles away.

Although Sporadic-E is rarely evident above 100 MHz., on 4th July, 1965, an extensive cloud of dense ionisation centred over Europe influenced the 2m band, and it was fortunate that a 2m contest had just started and many U.K. contestants were able to work the Hungarian station HG5DKQ -2metre contest had just started and it was fortunate that a contest the rare Sporadic-E opening might have gone unrecorded.

A typical large Sporadic-E occurred on 6th July, 1970, when at 0700 GMT a considerable number of Continental stations could be heard between 30 and 50 MHz. By midday the E-layer disturbance had spread its influence to the B.B.C. f.m. broadcast band and at 1430 GMT the author counted 14 Continental broadcast stations audible between 88 and 98 MHz. At 1900 GMT there was the usual interference to B.B.C. band 1 television and a large number of long distance sync pulses. A part from the weather and this can be very hostile to v.h.f. radio signals. Apart from the attenuating effect of the weather itself, there was the usual interference to v.h.f. broadcast bands for some periods would be written off as unusable. Two metre contests are very important to tropospheric studies; in addition to the personal satisfaction gained by the entrant, the contest logs are a record of v.h.f. activity and when analysed can have considerable scientific value.

**Solar Activity and the Weather**

The routine work at the author's station includes checking the 4 and 6 metre bands for ionospheric disturbance, recording the atmospheric pressure, noting the prevailing weather and checking the 2 metre band for tropospheric openings. As the daily records of solar, atmospheric and weather events were accumulated it became apparent that a new factor was emerging from them. It was seen that a relationship existed between certain types of solar activity and severe weather conditions.

Until recently the author, like many other people, was sceptical about the sun disturbing the earth's weather, despite scientific literature quoting climatic changes at the time of peak sun activity. But general opinion suggested that a positive connection between the sun and the earth's weather had yet to be found.

To look for this connection in the weather reports, were taken into account over a much larger area. During the first five days many small bursts and a few large ones lasting several minutes were recorded, while the weather on the 2nd, 3rd and 4th was wind and rain. For the next six days both the sun and weather were intermittently active until the 12th when a severe solar noise storm started and carried on until the 21st. The local weather was very bad from the 14th to the 19th, and the rainfall, checked by the XYL, was: 13th, 1.33"; 14th, 0.83"; 15th, 0.62"; 17th, 0.39"; 18th, 0.82"; and 19th, 0.11", making a total of 4.1" for the six days which coincided with the solar storm. The national news carried the story of the severe flooding in East Pakistan, and this again coincided with the solar storm.

In January 1971. The cold weather from December was carried into the new year by a severe winter. During the first 16 days saw little activity from the sun or weather; the radio telescope recorded a few bursts and the calm weather was interrupted by occasional rain. On the 17th a solar noise storm developed, and lasted until the 23rd, and on the 17th the weather went active. Wind and rain developed into a white Christmas with its snow, blizzards and extreme cold. The national news reported severe blizzards in Europe and that some countries had seen snow for the first time.

**Local activity:**

- **Active:** Wind, rain, gale, snow, blizzard, thunder.
- **Inactive:** Sunny, cloud, overcast, fog, frost, mist.

The classified sun/weather log kept from 1st June, 1968, to 30th April, 1971, produced the following set of figures:

- **Observation period:** 1,064 days.
- **Sun active:** 99 days.
- **Local weather active:** 402 days.
- **Sun and weather active:** 253 on the same day.

Taking a general view of this 1,064-day period one can see that the coincidence of the sun and weather active on the same day is 253 out of 402 (62.9 per cent.), which from these figures one could expect. It is obvious that when other factors, such as solar activity outside the author's observation time and national plus international weather reports, are taken into account the percentage scale would alter considerably. However, the author believes that the above results from his records as active and observed from his station is representative of weather over a much larger area.

**November 1970.** A month of activity from the national media (weather) during the first five days many small bursts and a few large ones lasting several minutes were recorded, while the weather on the 2nd, 3rd and 4th was wind and rain. For the next six days both the sun and weather were intermittently active until the 12th when a severe solar noise storm started and carried on until the 21st. The local weather was very bad from the 14th to the 19th, and the rainfall, checked by the XYL, was: 13th, 1.33"; 14th, 0.83"; 15th, 0.62"; 17th, 0.39"; 18th, 0.82"; and 19th, 0.11", making a total of 4.1" for the six days which coincided with the solar storm. The national news carried the story of the severe flooding in East Pakistan, and this again coincided with the solar storm.

In January 1971. The cold weather from December was carried into the new year by a severe winter. During the first 16 days saw little activity from the sun or weather; the radio telescope recorded a few bursts and the calm weather was interrupted by occasional rain. On the 17th a solar noise storm developed, and lasted until the 23rd, and on the 17th the weather went active. Wind and rain developed into a white Christmas with its snow, blizzards and extreme cold. The national news reported severe blizzards in Europe and that some countries had seen snow for the first time.

**Continued on Page 10**

---

*Fig. 3. Isolated solar bursts.*

*Fig. 4. Continuous solar noise storm.*

---

Amateur Radio, October, 1971
THE SOLAR LINK
(continued from page 9)

Around the peak of this solar storm the news reported freak mild weather on the 10th throughout the U.K. with record January temperatures. The sun and the weather were unsettled for the five days which followed the solar storm, and on the 15th another noise storm started and continued until the 25th. During this solar storm the weather developed, providing heavy wind and rain, severe gales, and a whirlwind in south-east England; and on the 21st the atmospheric pressure recorded by the writer was down to 973 mb. A further solar noise storm broke on the 28th and ended on the 31st, and with it came very active weather. A windy day on the 28th preceded a calm 29th, but on the 30th wind, rain and snow prevailed throughout England and Wales. The news services reported floods in Poland and severe floods in Mozambique, Australia had 9" of rain in one day, and the River Thames was in risk of flooding owing to severe gales in the North Sea.

April 1971. There were two solar noise storms during the month. The first started on the 9th and ended on the 17th during which period the new U.K. to China h.f. telephone link was delayed by "atmospheric disturbance". The news service announced on the 13th that the monsoon in East Pakistan had started a month early. A B.C.C. news report on the 21st May about the Mount Everest expedition said that the weather on the 16th-17th April on the mountain had been the worst for 72 years. From the 18th to 24th there were a few solar bursts and the weather was mainly fine apart from rain on the 23rd. On the 25th the second solar noise storm started, and on the 26th there was rain, sleet and snow across southern England with roads blocked in the West Country. The news media reported the coldest April day since records started in 1940.

ACKNOWLEDGMENTS

The author would like to make acknowledgment to the I.S.G.B. for the beacon service and to the beacon keepers who ensure that a permanent signal is transmitted 24 hours each day. A word of praise also for the members who enter the v.h.f. contests, especially the portable stations that provide signals from exotic sites which are compared with prevailing atmospheric conditions; for the valuable work of members of the Scientific Studies Committee who ponder and advise on the observers' reports; and for Jack Hum who in Four Metres and Down in "Radio Communication," reports on v.h.f. activities.

ANOTHER A.O.C.P.

THEORY CLASS

Owing to demand, the Victorian Division of the W.I.A. plan to commence another theory class, to be held on Saturday mornings from 9-11 a.m.

Anyone interested in enrolling should contact the office, 478 Victoria Parade, East Melbourne, or phone 41-3535 during office hours.

"HAM RADIO" MAGAZINE

only $5.50 for one year or $11.50 for three years' subscription

Write now to Federal Executive office, P.O. Box 57, East Melbourne, Vic., 3002

LOW DRIFT CRYSTALS

★
1.6 Mc. to 10 Mc.,
0.005% Tolerance, $5
★
10 Mc. to 18 Mc.,
0.005% Tolerance, $6
★
Regrinds $3

THESE PRICES ARE SUBJECT TO SALES TAX

SPECIAL CRYSTALS: PRICES ON APPLICATION

MAXWELL HOWDEN

15 CLAREMONT CRES., CANTERBURY, VIC., 3126
Phone 83-5090

LOG BOOK

AVAILABLE IN TWO TYPES—VERTICAL OR HORIZONTAL

Larger, spiral-bound pages with more writing space.

Price 75c each
plus 25 Cents Post and Wrapping

Obtainable from your Divisional Secretary, or W.I.A., P.O. Box 36, East Melbourne, Vic., 3002

Page 10
Amateur Radio, October, 1971
Development of an All-Band Vertical*  

H. S. BROWN, G3RFG

On arriving at his present QTH the author found that the ground space available for the erection of aerials measured only 30 x 10 ft. and another restriction was that nothing that looked like a t.v. aerial was allowed. In order to get on the air a self-supporting mast that could be raised or lowered easily by one person was erected and it has since been used during many aerial experiments. As a result of these experiments it became obvious that what was required was an all-band vertical that produced low impedance at its base for all bands, and the result is shown in Fig. 1.

The aerial is made up of three lengths of aluminium tubing 12 ft. long, with 1/16" walls, and of 1", 2" and 3" diameter respectively. One end of each of the two thicker tubes is slit down for several inches and the three lengths are then spliced together, the joints being secured by two Jubilee clips. A triangular piece of thick Perspex is fitted between the top two clips, and three lengths of thin nylon cord are connected to it as guys to prevent movement of the top section of the aerial. An 8 ft. 3 in. length (quarter-wave on 10 metres) is cut from the lower 1" diameter section and the two resulting lengths are secured to the mast, one above the other and 2" apart, by stand-off insulators.

The 2" break in the aerial is then linked and a check made for resonance on the 40 and 15 metre bands. The link is then replaced by the coil and the taps adjusted for resonance on 20, 80 and top band. If an impedance bridge is used it will be found that it will indicate approximately 25 ohms on 40 metres and 35 ohms on 15 metres. It was decided to use two lengths of 75 ohm co-axial cable in parallel to provide the best match on 15 metres because of the greater output power on 40 metres from the author's transmitter.

On 10 metres the aerial can be used as a normal vertical; by removing the base feeder and connecting a length of 75 ohm co-axial cable to the junction it becomes a vertical dipole; and by earthing the lower section and feeding the junction with 50 ohm co-axial cable it becomes an elevated-feed three-quarter-wave vertical. The earthing system consists of as many earth rods as possible connected together with thick seven-stranded copper aerial wire. It was also found

that t.v.i. could be decreased if a length of this earth-wire was run parallel with the feeder from the base of the aerial right back to the Z Match. The author's feeder is run underground as far as is possible.

Over a period of two years this aerial has proved a winner and it is only necessary to stand on a step ladder in order to change bands; by inserting the link or connecting the appropriate fly-leads from the coil which is attached to the mast by stand-off insulators.

The smaller, corresponding to a 40-day period, is fairly close to the actual rate of progress of weather across the State.

There are no really definite conclusions to be drawn from all this. I don't regard the job as finished, but as a pointer to more exact experiments with better control of conditions. I think it not silly to say that if taken far enough it could lead to information as valuable as that on which the Ionospheric Prediction Service relies for its work. The subject should be an ideal one for somebody who wants material for a thesis and could be expanded to include comparison of propagation of different bands. As a first step, I should think the correlation would be very much higher for signals of different frequencies over the same path. Another refinement of interest would be to measure path loss against distance to find whether better conditions cause stronger signals over short distances at the same time that t.v.i. could be decreased if a length of this earth-wire was run parallel with the feeder from the base of the aerial right back to the Z Match. The author's feeder is run underground as far as is possible.

The aerial is made up of three lengths of thin nylon cord are connected to it as guys to prevent movement of the top section of the aerial. An 8 ft. 3 in. length (quarter-wave on 10 metres) is cut from the lower 1" diameter section and the two resulting lengths are secured to the mast, one above the other and 2" apart, by stand-off insulators.

The 2" break in the aerial is then linked and a check made for resonance on the 40 and 15 metre bands. The link is then replaced by the coil and the taps adjusted for resonance on 20, 80 and top band. If an impedance bridge is used it will be found that it will indicate approximately 25 ohms on 40 metres and 35 ohms on 15 metres. It was decided to use two lengths of 75 ohm co-axial cable in parallel to provide the best match on 15 metres because of the greater output power on 40 metres from the author's transmitter.

On 10 metres the aerial can be used as a normal vertical; by removing the base feeder and connecting a length of 75 ohm co-axial cable to the junction it becomes a vertical dipole; and by earthing the lower section and feeding the junction with 50 ohm co-axial cable it becomes an elevated-feed three-quarter-wave vertical.

The earthing system consists of as many earth rods as possible connected together with thick seven-stranded copper aerial wire. It was also found

that t.v.i. could be decreased if a length of this earth-wire was run parallel with the feeder from the base of the aerial right back to the Z Match. The author's feeder is run underground as far as is possible.

Over a period of two years this aerial has proved a winner and it is only necessary to stand on a step ladder in order to change bands; by inserting the link or connecting the appropriate fly-leads from the coil which is attached to the mast by stand-off insulators.

A BIT OF LIGHT NONSENSE  

(Continued from Page 7)

The possible solutions to these frequency conflicts proposed by the Australis Group are:

(a) Changing the satellite channels.

(b) Changing the VK repeater channel frequencies.

(c) Abolishing the VK repeaters during each pass of the satellites.

Solution (c) would appear, at this stage, to be the fairest and simplest way of solving the problem, as the satellite frequencies are an optimisation of frequency conflicts all over the world.

A modified “demonstrator” version of one channel of the VK translator is being sent to Australia by the A.O.S. The A.M.S.A.T. are satisfied that it meets N.A.S.A.’s rigid performance specifications, the Australis Group will begin construction of the flight units.

The flight units of the A.O.S.-B 60-channel r.r.t.y. telemetry system and the 35-channel command and control system should be shipped to A.M.S.A.T. in Washington next month.

The launching of the A.O.S.-B satellite will take place, it is hoped, about the middle of 1972.

—Richard Tonkin, Chairman, W.I.A. Project Australis

(All comments on the frequency conflicts listed above should be sent in the first instance to the Federal Repeater Secretariat, C/o Tim Mills, VK2ZTM.—Ed.)
Getting to know your Neighbour

HOWARD RIDER* VK3ZJY

On Sunday, 27th June—having been in Djakarta for two days—I decided it was high time not hear more of the Amateur fraternity. Armed with a single name—K. W. Kwik—who lived at Djalal Mulaku 52, which, according to my map, was close to the hotel in which I was staying, I went out quite knotty what I would finish.

Finding the house was not as difficult as I had expected. A notice proudly stating this was the home of YBOCJ was well in evidence. In a very short time I was seated in the lounge room sipping tea and discussing common and specific interests of Amateur Radio with Kwik and his wife. The latter was not only interested but very knowledgable in this field.

I learned of the general operation, various regions, regulations and examination procedure which will be described later. Besides being QSL manager for the Djakarta region (YBO), Kwik was also one of the Examination Officers, so my start could not have been at a better place.

A phone call and I was taken out to meet the President of the group—Suwondo (Wondo) YBOAT. He added to my already extended sense of security and I learned that he had just missed an old friend, T. N. Dar (VU2BX), with whom I had spent many an enjoyable hour when living in New Delhi.

Many miles further on we visited the home of R. A. J. Lumenta Kaklum, YBOBY, whose call sign is a very well known one. I was a little surprised to learn that he was a star in the Operation Office (a term which would not have been at a better place.

Coffee naturally was served in the "shack" where a couple of contacts would be the last ones to be made in this country for fourteen days. Because of the advent of National elections, the Amateurs had decided to maintain radio silence from one week before to one week after this period. This was not requested by the government but was a voluntary decision.

As the evening wore on we talked further of the peculiarities and problems common to both countries, particularly with regard to distances. Two VKs were already well known—Heatie VK2AQK and Ron VK3AHJ. Beautifully bound copies of many issues of "Amateur Radio" and an Australian electronics magazine were produced giving further evidence of unseen friends in VK-land.

Some six hours after my initial meeting with Kwik and his wife I was driven back to my hotel. During this whole period I had found great warmth and generosity in the friendliness and hospitality offered to me, remembering that I had arrived unannounced and unexpected.

What then constitutes the Indonesian Radio Amateur? During the evening I had met people ranging from a Major-General in the Air Force, a retired businessman, an engineering manager, a houndsman, I. N. Dar, an ex-pat man—proving that in this country also Amateur Radio is not for the chosen moneyed few but for all who have an interest and the ability to learn and pass the examination.

The examination is not an easy one, in many respects harder than ours. It is divided into three graded levels.

(a) Preliminary Level.—A knowledge of local and international regulations, theory, practice and Morse at 5 w.p.m. will gain a limited licence (YD), enabling controlled operation between 3.5 and 3.9 MHz. at 10 watts maximum input.

(b) Intermediate Level.—An increased knowledge of the above plus Morse at 8 w.p.m. and an ability to understand the English language will allow for a limited licence (YC) with crystal controlled operation in the h.f. (except 14 MHz.), v.h.f. and u.h.f. bands at a maximum of 75 watts input.

(c) Advanced Level.—Further knowledge of the above plus Morse at 12 w.p.m. will allow full licence (YB) on all bands at a maximum input of 500 watts.

It is interesting to note that Morse code is a requirement in all levels and a good working knowledge of English in the higher two sections. Part of the practical test is the actual building of a transmitter by the applicant.

Although the Indonesian Government has considered and approved regulations and technical qualifications needed by an operator and his station (1967/68), it has for the moment delegated the authority of examination procedure to the Regional Groups of which there are nine. As can be expected, these Groups keep a very tight rein on those wishing to obtain a licence.

Even so, there are over 2,000 Amateurs in the whole of Indonesia (approximately 250 in Djakarta). Why then, in the middle of the air: The answer is mainly a monetary one. Most rigs are on the carrier frequency to shift or deviate symmetrically from its assigned frequency. By international agreement the maximum deviation is ±75 KHz. for sound broadcasting with an audio frequency pre-emphasis of 50 micro-seconds. However, in Australia for television sound the maximum deviation is ±50 KHz. and audio frequency pre-emphasis of 50 micro-seconds.

ERRATUM

Re the article "Angle Modulation", Lecture 14B, in "A.R." August 1971, page 3. The author has pointed out that a few lines have been omitted from the first paragraph under the heading Frequency Modulation in column 1. The paragraph should read:

When using an audio frequency voltage to produce f.m. it is the amplitude of the voltage which causes the carrier frequency to shift or deviate symmetrically from its assigned frequency. By international agreement the maximum deviation is ±75 KHz. for sound broadcasting with an audio frequency pre-emphasis of 50 micro-seconds. However, in Australia for television sound the maximum deviation is ±50 KHz. and audio frequency pre-emphasis of 50 micro-seconds.

Page 12 Amateur Radio, October, 1971
**REPEATER SECRETARIAT**

We have been advised from VK2 that additional repeater systems are being developed at the moment and some have been lodged with the P.M.G. for approval.

Central Coast, Gosford. To serve the area north of the Hawkesbury River, south of Lake Macquarie and east to the coast from the Pacific Highway. The equipment is to be installed at the local clubroom site, which is about 4 miles south-west of Gosford on a ridge of high ground. To avoid interference in the P.M.G. for approval.

Central West, Orange. To avoid interference in the P.M.G. for approval.

National Repeater systems are being developed at Wollongong, the antennas will have reduced gain in the southern direction. It will be a Channel 4 system.

Central West, Orange. This system has been operating for some years and is located on Mt. Canobolas.

Canobolas. This is to be replaced by an IC keyer.

Another problem area is Melbourne and possibly Sydney where several repeaters are not or will be operating. The original 3-channel concept of Wodonga (1968) was for Channel B simplex and Channels 1 and 4 for repeaters. The reason behind this was to ensure that all "service" repeaters will be operating. The original 3-channel concept of Wodonga (1968) was for Channel B simplex and Channels 1 and 4 for repeaters. The other reason behind this was to ensure that all "service" repeaters will be operating.

The reason behind this was to ensure that all "service" repeaters will be operating.

The problem has arisen in Melbourne where they have Channel 1. To the east in Gippsland and to the south-west at Geelong there are Channel 4 systems. It will not be long perhaps before a system could be required to the north. The Channel 4 systems both have good coverage into Melbourne with the result that one is often able to trigger both units. The question to be resolved is: (a) should there be additional channels? (b) should the coverage of overlapping systems be reduced to limit interference? or (c) should one or both of the systems, if not too severe, so as to preserve the two-channel concept? What do you think?

The F.R.S. Report mentioned in recent "A.R.'s" was delayed in publication, but should be in circulation by the time these notes come out. The Federal Repeater Secretariat is a committee of three members who act on behalf of F.E. in co-ordination of v.h.f./u.h.f. matters with repeaters, beacons, nets and satellite, etc. The postal address for the F.R.S. is C/o P.O. Box 342, Crows Nest, N.S.W., 2065.

Looking forward to hearing Amateurs' views on the points covered in this report, but please bear with us if we are a little slow in the reply, we usually have trouble in rounding up a good one-fingered typist.

---

**A service to members only**

**COMPONENTS FOR HOME-BREW GEAR**

For lists of components actually available from stock, write to—

**THE DISPOSALS COMMITTEE, VICTORIAN DIVISION, W.I.A., P.O. BOX 65, MT. WAVERLEY, VIC., 3149.**

---

**PREDICTION CHARTS FOR OCTOBER 1971**

(Prediction Charts by courtesy of Ionospheric Prediction Service)
The Southern Cross Award was instituted on 1st July this year to encourage more activity on all Amateur bands. The Award is prominently Australian by its name, the colours being green and gold.

Conditions of Award: Australians and New Zealanders to work 15 members of the Eastern and Mountain District Radio Club. DX stations to work five members of the Club, or three members of the Club plus VK3ER—the official Club Station, which counts as two contacts.

This Award is open to all Amateurs and S.W.I.s. Band and mode endorsements are available.

The Southern Cross Award

Australia's packets are spread all over the world, from the near by tropics to the far north. Some of these packets are taken up by small countries, others by larger countries. In both cases, the packets are spread over a wide area, and the packets are spread over a wide area, and the packets are spread over a wide area.

There is more in heaven and earth, Horatio, than is dreamt of in your philosophy.

Others come up with the argument that commerce is way ahead of us and what's more will become even further ahead as the result of research and exploitation of new techniques. Stop a moment. Has it really been any different? Were all the pioneers of electricity amateurs? When radio was first discovered, many people were fascinated by it. Some even went as far as to try and build their own radios. Others came up with the argument that commerce was way ahead of us and would not dare do so for fear of depreciating the value.

We followed the techniques of print-boarders; many of us have thrown out the breadboard went out of favour and components instead of screw-type connectors. The hook-up boards were thrown out. Many of us have thrown out the breadboard and components when projects were done. We were limited to what was available.

The Amateur Service and Its influence on the electronics business might not be what it was, but it is still going strong. Without the Amateur Service and Its needs people to do something for no cash, many of the new designs and techniques might not have come about.

The Amateur Service is unique and limitless as someone has said. It is not solely a question that the world needs people to do something for no cash reward. Without the Amateur Service and Its influence on the electronics business, many of the new designs and techniques might not have come about.

Let us hope you get on the air.

Complete VHF Station consisting of INOUE ICOM IC20, MAICO PVS1 AC Power Supply to suit, STOTLE ROTATOR, 44 ft. tilt-over Telescopic Tower, 10 Element 2 Metre Beam, EVEREST 2 Metre 5/8 Mobile Whip—all for $60.00 per week.

COMM. RECEIVERS: Realistic DX150A, $234.20, per week.

Trio 9595S $178.50, $3.00 per week.

These credit facilities are available throughout the Commonwealth.

Industrial and Medical Electronic Co.

6th Floor, 288 LITTLE COLLINS STREET, MELBOURNE, VIC., 3000
Phone 63-9258, A.H. 848-3018.

A. Evertick

F. R. Evertick
ROSS HULL MEMORIAL VHF/UHF CONTEST, 1971-72

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. and Short Wave Listeners to part to 2359 hours E.A.S.T. to improve this Contest. A Perpetual Trophy is awarded annually for competition between members of the W.I.A. in Australia and its Territories, 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.

We welcome proposals (in writing) to improve this Contest.

OBJECTS
Australian Amateurs will endeavour to contact as many other Amateurs in VK Call Areas and Foreign Call Areas under the following conditions.

DATE OF CONTEST

DURATION
Any seven calendar days within the dates mentioned above, not necessarily consecutive. These periods are to be at the operator's convenience. A calendar day is from 0001 hours E.A.S.T. to 2359 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.
   (d) Receiving, Open.
2. All Australian and Overseas Amateurs may enter for the Contest whether their stations are fixed, portable or mobile.
3. All Amateur v.h.f./u.h.f. bands may be used, but no cross-band operating is permitted. Operators are cautioned against operating transmitting equipment on more than one frequency at a time, particularly when passing cyphers. Cross-band operation to assist contest working is prohibited.

Such operation will be grounds for disqualification. Cross mode contacts will be permitted.

4. Amateurs may enter for any of the transmitting sections. The seven-day winner is not eligible for the 48-hour section.
5. Only one contact per band per station is allowed each calendar day.
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 contestant and must submit a separate log under his own call sign.
7. Amateurs must operate within the terms of their licences.
8. Cyphers: Before points may be claimed for a contact, serial numbers must be exchanged. The serial numbers of five or six figures will be made up of the RS (telephony) or RST (c.w.) report plus three figures, commencing in the range 001 to 999, for the first contact, and will then increase in value by one for each subsequent contact. When a contestant reaches 999 he will then commence again with 001.
9. Entries must be set out as shown in the example, using only one side of the paper. Entries must be post-marked not later than 7th February, 1972, and clearly marked "Ross Hull Contest" and addressed to Federal Contest Manager, Box 638, G.P.O., Brisbane, Qld., 4001.
10. Scoring: for all sections will be based on the attached table. Approx. distances to be shown in the log entry as shown in the example. Failure to make this entry will invalidate the particular claim. Operation via active repeaters or translators is not allowed for scoring purposes.
11. Logs: All logs shall be set out as in the example and in addition will carry a summary sheet showing the following information:
   Name .............. Call Sign
   Address .............. Division
   Score .............. Claimed Score

SCORING TABLE

<table>
<thead>
<tr>
<th>Distance in Miles</th>
<th>Up to 25</th>
<th>26 to 50</th>
<th>51 to 100</th>
<th>101 to 200</th>
<th>201 to 300</th>
<th>301 to 500</th>
<th>501 to 1000</th>
<th>1001 to 1500</th>
<th>1501 to 2500</th>
<th>2501 to 3500</th>
<th>3501 to 5000</th>
<th>5001 and over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mc.</td>
<td>1</td>
<td>5</td>
<td>15</td>
<td>50</td>
<td>100</td>
<td>250</td>
<td>500</td>
<td>1000</td>
<td>1500</td>
<td>2500</td>
<td>4500</td>
<td>6000</td>
</tr>
<tr>
<td>M. Higher</td>
<td>2</td>
<td>10</td>
<td>30</td>
<td>100</td>
<td>150</td>
<td>250</td>
<td>500</td>
<td>1000</td>
<td>1500</td>
<td>2500</td>
<td>4500</td>
<td>6000</td>
</tr>
</tbody>
</table>

EXAMPLE OF TRANSMITTING LOG (Brisbane Station)

<table>
<thead>
<tr>
<th>Date/Time E.A.S.T.</th>
<th>Band</th>
<th>Emission Power</th>
<th>Call Sign</th>
<th>RST/No. Sent</th>
<th>RST/No. Rcvd.</th>
<th>Dist. Miles</th>
<th>Points Claimed</th>
</tr>
</thead>
<tbody>
<tr>
<td>24th Dec. 0100</td>
<td>52</td>
<td>A2(a)</td>
<td>VK7ZAI</td>
<td>50001</td>
<td>50004</td>
<td>1100</td>
<td>15</td>
</tr>
<tr>
<td>0100</td>
<td>52</td>
<td>A2(a)</td>
<td>VK4NG</td>
<td>50002</td>
<td>50004</td>
<td>330</td>
<td>20</td>
</tr>
<tr>
<td>0230</td>
<td>144</td>
<td>A3</td>
<td>VK5ZK</td>
<td>50003</td>
<td>50004</td>
<td>990</td>
<td>35</td>
</tr>
<tr>
<td>0235</td>
<td>144</td>
<td>A3</td>
<td>VK3ZIO</td>
<td>45004</td>
<td>45004</td>
<td>850</td>
<td>35</td>
</tr>
</tbody>
</table>

EXAMPLE OF RECEIVING LOG (Perth S.w.l.)

<table>
<thead>
<tr>
<th>Date/Time E.A.S.T.</th>
<th>Band</th>
<th>Call Heard</th>
<th>RST/No. Sent</th>
<th>Station Called</th>
<th>Dist. Miles</th>
<th>Points Claimed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Jan. 1000</td>
<td>52</td>
<td>VK5ZDK</td>
<td>59221</td>
<td>VK8KK</td>
<td>1330</td>
<td>15</td>
</tr>
<tr>
<td>0100</td>
<td>52</td>
<td>VK2ZCF</td>
<td>58195</td>
<td>VK6ZAA</td>
<td>2040</td>
<td>25</td>
</tr>
<tr>
<td>0100</td>
<td>432</td>
<td>VK6ZDS/6</td>
<td>57061</td>
<td>VK6LK/6</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>3rd Jan. 0500</td>
<td>144</td>
<td>VK5ZHZ</td>
<td>44102</td>
<td>VK6ZCN</td>
<td>1330</td>
<td>100</td>
</tr>
</tbody>
</table>

Operating Dates ............ (7 cal. days)
Highest Score over a 48-hour period was ............ points.

Declaration: I hereby certify that I have operated in accordance with the terms of my licence and abided by the Rules of the Contest.
Signed.
Date .........

12. Entrants not abiding by the Rules of this Contest will be disqualified.
13. The rules of the Federal Contest Committee of the W.I.A. will be final. No dispute will be entered into.
14. Awards: Certificates will be awarded to the winners of each section in each VK and Overseas Call Area. 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 contestant who shall not be the Trophy winner, and who returns the highest scoring log covering a period of any 48 consecutive hours. Also, Certificates will be awarded for operating in the Ross Hull Contest and breaking any Australian v.h.f./u.h.f. distance record.

RECEIVING SECTION
1. Short Wave Listeners in Australia and Overseas may enter for the Contest, but no transmitting station may enter this Section.
2. Contest times and logging of stations on each band are as for the transmitting sections, however there is no 48-hour section.
3. To count for points, logs will take the same form as for transmitting sections, but will omit the serial number received. Logs must show the call sign of the station heard (not the station worked), the serial number sent by it, and the call sign of the station being worked.

Scoring will be on the same basis as for transmitting stations, i.e. on the distance between the Listener's station and the station heard. See the examples given. It is not sufficient to log a station calling CQ.
4. A station heard may be logged only once per calendar day on each band for scoring purposes.
5. Awards: A Certificate will be awarded to the highest scorer in Australia or Territories.
As far as the other members of Y.R.C. not Novice, the advantage of seeing some of these members actually operating the station will be the same: the Y.R.C. would be a more welcoming place. We would no longer have to worry about the station being closed down if we were not around. The station would be open to all, regardless of whether or not we were members.

P.S. — I also want to thank the many non-members who have come to the station and taken part in the operations. Their presence has been greatly appreciated. Thank you all.
Paragraph 7. The school boy I can quote is my elder son, VK3ZFM, who did as I said. He passed on 1st April, 1971, the A.O.C.P. and received all privileges and the magazine "A.R." for one year.

Further on your reference to how hard it is to get a license in your area, I have some reference in this field that if you are keen enough to study the A.R.R.L. Handbook or attend the W.I.A. A.O.C.P. classes, on a business basis, you can get a license. I have MEN's and Women's licences, and I can quote is accurate and you might do some study along the lines of the A.R.R.L. Handbook and received all privileges and the magazine "A.R." for one year.

Further on your reference to how hard it is to get a license in your area, I have some reference in this field that if you are keen enough to study the A.R.R.L. Handbook or attend the W.I.A. A.O.C.P. classes, on a business basis, you can get a license. I have MEN's and Women's licences, and I can quote is accurate and you might do some study along the lines of the A.R.R.L. Handbook and received all privileges and the magazine "A.R." for one year.

Further on your reference to how hard it is to get a license in your area, I have some reference in this field that if you are keen enough to study the A.R.R.L. Handbook or attend the W.I.A. A.O.C.P. classes, on a business basis, you can get a license. I have MEN's and Women's licences, and I can quote is accurate and you might do some study along the lines of the A.R.R.L. Handbook and received all privileges and the magazine "A.R." for one year.

Further on your reference to how hard it is to get a license in your area, I have some reference in this field that if you are keen enough to study the A.R.R.L. Handbook or attend the W.I.A. A.O.C.P. classes, on a business basis, you can get a license. I have MEN's and Women's licences, and I can quote is accurate and you might do some study along the lines of the A.R.R.L. Handbook and received all privileges and the magazine "A.R." for one year.

Further on your reference to how hard it is to get a license in your area, I have some reference in this field that if you are keen enough to study the A.R.R.L. Handbook or attend the W.I.A. A.O.C.P. classes, on a business basis, you can get a license. I have MEN's and Women's licences, and I can quote is accurate and you might do some study along the lines of the A.R.R.L. Handbook and received all privileges and the magazine "A.R." for one year.

Further on your reference to how hard it is to get a license in your area, I have some reference in this field that if you are keen enough to study the A.R.R.L. Handbook or attend the W.I.A. A.O.C.P. classes, on a business basis, you can get a license. I have MEN's and Women's licences, and I can quote is accurate and you might do some study along the lines of the A.R.R.L. Handbook and received all privileges and the magazine "A.R." for one year.

Further on your reference to how hard it is to get a license in your area, I have some reference in this field that if you are keen enough to study the A.R.R.L. Handbook or attend the W.I.A. A.O.C.P. classes, on a business basis, you can get a license. I have MEN's and Women's licences, and I can quote is accurate and you might do some study along the lines of the A.R.R.L. Handbook and received all privileges and the magazine "A.R." for one year.

Further on your reference to how hard it is to get a license in your area, I have some reference in this field that if you are keen enough to study the A.R.R.L. Handbook or attend the W.I.A. A.O.C.P. classes, on a business basis, you can get a license. I have MEN's and Women's licences, and I can quote is accurate and you might do some study along the lines of the A.R.R.L. Handbook and received all privileges and the magazine "A.R." for one year.
because the Radio Branch might (unproven) find itself compelled to increase licensing fees. The need for revision and correction and discussion over a period and made sure that the material was correct and it was certainly not possible in one evening. We ran regular regulations tests for a long time before the A.O.C.P. under the Club conditions are unanimous—repeat unanimous—in their opinion that a 1G0 mx is not used adequately in this Station. They have also indicated that there licensing fees. If the Administration is being accused of presenting a Report biased in favour of Novices. What else could we have done when the post of Vice-Chairman of the Novice principle? Your own Federal Council has been making it clear that they will not issue any Awards on operating experience. Makes me think a bit! In U.S.A. the comments on the matter under club instructors' supervision. I insist that the Committee had every right to submit to the Committee either in writing but I'll bet you have had a lot more operating time than I have! Regards and thanks again for your contribution.

12. I have just been advised by the Secretary-Manager of the W.I.A. that the Novice Report—only 10.4% were anti-Novice. It is a hard job under present conditions in our schools and things will be worse in 1972. How

Because the Radio Branch might (unproven) find itself compelled to increase licensing fees. The need for revision and correction and discussion over a period and made sure that the material was correct and it was certainly not possible in one evening. We ran regular regulations tests for a long time before the A.O.C.P. under the Club conditions are unanimous—repeat unanimous—in their opinion that a 1G0 mx is not used adequately in this Station. They have also indicated that there licensing fees. If the Administration is being accused of presenting a Report biased in favour of Novices. What else could we have done when the post of Vice-Chairman of the Novice principle? Your own Federal Council has been making it clear that they will not issue any Awards on operating experience. Makes me think a bit! In U.S.A. the comments on the matter under club instructors' supervision. I insist that the Committee had every right to submit to the Committee either in writing but I'll bet you have had a lot more operating time than I have! Regards and thanks again for your contribution.

12. I have just been advised by the Secretary-Manager of the W.I.A. that the Novice Report—only 10.4% were anti-Novice. It is a hard job under present conditions in our schools and things will be worse in 1972. How

Because the Radio Branch might (unproven) find itself compelled to increase licensing fees. The need for revision and correction and discussion over a period and made sure that the material was correct and it was certainly not possible in one evening. We ran regular regulations tests for a long time before the A.O.C.P. under the Club conditions are unanimous—repeat unanimous—in their opinion that a 1G0 mx is not used adequately in this Station. They have also indicated that there licensing fees. If the Administration is being accused of presenting a Report biased in favour of Novices. What else could we have done when the post of Vice-Chairman of the Novice principle? Your own Federal Council has been making it clear that they will not issue any Awards on operating experience. Makes me think a bit! In U.S.A. the comments on the matter under club instructors' supervision. I insist that the Committee had every right to submit to the Committee either in writing but I'll bet you have had a lot more operating time than I have! Regards and thanks again for your contribution.

12. I have just been advised by the Secretary-Manager of the W.I.A. that the Novice Report—only 10.4% were anti-Novice. It is a hard job under present conditions in our schools and things will be worse in 1972. How

Because the Radio Branch might (unproven) find itself compelled to increase licensing fees. The need for revision and correction and discussion over a period and made sure that the material was correct and it was certainly not possible in one evening. We ran regular regulations tests for a long time before the A.O.C.P. under the Club conditions are unanimous—repeat unanimous—in their opinion that a 1G0 mx is not used adequately in this Station. They have also indicated that there licensing fees. If the Administration is being accused of presenting a Report biased in favour of Novices. What else could we have done when the post of Vice-Chairman of the Novice principle? Your own Federal Council has been making it clear that they will not issue any Awards on operating experience. Makes me think a bit! In U.S.A. the comments on the matter under club instructors' supervision. I insist that the Committee had every right to submit to the Committee either in writing but I'll bet you have had a lot more operating time than I have! Regards and thanks again for your contribution.

12. I have just been advised by the Secretary-Manager of the W.I.A. that the Novice Report—only 10.4% were anti-Novice. It is a hard job under present conditions in our schools and things will be worse in 1972. How
least a proportion of these into professional electronic careers.

A sub-committee of the Eastern Zone of the Victorian Division of the W.I.A. wishes to encourage a class of licence to provide a step, calling the larger group of members and the existing high standard expected of the present A.O.C.P. holder.

The term "Novice Licence" has been commonly used, but it is unfortunate in that it implies a low standard. It was suggested that the A.O.C.P. examination paper be in two sections. The first involving perhaps 30 questions, and the second involving the supply, crystal controlled c.w. transmitters, simple receivers for c.w. operation. Restricted applicants would only attempt this first section. The normal A.O.C.P. applicant would also be required to do this section, and in addition follow on with a further section covering the more advanced technical topics standard.

To prevent Novice sections of the bands becoming areas of low standard operation, there seems to be a possibility that licences might be issued in restricting frequencies other than from band edge to the generally accepted frequency at which phone operation normally commences.

The question of pirate operation looks as the largest cloud on the horizon in the minds of many. Within it a form of licence will leave functional transmitting equipment in the hands of an unlicensed operator. However, this committee favours making a Restricted Licence a continuing one. The standard of the examination should equip the Restricted licensee to operate competently from a technical viewpoint on c.w., whereupon there is no justification for a time restriction. Older persons or students should not be forced into procrastination. In fact, the desire to work, there seems to be little merit in restricting the present A.O.C.P. holder.

Should also be required to do this section, and in addition follow on with a further section covering the more advanced technical topics standard.

—Victorian Eastern Zone, W.I.A., Novice Licensing Committee

T.V. PIONEERS

Editor "A.R.", Dear Sir,

I have just heard of the death of Tom Schofield, VK6WS, and I am sad at his passing. He was indeed a pioneer amongst Amateurs and a name well remembered for his achievements.

However, over the years he has been credited to the band, it is the first time he has appeared in public notices in Australia in 1935; in fact, a bronze plaque on the Observations Terrace, Brisbane, used to attest to this.

In view of recent publications on the subject, the Brisbane City Council, on advice from the Historical Society of Queensland, have changed the wording on the plaque from "The First Television Transmission in Australia" to "The First Television Transmission in Queensland".

This is now in accordance with the facts as there is ample evidence that the first public demonstration of television in Australia took place in Melbourne on 29th August 1934.

At that time I was operating Amateur station 3DI and was also in charge of the equipment and staff of the station. To my knowledge, this is the earliest mention of the fact that Tom's radio station was the first in Australia.

My interest today is to pay tribute to a true pioneer and at the same time to record the records in order.

—Gil Miles, VK2XKJ

LIMITED LICENSEES

Editor "A.R.", Dear Sir,

In the August issue of "A.R." was a reply by the Federal President of the W.I.A. to an anonymous letter concerning Limited licenses. The most noticeable thing about this reply was the rather shallow repetition of the title "Anonymous Letter Writer". If a person wishes to make a point while remaining anonymous, it is to be regretted. In fact, the desire to do so must be taken at least partly as a reflection on the organisation to which he is writing.

Having criticised the manner of Michael Owen's reply, I would like to deal with the matter. If the Institute is so interested in Limited licenses, why does it deliberately discourage them from participating in the R.D. Contest? The rules of the Contest are such that the chief operator cannot help his team achieve a higher score than by making the five contacts needed to enter a leg. I VK6, at least, considerably less stations on six metres wanted this year to score all points. I wonder how many of these will bother next year?

—Alan Jamieson, VK6ZPJ

(With the 1971 Federal Convention dealt with changing the rules of Contests and to the transfer of the Federal Contest Committee. The former referred to repeat contacts after specified periods, the latter formalised the transfer of the Federal Contest Committee from VK6 to VK6A. It is reasonable to assume that future 24-hour contests will include these provisions.)

R.D. CONTEST, 1971

Editor "A.R.", Dear Sir,

Was I wrong or was this year's Contest among the best yet as far as friendship is concerned?

One always meets old friends in the R.D. Contest, to me the best Contest I have experienced as an Amateur, both of one's own State and further afield, and I was not disappointed this year.

Both the north and north-east operators were not very happy about 80 metre band conditions as the band was virtually unusable because of QRN. Several storms were over S.E. Queensland soon after the Contest started and lightning was to be heard surrounded the antennas.

I did not hear any 10 metre signals from my QTH, but logs will tell the story on this band.

On 15 metres, VK9 was going great guns with southern States that I could not hear late Sunday morning.

Should we nominate a calling time for the 10 metre band? Say, late Sunday morning.

To those who entered to win, for themselves or their State, I wish you all good luck and good showing. To those who came on to help make it a pleasant Contest, thanks a lot for your efforts. Your logs are appreciated. Let your Federal Councillor, or me, have suggestions for making this Contest better.

I hope to hear you next Remembrance Day Contest. It is a good Contest, thanks a lot for your efforts.

—Peter Brown, VK4PJ, Federal Contest Manager.

OBITUARY

W. ("SKIPPER") SCHOFIELD, VK6WS

In Perth on 4th August, 1971, William ("Skipper") Schofield, VK6WS, aged 96, a very old timer, passed away. His interest in radio commenced in 1925 when he purchased the then newly released Crystal radio and successfully completed its construction.

He later joined the W.I.A. as a student member, attended the A.O.C.P. classes, and, in his sixties, secured his Amateur licence with the call sign VK6WS. He participated in the administration of the W.A. Division for a number of years, and also a lending light in the Swan Radio Society, later the Radio Society of W.A.

Although blind for the latter years of his life, he remained an active operator with the assistance of the many friends who maintained his equipment in safe and operating order. He had no wish to allow the radio in which he had so much interest prevented further activity. He was also a prominent yachtman and a member of the River Bomber Yacht Club, hence the affectionate sobriquet "Skipper". Many W.I.A. members have happy memories of week-end excursions on his ocean-going cruiser.

To his relatives, the members of the W.A. Division extend their sympathy.

HAMS and all other Professionals NEED...

...Sonnenchein dryfit
...BATTERIES...the LEAD ACID BATTERY

You CAN install in ANY POSITION!

Sonnenchein batteries are of the lead-acid type, ideal for all forms of portable electronic equipment requiring 2, 6 or 12 volts at 0.9 to 7 AH capacity. Send for free comprehensive Technical Manual.

For FULL Particulars
MAIL COUPON TODAY
ONLY AVAILABLE from

R.H. Cunningham
56 Collins St., Melbourne, 3000.
N.S.W.: 64 Alfred St., Milsons Point, 2061.
929-8066
61-2464

OLD: L. E. BOUGHEIN & CO., 30 Grimes St., Auchenflower, 4066. 76-8007

Sonnencchein AR10/71

Name.
Address.

Mail coupon today for FREE technical manual.

Sonnenchein dryfit
BATTERIES...the LEAD ACID BATTERY
You CAN install in ANY POSITION!
NEW CALL SIGNS

JUNE 1971

VK1VB—V. F. Burman, 140 Badimara St., Waramanga. 2611.
VK1ZAP—A. F. Blight, 1 Praed Pl., Garran. 2603.
VK2ATX—N. G. McAlpine, 158 Pennant Hills Rd., West Pennant Hills, 2123.
VK2BSZ/T—E. K. Southwick, 55 Dunton St., Hurstville Park, 2190.
VK2ZD—C. G. Dunkley, 8 Chambers St., East Maitland, 2323.
VK2ZGT—C. McGregor, 44 Koola Ave., Killarney, 2701.
VK2ZJG—J. C. Young, 18 Vernon St., Hunters Hill, 2110.
VK2ZK—M. K. Morris, 69 Rous St., East Maitland, 2323.
VK2ZQW/T—D. M. Badcock, 17 Helen St., Currumbin. 4215.
VK2ZJG—J. C. Young, 18 Vernon St., Hunters Hill, 2110.
VK2ZYO—T. J. Young, 5 Grant St., Tamworth, 2340.
VK2ZQW/T—M. D. Badcock, 17 Helen St., Currumbin. 4215.
VK2ZWT/G—J. W. West, Hunter's Point Rd., Hunter's Point, 2111.
VK2ZYP/T—G. R. Beech, 146 Arrow Rd., Auburn, 3170.
VK3BBE—E. C. Bick, 80 Moga Ave., East Keilor, 3062.
VK3VAP—R. E. Proudflock, 26 Stuart St., Armadale, 3143.
VK3ZQ—J. B. Leibgold, P.O. Box 251, Lae, 5981.
VK3ZTQ—D. M. Badcock, 17 Helen St., Currumbin, 4215.
VK3WOP—J. S. Boland, 51 Villaverde Rd., Como, 1583.
VK3ZJG—J. C. Young, 18 Vernon St., Hunters Hill, 2110.
VK3AAV—C. J. Dodd, 8/18-20 St. George's Rd., Homebush, 2191.
VK3ZJO—J. R. O'Halloran, 67 Macedon St., Alexandria, 1414.
VK3ZKL—A. Slamn, 72 Carronvale Rd., Moorabbin, 3182.
VK3ZHA—E. K. Southwick. Now VK2BSZ/T.
VK3ZJP—M. D. Daly, 9/105 Willeed Rd., Oakleigh, 3166.
VK3ZJG—J. C. Young, 18 Vernon St., Hunters Hill, 2110.
VK3ZQW/T—M. D. Badcock, 17 Helen St., Currumbin, 4215.
VK3ZVT—S. R. Gregory. Transferred to Vic.
VK3ZBE/T—J. L. Jones. Transferred to S.A.
VK3ZUF—D. W. McIvor, 4 Stanton Tce., Townsville, 4810.
VK3ZHE—J. W. Heares, 1/30 Russell St., Fortitude Valley, 4006.
VK3ZOR—R. G. Reid. Now VK7RD.
VK3ZFS—G. E. Thomas. Now VK5LW.
VK3ZEM—I. C. F. Modistach. Not renewed.
VK3ZBK—E. J. Kenny. Not renewed.
VK3ZEU—N. G. Scott, P.O. Box 455, Loxton, 5350.
VK3ZAO—M. D. Sobels, 86 Valiant Rd., Holden Hill, 5088.
VK3ZTQ—D. M. Badcock, 17 Helen St., Currumbin, 4215.
VK3ZT—J. L. Jones. Transferred to Tas.
VK3ZAM—D. L. Godfrey, 122 Nelson Pl., Williamstown, 3016.
VK3ZBR—M. K. Morris, 69 Rous St., East Maitland, 2323.
VK3ZCS—M. L. Brane, 43/6 Williams Rd., Windsor, 3181.
VK3ZS—S. I. Zeunert, 274, Swift Dr., Glen Waverley, 3150.

ALTERATIONS

VK2WC—W. C. Cavagnagh, 3 Hatchings St, Wauchope, 2446.
VK3VJ—H. Fitzpatrick, 4 McIntyre St., Lakemba, 3193.
VK3FJ—C. R. Gibson, Spring St., Malvern, 3143.
VK3HI—A. A. Forse, 8 Merrick Cres., Glen Waverley, 3150.
VK3QO—D. T. Butter, Flat 8, Debondbrd Crt., Lower Plenty, 3083.
VK3SL—M. L. Brane, 43/6 Williams Rd., Windsor, 3181.

Hy-Q CRYSTALS FOR AMATEUR USE

A full range of high stability close tolerance crystals especially made for Amateur use is now available.

These crystals are made on the same equipment, with the same care, and subjected to the same exacting tests as those manufactured by us for Military and Industrial applications.

100 KHz., 0.02% Style QC3/X holder ..... $9.90
300 to 500 KHz., 0.02% Style QC6/C (D) holder $6.50
1000 KHz., 0.01% Style QC6/A (D) holder $8.50
2 to 20 MHz., 0.005% Style QC6/A (D) holder $4.70
20 to 60 MHz., 0.005% Style QC6/A3 (D) holder $5.30
60 to 100 MHz., 0.005% Style QC6/A5 (D) holder $9.59

Other frequencies and tolerances can be quoted for on request—send for technical brochure.

Postage/Packing: Victoria 20c, other States 30c

The above prices are Nett Amateur to which should be added Sales Tax if applicable at the rate of 27 1/2% for Receiver use, or 15% for Transmitter or Transceiver use.

Hy-Q

Hy-Q Electronics Pty. Ltd.
10-12 Rosella Street, Frankston, Vic., 3199
P.O. Box 256
Telephone 703-5611, Area Code 03.
CBs: HyQ Melbourne. Telex 31630.

AGENTS:
N.S.W.: General Equipments Pty. Ltd., Artarmon.
Phone: 6681.
Mt. Bryan, 112 miles N.N.E. of Adelaide, on Leigh VK6WA mentions that two solid state of the annual VK5 V.h.f. Field Day, and also operations this year, advance notice is given. He has indicated he will be very keen to work VK3 144.700 VK3VE. Vermont. for its use. However, don't make the mistake on 52.4 MHz. This call sign is unusual to has been licensed for operation in Townsville, but John of the better known or more active areas. An were quite a few with scores around 50 to 60 it in time for the coming DX season, but could both mx beacon is running satisfactorily, but the 2 mx beacon is been operated over the years for scatter purposes. This will be produced on the familiar another form of scatter signals which mayainte are working. This is much preferable to the equipment required is the best another issue is interesting enough to bear repetition on 50 MHz. at distances up sections. The equipment required is the best DX season. This path has not been exploited at 100 MHz. The power used was higher than the Cook Bi-Centenary Award that your ap­ notes must be in my hands by the 30th of the passing 100 KHz. for beacons exclusively.” From Brian VK5CA comes a very brief word the scattering area is a variable parameter, W 50.100 ZK1AA. Cook Island. By applying a kilowatt to the feedline one that's all for this month. I leave you with the bottom line is this that one cannot operate on the frequency so that we are loved, loved for God's wonderful and fading will result. All types of fading will be experienced. There will be short time and short path fading, and also long path fading from 10 c.p.s. to several hours. Some distortion: fading will be experienced. One paradox is that a large antenna shows a lower minimum signal than a small one. But the long path fading is however. The explanation is that the signal from a small antenna is spread over so much bandwidth by a highly directive antenna if this was not correctly aligned compared to a less critical antenna, the minimum signal will be lower. With correct intercession the signal is higher. In the case of tropospheric scatter in the u.h.f. region a similar situation exists. The scatter is occurring at a higher level and this gives a guide what to expect it would appear that Facilities have been made available in Melbourne to be thus deduced that a fully operational moon bounce station should be able to bridge the gap. So there you are. The possibilities do exist. However, I would imagine one of the diffi­ culties in a city area would be the rather high fresh to do, why not select a partner in another State and get moving! COMING EVENTS

That's all for this month. I leave you with the Victorian V.h.f. The full text of Geoff's letter may be read in "The Victorian V.h.f." but the above is a sufficient lead in to set you thinking on the matter. From Brian VK5CA comes a very brief word of advice after a contact recently on f.h. with TAI8NJ to the effect that VK stations are being heard in Japan with much greater regularity on 52 MHz. than we seem to be giving much interest those prepared to make the effort, and the fortifying article 5150 MHz. helps to a good DX in city area is really no longer valid. This may have had considerable merit in the days of almost exclusive crystal locked operation. However, with the ever increasing use of v.f.o. and the use of 50 and 144 MHz. in relatively not now, certainly in the near future, will operate the methods that they are working. This is much preferable to the split frequency idea as weak stations are de­ finitely more readily heard on the frequency of the station they are calling, rather than be­ ing able to receive the call signal on 50 MHz. or so. Calling on the stations' transmitting frequencies also solves the problem of the weaker stations. However, many operators are unaware of the presence of weak DX on or near 50 MHz. GEOFF makes the following points amongst others: "I consider that the idea of allocating par VK5 144.800 VK5VF, Mt. Lofty. VK7 144.600 VK7AI, Darwin. VK9 144.660 VK9KK, Christmas Island. ZL 145.200 ZL2VHF, Wellington. ZLZ 145.300 ZL3VHF, Christchurch. ZA 148.000 ZA11, Johannesburg. W 100.010 WB9JAP, U.S.A. HL 100.110 H18WI, South Korea. ZK 100.500 ZK1AA, Cook Island. KHE 100.110 KHEQ1, Hawaii. VK6 201.990 VK61ZT, Perth. VK7 202.000 VK7AI, Darwin. VK9 202.060 VK9KK, Christmas Island. ZL 202.120 ZL2VHF, Wellington. ZLZ 202.320 ZL3VHF, Christchurch. ZA 202.350 ZA11, Johannesburg. W 202.010 WB9JAP, U.S.A. HL 202.110 H18WI, South Korea. ZK 202.500 ZK1AA, Cook Island. KHE 202.110 KHEQ1, Hawaii.

COMING EVENTS

These include low noise front ends to the receiver, high stability transmitters and receiv­ers, and some degree of exception including both antennas and frequency.

The scattering area is a variable parameter, and fading will result. All types of fading will be experienced. There will be short time and short path fading, and also long path fading from 10 c.p.s. to several hours. Some distortion: fading will be experienced. One paradox is that a large antenna shows a lower minimum signal than a small one. But the long path fading is however. The explanation is that the signal from a small antenna is spread over so much bandwidth by a highly directive antenna if this was not correctly aligned compared to a less critical antenna, the minimum signal will be lower. With correct intercession the signal is higher. In the case of tropospheric scatter in the u.h.f. region a similar situation exists. The scatter is occurring at a higher level and this gives a guide what to expect it would appear that Facilities have been made available in Melbourne to be thus deduced that a fully operational moon bounce station should be able to bridge the gap. So there you are. The possibilities do exist. However, I would imagine one of the diffi­culties in a city area would be the rather high fresh to do, why not select a partner in another State and get moving! COMING EVENTS

These include low noise front ends to the receiver, high stability transmitters and receiv­ers, and some degree of exception including both antennas and frequency.

The scattering area is a variable parameter, and fading will result. All types of fading will be experienced. There will be short time and short path fading, and also long path fading from 10 c.p.s. to several hours. Some distortion: fading will be experienced. One paradox is that a large antenna shows a lower minimum signal than a small one. But the long path fading is however. The explanation is that the signal from a small antenna is spread over so much bandwidth by a highly directive antenna if this was not correctly aligned compared to a less critical antenna, the minimum signal will be lower. With correct intercession the signal is higher. In the case of tropospheric scatter in the u.h.f. region a similar situation exists. The scatter is occurring at a higher level and this gives a guide what to expect it would appear that Facilities have been made available in Melbourne to be thus deduced that a fully operational moon bounce station should be able to bridge the gap. So there you are. The possibilities do exist. However, I would imagine one of the diffi­culties in a city area would be the rather high fresh to do, why not select a partner in another State and get moving! COMING EVENTS

These include low noise front ends to the receiver, high stability transmitters and receiv­ers, and some degree of exception including both antennas and frequency.

The scattering area is a variable parameter, and fading will result. All types of fading will be experienced. There will be short time and short path fading, and also long path fading from 10 c.p.s. to several hours. Some distortion: fading will be experienced. One paradox is that a large antenna shows a lower minimum signal than a small one. But the long path fading is however. The explanation is that the signal from a small antenna is spread over so much bandwidth by a highly directive antenna if this was not correctly aligned compared to a less critical antenna, the minimum signal will be lower. With correct intercession the signal is higher. In the case of tropospheric scatter in the u.h.f. region a similar situation exists. The scatter is occurring at a higher level and this gives a guide what to expect it would appear that Facilities have been made available in Melbourne to be thus deduced that a fully operational moon bounce station should be able to bridge the gap. So there you are. The possibilities do exist. However, I would imagine one of the diffi­culties in a city area would be the rather high fresh to do, why not select a partner in another State and get moving!
The response to appeals for help in compiling this column is coming in well from old friends. More is needed though, please. Every effort is being made to make this column current and useful. If a rare DX-pedition comes up after this article is written, but before it is read, the only piece of useful information may be the QSL address.

ITALIAN PREFIXES

The A.R.I. advises that the prefixes now in fashion with the increased postal charges that Commonwealth Reply Coupons may go minus 40 minutes of G.M.T. sunrise times stated at home, is looking for contacts on 2BCG at home. Cruickshank, VR4CG, on the Solomons (VK-1260) at home, is looking for contacts on 14150 KHz. most evenings.

160 METRES

Ralph W1HQT will be on 1802 KHz., plus or minus 250. The following operators also worked some of the stations in the QSL list. George Cruickshank, VR4CG, on the Solomons (VK-2BCG) at home, is looking for contacts on 14150 KHz. most evenings.

COMPREHENSIVE PRICE LIST NOW AVAILABLE—WRITE FOR YOUR COPY

BRIGHT STAR CRYSTALS

FOR ACCURACY, STABILITY, ACTIVITY AND OUTPUT

SPECIAL OFFER—

STANDARD AMATEUR CRYSTALS

STYLE HCGU HOLDER, FREQUENCY RANGE 6 TO 15 MHz.

0.01% $4.25

0.005% $5.50

Prices include Sales Tax and Postage

COMMERCIAL CRYSTALS

IN HCGU HOLDER, 0.005% TOLERANCE, FREQUENCY RANGE 6 TO 15 MHz.

$6.00 plus Sales Tax and Postage

Write for list of other tolerances and frequencies available.

For orders, write Bright Star Crystals, Pty. Ltd., Lot 6, Eileen Road, Clayton, Vic., 3168.

W.I.A. D.X.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 total points earned from contacts with each country. In cases where credits for new members and those totals have been amended are also shown.

New Member: Amended: New Member: Amended:

PHONE

VK5MS 219/243 VK2APK 288/295
VK6EU 316/342 VK4FJ 296/307
VK4H 307/336 VK3ARX 297/315
VK4KS 307/322 VK4UC 278/278
VK5MK 303/324 VK2AK 274/279
VK4A 296/314 VK3Z 274/279

New Members: Cert. No. Call Total

118 VK5ZB 106/107
132 VK4QA 101/101
123 VK3AQ 113/113

Amendments:

VK4DO 236/248 VK2TG 185/188
VK5MK 235/235 VK313 143/143
VK4RF 216/216

C.W.

VK2QG 303/326 VK3NC 273/300
VK3AH 305/315 VK3ARX 271/280
VK4FJ 289/310 VK4U 267/287
VK3YL 286/303 VK6R 266/289
VK4HK 285/329 VK2AH 269/272
VK2AH 282/296 VK3TL 255/260

New Member: Cert. No. Call Total

98 VK3LV 101/101

Amendments:

VK4DO 219/220 VK4RF 192/202

OPEN

VK8RU 317/343 VK5KM 303/324
VK3AH 305/315 VK2APK 302/314
VK2AGH 314/334 VK3EO 301/295
VK4FJ 289/310 VK4U 290/299
VK4KS 308/327 VK4UC 298/298
VK4TY 306/321 VK4FJ 297/293

New Member: Cert. No. Call Total

136 VK5FY 109/112

Amendments:

VK4DO 251/269 VK3LV 106/106
DIVISIONAL NOTES

NEW SOUTH WALES

In order to assist the sub-editor, T. Mills, VK2ZTM, and to facilitate the preparation and submission of news to Amateur Radio, October, 1971 Page 23

Friday, 22nd OCTOBER, 1971

VICTORIA

ANNUAL DINNER

will be held on FRIDAY, 22ND OCTOBER, 1971 at the VILLAGE GREEN HOTEL, Glen Waverley.

The main business part of the meeting received a short report from the Headquarters Building Committee, heard further stage plans for the second Inter-divisional meeting, and considered several other topics of interest. The October 26 meeting will be a Jumble Sale.

The August V.h.f. Group meeting was a regular meeting with 34 members present. It was agreed that a wide range of subjects from cross modulation, to the operation of a solid state, distribution of gain throughout the circuit, effect of gain and bandwidth on overloading problems and similar kinds of Amateur eyeball problems. Quite a stimulating exchange of ideas and comments were gained some help. The October meeting is to be a similar discussion session on antennas.

For members who do not collect cards will be forwarded in order to clear the Bureau. All cards remaining unfinancial at 31st August were returned.

It was decided that all cards will be despatched in order to clear the Bureau. All cards remaining unfinancial at 31st August were returned.

A scale of fees favouring Institute members and pensioners.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

QUEENSLAND

Redcliffe Radio Club, VK4HC—The club exhibited and demonstrated Amateur Radio activities. Among the items on display was an FT-DX-400 and a Swans 350 with one antenna. During the meeting the following week it is hoped to improve on this and also go on v.h.f. Numerous interference problems were brought to the members’ attention

When these notes were presented to 16 members of the club who amongst themselves. When these notes were presented to 16 members of the club who amongst themselves. When these notes were presented to 16 members of the club who amongst themselves. When these notes were presented to 16 members of the club who amongst themselves.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)

SOUTH AUSTRALIA

The August S.A. Division meeting was a display of members’ equipment, which attracted a wide range of home constructed equipment of various types at the show. One member exhibited a s.s.b. tx from Ern VK5EN, a receiver from Les VK5NJ received an honourable mention. Other transmitting equipment on display included a s.s.b. rx from the State Co-ordinator, VKs 2YB, 3XB, 4DP, 5FM, 7LJ, 5NZ, 6HK, 7PF.

The club has now just over 50 members, varying in age from 12 to 61 years and including some family teams. One particular team, consisting of a father and son, travel each Monday night 20 miles to attend the Elementary Y.R.S. classes. (John VK4QA)


**SILENT KEYS**

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

VK2ACT—W. L. Brook.

VK2AWD—A. W. Dever.

VK4CM—T. M. B. Elliott.

VK6WS—W. Schofield.

**HAM ADS**

Minimum S1 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 SWL's. The publishers reserve the right to reject any advertising which in their opinion is unsuitable for publication. Copy must be received at P.O. 36, East Melbourne, Vic., 3002, at latest 4 weeks prior to date of publication. Readers must acknowledgeHamads accepts no responsibility for unsolicited material received at this address.

ATTENTION librarians and others. Pre-war issues accompany the advertisement.

WANTED: Circuit diagram, Handbooks or any information on the following items. M. C. Johannesburg, P.O. Box 1381, Johannesburg, S.A. 2006.

WANTED: 220v, 600w, 220 Hz, 12 1/2" to 12 1/4" resonant power amplifier. Expandable, includes power transformer. $100. Bill Verrall, VK5KV, 111 Carey Rd., St. Leonards, N.S.W. 2065.

WANTED: Drake 2B Receiver in good condition, $250. Offers accepted. Jack Phelan, VK1GD, Box 30, Toowoomba, Qld., 4350.

WANTED: Collins 45RA, 160-10 mult, 20w. AM Xtal controlled 160 mx Tx incl. PSU. $85. Contact: M. T. G. Box 39, Toowoomba, Qld., 4350.

WANTED: Collins 51J1-2-3 Receiver. Johnson Valves, all recent mods, $630. J. D. A., Box 39, Muller Hill, N.S.W., 2522.

WANTED: Collins KWS-1 and 75A-3 combination for sale as soon as possible. $500 or best offer. V. J. Pirie, VK2FG, 50 Pendle Rd, Springwood, N.S.W. 2777.

WANTED: LIC for 165-170 MHz. Power Supply, crystal controlled 150w. SSB $150, AM $100. Peter B. Salmon, 41 Avian Ores., Lane Cove, N.S.W., 2066.

WANTED: Audio transformer for Beam antenna, 1800 Hz. James Cown, 284 Kepel St., Balaclava, Vic., 3183.

WANTED: 117v. transformer for $340. VK3AKZ, 6 Dufryn Pl., Toorak, Melb., Vic., 3142.


WANTED: SSB, TX with 50w, $75. Offers, please. VK3AGC, 228x Grand Rd., Cumberland Park, S.A., 5041.

WANTED: Collins 9622 final (6DS with 50w carbon anode), $170. Both plus 117v. transformer for $340. VK3AKZ, 6 Dufryn Pl., Toorak, Melb., Vic., 3142.


WANTED: Drake 2B Receiver, 160-10 mult, 20w. AM Xtal controlled 160 mx Tx incl. PSU. $85. Contact: M. T. G. Box 39, Muller Hill, N.S.W., 2522.

WANTED: Drake SX-101 Receiver, 160-10 mult, 20w. AM Xtal controlled 160 mx Tx incl. PSU. $85. Contact: M. T. G. Box 39, Muller Hill, N.S.W., 2522.

SOLID-STATE BREAK THROUGH from YAESU

FT-101 Dual Power Supply TRANSCEIVER

Perfect choice for car, caravan, boat, aircraft, field day activity, etc.

FEATURE CHECK LIST
- Built-in AC and DC power supplies
- Built-in WWV 10 MHz. band
- Noise Blanker
- 25 and 100 KHz. Calibrators
- Built-in VOX
- ±5 KHz. Clarifier
- Break-in CW with Side Tone
- 1 KHz. Dial Read Out
- Selectable SSB
- AM Capability
- Built-in Speaker
- Microphone
- Dual VFO Adaptor
- Crystal Channel Oscillator

ACCESSORIES (optional extras)
- External VFO ... ... ... ... Model FV-101
- External Speaker ... ... ... ... Model SP-101
- Mobile Mounting Bracket
- CW Filter (600 Hz.)

All sets are pre-sales checked for operation on all bands, and covered by our 90-day warranty. Full facilities are available for after-sales service.

Latest model with factory-installed modifications, complete with power cables, plugs and P.T.T. noise-cancelling microphone.

Price $675 incl. S.T. (Price and specifications subject to change).

Sole Authorised Australian Agent:

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 67-1650 (AH 371-5445)


Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

Amateur Radio, October, 1971
Distributors
For Australian and
International
Manufacturers...

TEST EQUIPMENT:
RAPAR • SWE-CHECK
BWD • HORWOOD
Call and see our large
range of test equipment

SEMI-CONDUCTORS:
TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

1971-72 CATALOGUE NOW AVAILABLE, $3

RAPAR Model F75K Multimeter

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921
OPEN SATURDAY MORNINGS!
A & R OUTPUT TRANSFORMER
TYPE ED M10
Primary impedance, 8.000 ohms c.t.; ultra-linear screen taps; 43% turns; ultra-secondary Impedance, 2, 8 and 15 ohms; power rating, 10 watts; frequency response, plus or minus 2 dB 50 Hz. to 30 KHz.; overall size: 4 1/4-in. x 2-1/16-in. x 2-1/8-in.; mounting centres, 2 1/2-in.
Few Only! Price $8.00nett.

AMERICAN RECORDING TAPE
(New, in sealed boxes)
1500 feet, 7-inch. Acetate, 1-1/2 mil. ...................................... $3.50
1200 feet, 7-inch. Acetate, 1-1/2 mil. ...................................... $2.50
1200 feet, 7-inch. Mylar, 1-1/2 mil. ...................................... $3.00
1200 feet, 5-1/8-inch, Acetate, 1 mil. ...................................... $2.00
1200 feet, 5-1/2-inch, Mylar, 1 mil. ...................................... $2.50
Postage 10c.

METERS
MO5 METERS: New. Face 3-1/2-in., M/H 2-1/2-in. Res. 120 ohms 0-1, 0-5, 0-10, 0-20, 0-50, 0-100, 0-500, 0-1000 uA. Price $5.25 nett. Postage 20c.
MO5 METERS RES.: 0-15, 0-30, 0-300 volt DC. Price $5.40 nett. Postage 20c.
MR3P METERS: New. Face size 3-1/2-in., M/H 2-1/2-in. Res. 120 ohms 0-1, 0-5, 0-10, 0-50, 0-100, 0-500, 0-1000 mA. Price $8.00 nett. Postage 20c.
MR3P METERS: 0-50, 0-100, 100-100, 0-500 uA. Price $11.50 nett. Postage $1.20.
GREEN CAP CONDENSERS
Sizes: 0.001, 0.002, 0.003, 0.004, 0.005, 0.006, 0.008 uF. Price 12c each.
Sizes: 0.01, 0.02, 0.03, 0.04, 0.047, 0.055, 0.068, 0.082 uF. Price 15c each.
Sizes: 0.1, 0.22, 0.33, 0.39, 0.47 uF. Price 18c each.
1 uF. (200v.w.). 2 uF. (200v.w.). Price 58c each.
RESISTORS
1/2 watt 8c each, 1 watt 10c each.

LAFAYETTE SOLID STATE HA600 COMM. RECEIVER
Five bands, a.m., c.w., s.s.b., Amateur and Short Waves, 150 to 400 KHz., and 550 KHz. to 30 MHz. FET front end. Two mechanical filters. Noise dial. Product detector. Crystal calibrator. Variable BFO. No. Tune-able 50 meter, 24 in. bandwidth; 300 M.C, a.c./d.c. d.c. neg. earth operation. RF gain control. Size: 15 x 9 1/4 x 8 1/4 inches. Weight 18 lb.
Price $199.50 net.

TRIO COMM. RECEIVER MODEL 9R-59DS
Four-band receiver covering 535 KHz. to 30 MHz. continuous, and electrical bandwidth on 10, 15, 20, 40 and 80 metres 8 valves plus 7 diode circuits. 4/8 ohm output and phone jack. SSB-CW-AM, ANL, variable BFO. 5 meter, sep. bandwidth dial, I.F. 455 KHz., audio output 1.5w., variable RF and AGC controls. 115/220v. AC mains. Beautifully designed. Size: 7 x 15 x 10 in. With instruction manual and service data.
Price $178.50 including sales tax

LAPEYETTE HA800, solid state, as above but Ham Band only SS8-AM-CW. Price $195 nett.

AMERICAN RECORDING TAPE
Price $4.50 nett. Postage 20c.

PHONE INTER-COM. SETS
Telephone Inter-communication Set with signal bulb, two U2 batteries. Ideal for children. Price $6.75. Postage 30c.

Egg Insulators
For your Aerial. 8c each.

Variable Condensers

low pass filters
A "Cabanee" low Pass Filter will fix T.V.I. Cut-off frequency, 30 MHz.; attenuation at 60 MHz., better than 30 dB.; insertion loss, negligible, impedance 50-70 ohms.
Price $11.50. Postage 10c.

SOLID STATE STEREO AMPLIFIER
8 watts r.m.s. per channel. Input for magnetic, crystal and ceramic type microphone. P.V. cartridges, tape recorder input and output, tuner input, stereo headphone jack.
Reduced to $55.00. Postage 10c.

FIVE-CORE CABLE
5 x 5/0076. Ideal for Intercoms., Telephones, etc.
New. 100 yd. rolls, $17 (postage 75c), or 20c yd.

STEREO HEADPHONES
Professional quality (well known brand). Large earpads, standard stereo plug, 6 ft. lead.
Price $3.75. Postage 50c.

CRYSTAL CALIBRATOR No. 10
Nominal range, 500 KHz. to 30 MHz., 500 KHz. xtal and 250 KHz./500 KHz. BFO. Provides heterodyne output in steps of 1 MHz. Dial driven by machine cut strip gears, calibrated in 2 KHz. div. Easily read to 250 Cycles. Output "spiked" approx. 1 sec. intervals, identifies beat note. Power requirements: 12v. DC at 0.3 amp., 250 volts at 15 mA. This is a precision Instrument. Complete with crystal.
Price $23.50.

EXTENSION SPEAKERS
Type T330 Tubular Extension Speakers, 8 ohms, new. Complete with lead and two plugs 2.5 and 3.5 mm. Price $4.30. Postage 20c.
CONTENTS

Technical Articles—

Acitron SSB-400 Transceiver ........................................ 5
A Tester for Field Effect Transistors ........................... 9
Drake 2-B Receiver on Top Band ................................. 3

General—

Amateur Radio Co-operation—YB Style .......................... 11
A Table of Distances between Australasian V.h.f. Locations 12
Australis ................................................................. 22
Correspondence: Novice Licensing .............................. 23
Distances between Australasian V.h.f. Locations ............. 14
Divisional Notes ....................................................... 27
DX ................................................................. 21
Federal Awards ......................................................... 28
Federal Comment: The Space Conference—Geneva 1971 .... 2
Intruder Watch ......................................................... 25
Key Section ............................................................ 19
Licensed Amateurs in VK ............................................ 22
New Call Signs ......................................................... 22
Obituary ................................................................. 25
Overseas Magazine Index ........................................... 9
Prediction Charts for November 1971 .......................... 19
Silent Keys ............................................................. 28
Stolen ................................................................. 19
VHF ................................................................. 20
VKs Heard on 160 Metres ........................................... 28
W.I.A. Novice Investigation Committee ....................... 25

Contests—

John Moyle Memorial National Field Day 1972 ................ 13
1971 Remembrance Day Contest Results ....................... 16

COVER STORY

The Eimac Division of Varian recently released three high-mu triodes—the 8873, 8874 and 8875. They are compact, external-anode, ceramic-metal triodes intended for use in zero-bias class B amplifiers in audio or radio frequency applications. Further details may be obtained from Varian Pty. Ltd., 82 Christie St., St. Leonards, N.S.W., 2065. (Additional descriptions appeared in “Ham Radio” for January 1971.)
In the long term the World Administrative Radio Conference for Space Telecommunications of the International Telecommunications Union held in Geneva from 7th June to 15th July, 1971, may be found to be one of the most significant events for the Amateur Service in recent years. In the September issue of "Amateur Radio" a report on the proceedings and outcome of the Conference was published. I think it is now appropriate to examine the results of that Conference and, at the same time, to offer some comment on the implications flowing from it so far as they relate to the Amateur Service.

Previously, the Amateur Service has been defined in the I.T.U. Radio Regulations as a "service of self-training intercommunication and technical investigations carried on by Amateurs, that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest". No alteration was made to this definition, but the Conference did adopt the definition of a new service, the "Amateur Satellite Service" in the following terms, "a radio communication service using space stations on earth satellites for the same purposes as those of the amateur service".

At first glance, this definition would appear to be an expression of convenience for use in footnotes. However, the significance of the adoption of this definition is far better than that. Many provisions of the Radio Regulations apply to the "Space Service" which is in turn defined as a "radio communication service". Therefore, as the Amateur Satellite Service is by definition a radio communication service, the doubt that has existed in the past as to the application of these provisions to Amateur Satellites is removed.

In my mind, even more significant than the result of the conference so far as it affected the Amateur Service was the opposition from so many countries to the Amateur Service. It is abundantly clear that the Amateur Service was supported by Australia as well as New Zealand, the United Kingdom, the United States of America, Canada, West Germany and other countries. The issue affecting the Amateur Service that produced so much opposition was the question as to whether or not Amateur Satellites would be permitted in the Amateur shared bands. The countries that vociferously opposed Amateur Satellites in shared bands included Sweden, Norway, France, Switzerland, Portugal, U.S.S.R., Mexico, Greece, Spain, Netherlands, Italy, India and other countries.

We are fortunate that we enjoy the support of our administration. Comparisons with certain other countries must lead us to the conclusion that the Amateur Service, at least in some of those countries, does not enjoy a similar rapport.

The proposal to permit Amateur Satellites in shared bands had been meticulously investigated and recommended by the C.C.I.R., the I.T.U.'s technical advisory arm.

Of course the W.I.A. was particularly concerned about the 2 metre and 70 centimetre bands—the two bands that it was planned that the A.O.B. translator project would use. Despite some opposition, the principle of the unrestricted use by the Amateur Satellite Service of the exclusive bands, was accepted by the conference. This, of course, covered the frequency band 144-146 MHz., the worldwide two metre allocation.

However, there is no Amateur allocation between 146 MHz. and 24 GHz. that is not a shared band. In the final outcome, use of the segment 435-438 MHz. by the Amateur Satellite Service is permitted, thanks to the excellent lobbying of the I.A.R.U. team which saved the day at the very last minute. For the sake of completeness, it is useful to restate the relevant footnote to that segment:

"320A. In the band 435-438 MHz. the amateur satellite service may be authorised on condition that harmful interference shall not be caused to other services operating in accordance with the table of frequency allocations. Administrations authorising such use shall ensure that any harmful interference caused by emissions from amateur satellites is immediately eliminated."

Even this footnote was the subject of opposition from Indonesia, Singapore and to a lesser extent, Malaysia.

No doubt in a number of cases, the opposition to the use of the shared Amateur bands by the Amateur Satellite Service, can be ascribed to genuine fears of harmful interference, but no doubt there are many other reasons that influenced those countries that opposed the Amateur position. "It Seems To Us" in "QST" of August 1971 puts the matter very clearly: "In the first weeks of the Conference it became apparent that a number of societies in other countries had not done their 'homework' of liaison with authorities."

The fact that at the last Plenary Meeting, the footnote I have quoted above in relation to the segment 435-438 MHz., was inserted into the frequency table, may result, one ventures to suggest, in many administrations giving special scrutiny to the Amateur Service. In addition, other services which failed to achieve anything at all, or at best very little, such as the Maritime Service, which failed totally to secure any frequencies for space communications, may likewise decide to carefully examine the position of the Amateur Service.

In my view, the Amateur Service over the next few years, could face a questioning of its position and perhaps its very existence, by a number of administrations and other services. It is clear that the Amateur Service as a whole must be able to demonstrate the usefulness to which it puts its frequencies. This, in itself is a complete justification for the Wireless Institute of Australia continuing to foster activities such as Project Australis.

Furthermore, the irresponsible use by any Amateur of the frequencies allocated to the Amateur Service cannot be other than detrimental to the whole service in respect of its allocations and privileges. The final results of the Conference may be less than we sought but were the minimum for which we hoped. The result also may be that the Amateur Service will, in the eyes of many, be on trial. Each of us, by our support of those activities that are truly useful, and by the responsible use of our privileges, can ensure that we do not place the future in jeopardy.

MICHAEL J. OWEN.
Federal President, W.I.A.
(Also refer to page 6 of September "A.R." for previous details.—Ed.)
DRAKE 2-B RECEIVER ON TOP BAND*
NOTES ON A SIMPLE MODIFICATION

R. L. GLAISHER, G6LX

The Drake 2-B was first introduced in 1959 and although it has been superseded by later models, in the writer's view it is still one of the best of the post-war Amateur receivers for s.s.b. and c.w. use. In addition to coverage of the 3.5 to 28 MHz. Amateur bands, it has a built-in facility which permits, with the use of extra crystals, reception on five extra bands each 600 KHz. wide anywhere in the range 3 to 32 MHz. It is this facility which can be used to extend the coverage to include the 160 metre band.

As will be seen by reference to the block diagram (Fig. 1), the receiver is a multiple-conversion superhet, having a basic tuning range of 3.5 to 4.1 MHz. A crystal oscillator and mixer stage is switched into circuit for the Amateur bands 7 to 28 MHz and for the five extra bands in the spectrum above 4.1 MHz. The grid and anode circuits of the r.f. stage are tuned independently of the main frequency control by the use of a separate pre-selector control comprising L/C circuits which resonate at 7 MHz. ± 2 MHz. Coverage of the other bands and frequencies is obtained by the switching of capacitive or inductive shunts across the pre-selector coils to raise or lower their inductance.

To receive 160 metres, triple-conversion is used, as on the 7 to 28 MHz. bands. As the pre-selector circuits will only tune down to 3.3 MHz., it is necessary to add capacity so that they will resonate at 1.9 MHz. at mid-scale of the pre-selector tuning. This can be done by using the extra crystal having an exact multiple of 100 KHz. be used as this will provide a coverage of 1.8 to 2.0 MHz. with the receiver tuned 3.7 to 3.5 MHz. Product mixing is not recommended, as apart from the problem of the oscillator being in the band in the 1.8 to 2.0 MHz. segment, there are difficulties with strong second-channel signals and in-band birdies. Using difference mixing, there are no obvious spurious or second channel signals within the 1.8 to 2.0 MHz. band. It is suggested that a crystal having an exact multiple of 100 KHz. be used as this will provide a direct-frequency read-out on the main tuning scale.

PRE_SELECTOR MODIFICATION

It is first necessary to identify the two switch wafers that are associated with the pre-selector input and output circuits and the connections to the wafers that correspond to switch positions "A" and "80" (see Fig. 2A). The modification consists of removing these leads and wiring in the padding condensers (C1A, CT1A, C2A and CT2A) as shown in Fig. 2B. While there is sufficient room to mount the extra components on short brackets attached to the chassis, this was not found to be necessary and the condensers and trimmers are wired directly between the switch contacts and the 80 metre shunts using short lengths of 18 gauge tinned copper wire. If brackets are used, it should be remembered that most types of compression trimmers are constructed so that one side is at earth potential and insulated spacers will be required between the trimmers and the mounting brackets.

ALIGNMENT

Once the pre-selector modifications have been completed and a crystal of the correct frequency inserted into crystal socket "A", the only thing that remains is to adjust the trimmers CT1A and CT2A in order to resonate the pre-selector tuned circuits to 160 metres. This is a very simple adjustment which can be done without the use of a signal generator or other test equipment.

(Continued on Page 9)
BAIL ELECTRONIC SERVICES
SOLE AUSTRALIAN AUTHORISED AGENTS FOR

Yaesu "F" Series
S.S.B. EQUIPMENT

★ FLDX-400 TRANSMITTER, FRDX-400 RECEIVER, FL-2000B LINEAR AMP.
★ FT-200, FTDX-401, FT-101 TRANSCEIVERS
★ FTV-650 6M. TRANSVERTER, FT-2F 2M. FM TRANSCEIVER

(ALL YAESU SETS RECEIVED ARE LATEST VERSIONS, AND FACTORY "EXPORT" QUALITY ONLY)


N.S.W. Rep.: STEPHEN KUHL, P.O. Box 56, Mascot, N.S.W., 2020. Telephone Day 67-1650 (AH 371-5445)
Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 60-4379

The World’s Most Versatile Circuit Building System!

SIZES: 1/8” and 1/16” WIDTHS
LENGTH: 100 ft. roll, 5 ft. card

IDEAL FOR PROTOTYPE AND PRODUCTION CONSTRUCTION
USEFUL FOR WIRING REPAIRS
★ NO DRILLING ★ FAST ★ NO MESS

Available from all Leading Radio Houses

Marketed by—

ZEPHYR PRODUCTS PTY. LTD.
70 BATESFORD RD., CHADSTONE, VIC., 3148
Telephone 56-7231

MANUFACTURERS OF RADIO AND ELECTRICAL EQUIPMENT AND COMPONENTS
GENERAL DESCRIPTION

The Acitron SSB-400 Transceiver consists of the following modules:

1. Band Switched R.F. Section
   This is a large double-sided circuit board housing:
   Injection crystal oscillator,
   Injection balanced mixer,
   R.f. amplifier,
   Transmitter balanced mixer.
   This complete section is readily removable for maintenance purposes.

2. I.F. Modem
   A second relatively large printed circuit board houses:
   Receive balanced mixer,
   Transmit balanced modulator,
   9 MHz. filter and associated matching networks,
   Two i.f. amplifiers,
   A.m. and sideband detector,
   A.g.c. system.

3. 10-Watt Broad-band Driver

4. Frequency Counter and Digital Display

5. 6-5 MHz. VFO.

The remaining modules are contained on separate plug-in boards. These are:

6. 10 Volt Power Regulator

7. Audio Amplifier

8. 9 MHz. Carrier Oscillator

9. Microphone Amp., Vox/Anti-Vox

10. Digital Oscillator and Balanced Mixer

11. 100 KHz. Clock Oscillator and Logic Generator.

All circuit boards are plated fibre-glass using gold plated edge connectors, where applicable.

A.L.C.

The a.l.c. system uses the grid current of the final tube to generate a negative voltage which is applied to the first i.f. amplifier. Whilst the main function of the a.l.c. system is to prevent overdrive of the transmitter, it also performs the function of a speech compressor owing to its very fast time constant, thus allowing approximately 15 to 20 dB compression to be incorporated on transmit, if desired.

TRANSMIT BALANCED MIXER

A hot carrier diode ring mixer is used to ensure a minimal radiation of spurious emissions. This is a broadband device using toroidal transformers, therefore, no tuning is required.

MICROPHONE AMPLIFIER, VOX/ANTI-VOX SYSTEM

The microphone amplifier consists of a source follower driving an integrated circuit. The source follower input enables high impedance crystal to low impedance dynamic microphones to be used. The terminating resistor to suit the microphone is the only change required. There is adequate gain in the microphone amplifier to accommodate most dynamic, crystal and rocking armature microphones.

Four transistors, two integrated circuits, one FET and six diodes are used in this system which is self-contained on a single plug-in circuit board.

"S" METER

The "S" meter forms the dual function of "S" meter and transmit power monitor. On receive, the "S" meter is connected by a bridge circuit to the combined source voltages of the r.f. and first i.f. amplifiers. Both of these are a.g.c. controlled, giving a dynamic range on the "S" meter of approximately one microvolt to one volt. On transmit, the "S" meter is connected to a diode monitor on the transmitter r.f.
output. A separate meter is used to indicate plate current of the power amplifier.

9 MHz. CARRIER OSCILLATOR
This unit consists of a series mode transistor oscillator and FET source follower. Diode switching allows the correct crystal to be selected when changing from normal to reverse side-band.

A.G.C.
The a.g.c. system uses a negative voltage derived from a voltage doubler and feeds in turn to the r.f. and first i.f. amplifiers, both units being dual gate FETs. This allows a large dynamic range prior to receiver overload and in actual practice the receiver will accept a signal from noise level to almost one volt before overload occurs.

10 VOLT POWER REGULATOR
The 10 volt power regulator supplies power to all stages of the transceiver with the exception of the audio output stage, transmitter p.a. and broad-band driver.

The supply consists of a two-stage emitter follower with short circuit protection supplied from a zener referenced voltage.

400 WATT POWER AMPLIFIER
The power amplifier consists of a YL1060 u.h.f. dual tetrode transmitting tube. This stage has a broad-band input and pi-coupler output. The valve is running approximately 800 watts p.e.p. in and delivering 400 watts p.e.p. out.

The power is slightly less on 10 metres. Approximately 1,800 volt (p.a.) and 400 volt (screen) supplies are used.

R.F. AMPLIFIER
This is a band switched r.f. amplifier consisting of a dual gate FET followed by an emitter follower. Tuning is electronically accomplished using diodes. The r.f. amplifier is used both on transmit and receive.

BALANCED MIXER - MODULATOR
One of the most interesting blocks in the transceiver is an integrated circuit balanced mixer which performs the dual function of receive balanced mixer and transmitter balanced modulator. While receiving, the input ports are connected to the r.f. amplifier and the injection balanced mixer. The output of the balanced mixer is fed via an emitter follower to the 9 MHz. crystal filter. On transmit, the input ports are changed over and the transmitter audio is fed to one port and the 9 MHz. carrier to the other. The unit then functions as a balanced modulator. The carrier suppression of the balanced modulator and filter combined is in the vicinity of 60 dB.

9 MHz. 8-POLE CRYSTAL FILTER
A 9 MHz. 8-pole crystal filter is used with a bandwidth of approximately 2.5 KHz. at the 6 db points, rising to only 4.1 KHz. at the 60 db. points.

I.F. AMPLIFIERS
The first i.f. amplifier is used both on transmit and receive and consists of a dual gate FET. It has a.g.c. applied on receive and a.i.e. on transmit.

The second i.f. amplifier also consists of a dual gate FET.

A.M./S.S.B. DETECTOR
The product detector used is a diode bridge detector and one leg of the bridge is opened when operating in the a.m. mode. A source follower connected to the output reduces the impedance to drive the audio amplifier, via the volume control.

THREE-WATT AUDIO AMPLIFIER
The three-watt amplifier consists of a pair of TQ3 transistors, transformer coupled to the loudspeaker and driven by two small signal transistors.

TEN-WATT BROAD-BAND DRIVER
The 10-watt broad-band driver consists of a transformer coupled pair of v.h.f. strip-line transistors. These are driven by a single v.h.f. strip-line transistor. The complete unit is broad-band, from input to output, delivering approximately ten watts of drive to the power amplifier. This unit is contained on a separate circuit board mounted on a heat sink and does not require tuning.

V.F.O. 6-5 MHz.
The v.f.o. consists of a permeability tuned FET Vacker oscillator followed by suitable buffering stages. The unit is completely enclosed in a metal box and is substantially free from vibration, making it particularly suitable for mobile use.
INJECTION BALANCED MIXER

The injection balanced mixer is once again an integrated circuit similar to the type used in the balance modulator. The input ports are connected to the 6-5 MHz v.f.o. and the band-set crystal oscillator. The output of this is fed via broad-band tuned circuits (to reduce the possibility of spots on receive) to an emitter follower driving both the receive and transmit mixers.

CRYSTAL OSCILLATOR

This unit is a series overtone crystal oscillator followed by a FET source follower. The appropriate crystals being switched in when changing from band to band.

DIGITAL SYSTEM

As the v.f.o. is reverse tuning from 6 to 5 MHz, a balanced mixer is used to convert this to the 2 to 3 MHz range. This is then applied to a conventional frequency counter. The 8 MHz crystal used in the digital oscillator is diode switched when changing from upper to lower sideband and in some cases when changing from band to band (depending on whether additive or subtractive mixing is used). This is achieved automatically due to the logic system, enabling the digital readout to display the exact carrier frequency, rather than the centre pass band frequency.

FREQUENCY COUNTER

The frequency counter consists of eleven dual in line integrated circuits comprising complete count and memory facilities and it drives a three-digit seven-segment gallium arsenide display. It has the facility to scale down and read to one extra digit (100 Hz).

LOGIC GENERATOR

The logic generator performs the functions necessary to generate the various gate, set and re-set pulses, etc., for the frequency counter. It also generates tones for c.w. transmission and tuning purposes. Eight dual in line integrated circuits and two transistors are used in this section.

100 KHz. CLOCK OSCILLATOR

The 100 KHz. clock oscillator consists of a parallel mode 100 KHz crystal. Twenty-one integrated circuits, five transistors and one FET are used in the complete digital readout system.

P.A. TUNING

Before describing the tune-up system employed in the SSB-400, some comments are necessary on the tuning of s.s.b. transmitters in general.

It is a well known fact that an s.s.b. transmitter must be tuned at the full rated (p.e.p. value) input that it will be operating at on voice peaks in order (Continued on Page 9)

(Continued on Page 9)
A Tester for Field Effect Transistors

A. G. THORBURN, G3WBT

The winter constructional programme at G3WBT included, for the first time, quite a few projects using field effect transistors, but because of a lack of knowledge and a lack of data on these devices, this FET tester was designed, constructed and found satisfactory in operation. This design is not the last word in FET testers, as simplicity and availability of parts in the stock (junk) box were important influences.

The design of such a tester should enable FET transfer characteristics to be ascertained so as to allow correct bias points to be determined and load lines drawn. From these, some understanding of FETS would be obtained and circuits using them could be laid out for efficient and effective use.

Further criteria of the design were ability to check N and P channel junction FETS, MOSFETS or IGFETS; depletion or enhancement modes, and the ability to attach the FET easily to the tester and accommodate the multiplicity of different orders of drain, source and gate connections.

THE CIRCUIT

Fig. 1 shows the circuit diagram, and Fig. 2 shows the front panel layout. The latter has three crocodile clips, not shown in the circuit diagram, to which the FET leads are attached; the correct connections for drain, source and gate being arrived at by insertion of the three miniature wander plugs in the appropriate sockets.

Switch positions in the circuit diagram are shown for N channel junction FETS where the drain has positive polarity and the gate is negatively biased from 0v. to —6v. by means of RV1 with the 6v. zener in circuit, or to 9v. with S5 open. S5 must be open when the tester is not in use otherwise the 9v. PP3 will take current through the zener and R1 despite S2 being in the off position.

RV1 can be of very high resistance, as the gate, being reversed biased, takes no measureable current. S5 closed also allows RV1 to be calibrated in volts, 0 to 6, so no meter is required to read gate volts. When S5 is open the full 9v. is available if required. With enhancement mode MOSFETS or IGFETS there may be no drain current until application of gate volts bias.

For N channel MOSFETS with drain positive, the gate will be positive, the drain current increasing with increased positive bias. P channel MOSFETS require negative bias for current flow.

Depletion mode MOSFETS have current flow with zero bias, the N channel type decreasing drain current with negative bias and increasing drain current with positive bias. In this way depletion mode MOSFETS can operate from zero bias on application of either positive or negative bias, i.e. from zero bias a change either way changes drain current. The B1 switching takes care of all these possibilities in conjunction with RV1.

In the model shown, B1 is external to the tester, as is the separate a.c. p.s.u.

Fig. 1 shows B2 as 18v. from two PP9 or RR6 batteries in series. B2 and components to the right of the chain line in Fig. 1 can be built as a separate item as an alternative to the a.c. p.s.u.

OPERATION

To operate, all switches should be off and the wander plug positions checked that they are correct for the FET to be tested. S4 should be switched to the 500 ohm RV2 position, which should give 1.8v. maximum with an 18v. battery, and with a 30v. p.s.u. 3 v. maximum. For a junction FET, RV1 can be set half way and S3 meter switch to 100 mA. For IGFETS a finger should be held across the gate and source, crocodile clips to prevent any build-up of static until the bias is switched on.

Switch on S2 before S1 so that bias is applied before drain-source volts. Increasing bias on junction FETS decreases drain current. The meter switch should of course be moved to ensure that some drain current is showing.

Manipulation of RV1, RV2 and RV3 in conjunction with S4, using the station multimeter to read drain to source voltage and tabulating drain current against drain to source volts at known gate to source bias volts, allows the FET’s transfer characteristics to be plotted and curves filled in.

Fig. 3 shows results obtained on an N channel general purpose FET.

While 18v. should be all that is necessary for B2, as components were available in the junk box a variable p.s.u., 0-30v., Fig. 4, was made up. The


Page 8

Amateur Radio, November, 1971
transformer was an ex-radio speaker output transformer for 15 ohm output. The 500 μF capacitor is mainly to allow peak voltage to build up. Fig. 5 shows the voltage drop against current taken for this p.s.u., and is included as a matter of interest for those contemplating a similar type of p.s.u.

**CONSTRUCTION**

The tester shown is constructed in a ½” wall wooden box with a ½” thick paxoline panel. After marking out and drilling, a sheet of substantial plain white paper is placed over the finished drilled panel and all holes rubbed in. Hole centres are easily found to allow the paper to be marked up, using a suitable pair of compasses and pen for all necessary inscriptions. The panel is then lightly gummied and the paper placed in position. After allowing a period for drying out, the author used 2½” wide Sellotape to cover the papered panel and wrap a little around the edges. The large holes can be cut radially before folding inwards and the small holes pierced with pen or pencil.

Assembly of the switches, variable resistors, etc., can then take place, the Sellotape protecting the panel while wiring and soldering takes place. RV1 is a linear wire wound potentiometer and the panel can be pre-marked 0 to 6V, as the input resistance is constant. It is advisable to subdivide the 0 to 1 division into either 10 or 5 further divisions.

It is not possible to divide out the sweep of RV2 and RV3 as the load here is not constant, as can be seen by Fig. 5, which, in a way, simulates the varying load presented by the FET drain current. The station multimeter across B2 input to the tester when in use shows this up as widely varying voltages at identical positions of RV3.

**OVERSEAS MAGAZINE INDEX**


- **Antennas:** An optimum performance array for 160, 80 and 40 metres; A half-Wave DRR Antenna; An Antenna for 75 metre WAT: The KTCGO Moded HT-18 Hy-Tower; A Rotatable Dipole for 20 metres; A Rotatable Dipole for 10 metre Vertical, see key 1; The Ground Image Vertical Antenna; Two Pole, Light Portable Beam for 2 metres; Development of an All-Band Vertical (41).

- **Accessories:** A Simple 1½” Keyer with weight control (41); Kai-Jun CW Monitor and Electronic Keyer, review (51).  

- **General:** A Second Look at Linear Integrated Circuits (39); A 20 MHz Digital Frequency Meter using TTL ICs, Part 2 (41); Microwave Diodes (41); Modern Filter Design for the Radio Amateur (41); The Solar Link (Amateur Radio Astronomy) (41).

- **Receiving:** A Solid State Noise Blanker (31); A Tuned 480 MHz FM Receiver (31); Heath Model SB-303 Receiver, review (31); An RF Noise Bridge and its uses (51); More about Digital Reception, Part 3 (51).

- **Transmitting:** A Power Bridge and SWR Indicator for 2 metres (31).

**ACITRON SSB-400**

(Continued from Page 71)

To obtain the maximum output consistent with the best linearity. For example, if a transmitter is operated at 400 watts p.e.p. full output it can only be run at a percentage of this level. If it is tuned up at a value below this level and the drive is then increased to full input, it will be substantially maltuned and most certainly not optimised for best linearity.

In order to meet the above, the following requirements have to be met:

(a) A power supply capable of running with a continual two-tone input at the full p.e.p. rating, with little or no voltage drop.

(b) A p.a. tube or tubes capable of standing the full p.e.p. rating for some time.

However, in practice allowing for 50% transmit/50% receive time, the actual p.a. power is less than 25% of the maximum rating. The system of tuning is accomplished by feeding a low-duty cycle wave form into the transmitter audio input. In practice, this consists of a tone burst, with a one to ten mark to space ratio, meaning that the transmitter is running during these bursts to its full rated input, but is only running an average power in the order of 10% of its maximum rating.

This in effect means that although the transmitter is running to its full p.e.p. input there is only one-tenth of the drain on both power supply and p.a. tube. This enables the operator to be relatively slow in carrying out the tune-up procedure and still have little possibility of damaging the final stage.

The price of the SSB-400 transceiver is $750.

☆

**HY-Q ELECTRONICS TO MANUFACTURE IN SINGAPORE**

Hy-Q Electronics Pty. Ltd., the Melbourne based manufacturer, whose Frankston, Vic., plant is now operating at capacity, are to start manufacturing in Singapore.

Mr. T. A. Dineen, marketing director of Hy-Q, stated that plans for the new operation Hy-Q Electronics International Pty. Ltd. will be in production early in 1973 and that the new air-conditioned factory is already under construction.

The new venture will be joined in this venture by O’Connors Pty. Ltd., a Singapore based organisation with a 30% holding in the new company.

Mr. Dineen recently carried out a survey of Singapore and interviewed Dr. Mr. Cooper, chairman of Hy-Q Electronics, and Mr. Richard, managing director, concluded the negotiations with O’Connors and the Singapore Government.

**BEWARE OF . . . CHAIN LETTERS**

Another batch are in circulation. If you get one, tear it up!
## STOCKTAKE CLEARANCE SALE

### HIGH IMPEDANCE MICROPHONES
- Ceramic press-to-talk, coiled cord: $8 plus tax
- Dynamic press-to-talk, coiled cord: $10
- Ceramic with switch, model SM52: $3.50
- Ceramic: $3
- Ceramic torpedo stand type: $8

### S.W.R. BRIDGES
- Sansei Mini-Bridge, 2 kw: $8 plus tax
- Sansei SE405 SWR/Field Strength: $13

### B. & W. COMPONENTS
- Linear Amplifier G.G. Ferrite Filament Choke FL15: $10 plus tax
- Linear Amplifier Plate Choke, ceramic former: $5.15
- Sansei Xtal Cal., 25 and 100 KHz, transistors, self contained battery, very neat cabinet, compact: $22

### SWAN TRANSCEIVER POWER SUPP.
- 500 watt 12 volt DC Supply, suit most Transceivers: $110 tax inc.
- 240 volt AC, with Speaker: $110

### SWAN HORNET ANTENNAS
- TB-2 2 el. Triband, ex. heavy duty: $100 plus tax
- TB-3 3 el. Triband, ex. heavy duty: $125
- TB-4H 4 el. Triband, ex. heavy duty: $171

### GOTHAM SINGLE-BAND BEAMS
- Y203 3 element 20 metre: $45 plus tax
- Y153 3 element 15 metre: $31
- Y104 4 element 10 metre: $37
- Y69 9 element 6 metre: $59
- Y212 12 element 2 metre: $53

### TUBES—U.S.A. G.E. COMPACTRON
- 6KD6, 6LQ6, 6HF5, 6JS6C, 6DQ5: $5.86 plus tax
- 6JH8, 7360, 6GK6: $3
- Full range of tubes for all popular Transceivers.

### CRYSTALS
- 100 KHz. Cal. Crystals: $5.50 plus tax
- Small Ships freq. 2524, 2182, 6204, 2284 MHz., HC6U type: $5.25

### MISCELLANEOUS
- Dow Key broad-band pre-amplifiers, 2 to 30 MHz: $10
- Strain Insulators: $0.26
- All weather Co-ax Relay: $16
- Simplex Ceramic Trimmers: $0.20
- 10 volt Zener Diodes: $2
- Dow Key Electronic TR Switch: $12

### "FRONTIER" TRANSCEIVERS
- 1200 Super GT Transceiver, five-band, 500 watts: $525 tax inc.
- 500 Digital Transceiver, five-band, 500 watts: $715 tax inc.
- 240 volt AC Supply and speaker for above: $92
- Super 3500 GT Linear Amplifier: $314

---

**W.F.S. ELECTRONIC SUPPLY CO.**

12 BOWDEN STREET, NORTH PARRAMATTA, N.S.W., 2151

TELEPHONE 630-1621
Radio Amateur with his commercially built s.s.b. transceiver, cubical quad, monitoring scope, etc., moving through Indonesia is like turning back the pages of history. With very, very few exceptions to such sophisticated equipment will be found, nor even the components out of which such gear can be built.

Valves such as 6V6s, 6L6s, EL34s and 807s form the vast majority of final r.f. amplifiers and modulators, whilst antennas are nearly all of the single wire feed types (inverted L, Windom, etc.). I have only seen two folded dipoles, both manufactured from t.v. ribbon. Co-axial cable is a term read in the very few available magazines.

The few home-brew s.s.b. units I have viewed are pieces of art and reflect the ingenuity of the builders. For example, the Australian Amateur can purchase a crystal filter or p.s.n. from any one of a number of vendors, his                               counterpart, however, not only does not have this facility, but could not afford it. The cost would represent more than one month's, and in some cases more than two months, wages (I am assuming the price to be around $9.00).

Following my meetings in Djakarta (Region 0), my work took me to Bogor, a township some 70 kms. distant (Region 1). Here I was very fortunate as my contact person at the University was Soedarsono, himself a Radio Amateur (YDIPY). Being a member of the local group, he swiftly arranged an informal meeting. Present were: Sofjan Wahab (YBFIX), President; Atjo Dimjati (YDPX), Secretary; Mardijanto (YC-1PD), M. Ali Nursiwan (YDIGA), David Djoemeno (YD1GB), John Murdock (YB1AAK/WA8RLR), Soedarsono (Y1MRPX) and myself.

After a long general discussion it was decided to hold a public display of equipment and operation techniques on 17th August which is Indonesian Independence Day, perhaps the most important national holiday of the year.

There was to be a general exhibition in a very large hall in Bogor and permission would be sought for display area. If gained, the exhibition would be a milestone, one of the first of its kind ever held in Indonesia.

My presence was politely but firmly requested and even, although at the time I would be working in Denpasar, Bali, over 1,000 miles away, it was agreed that I fly back and put in an appearance. Living in the area, John Murdock and I had told of the plans and he offered whatever help he could give.

There was more to this display than appeared on the surface as I was later to find out—it was only the incentive to start that was needed.

For many reasons that are generally known, Amateur Radio in Indonesia is very young, actually just a little over three years old. It is up to about the same stage that existed in Australia in the late 1930s. The old timers will remember those days as ones in which individuals, usually Amateurs, were transmitting regular programmes both on broadcast and lower short wave bands.

That is the position that exists in Indonesia now. There are two main divisions (a) Radio Amateurs licensed by the government to operate on Amateur frequencies and within the framework of International Amateur Radio Regulations; they issue three classes of licence depending upon the examinable knowledge reached by the Amateur, and (b) broadcast stations, latterly issued by the government to operate within the broadcast and lower short wave bands; there are two licences depending upon the experience and qualifications of the holder. Amateurs in this category are not a pre-requisite.

Unfortunately there are many unlicensed broadcast stations—policing the regulations is very difficult because of staffing and equipment problems. It is a slow process weeding out the unlicensed, but it is being undertaken and gathering momentum as finance and personnel become available.

I have seen a number of broadcast stations, most of which range between 60 and 100 watts input and have 807s in the final. Some are of good quality, others are very poor but all fill a need which is to give the local population some form of entertainment to listen to.

The general population, however, do not realise that there is a difference between the true Amateur and a broadcast station, to them they are one and the same. Many problems occur particularly because of the extremely limited radio knowledge of the broadcaster. Distortion and harmonic radiation in some areas create "birdies" and heterodynes all over the dial. Of course, the Amateur gets the blame.

Education of the public in this field was thus a further reason for the proposed display at Bogor. When this was first explained to me, I was a little incredulous, but now having travelled extensively throughout Indonesia, I fully agree with all that was said.

A further meeting was held three days later (Tuesday, 13th July) at which it was decided that the display would be completely Indonesian in gear—all home-built and transmissions would be broadcast in 3.5 MHz band. A letter was despatched to the Hall Committee requesting available space.

The following day I began my tour which took me over 1,000 miles to the east of Bogor. I was very surprised to find how effectively the grapevine operated.

Amateurs in Jogjakarta and Surabaja not only knew of the proposal but were watching the outcome with great interest. It became obvious to me that if successful, many other such exhibitions would be held the following year in other regions. If unsuccessful, it would be a bitter blow to the Amateur fraternity.

As promised I flew back from Bali and arrived in Bogor during the afternoon of 16th August. Things had not gone well and little had been done because no reply had been received from the Hall Committee up to 1800 hours on 16th.

When I told of the general interest shown, the President (Sofjan), Soedarsono and I went to see the organiser and space allocation committee. Valid reasons were given for no allocation, but by this time Sofjan wasadamant, and determined.

Things began to move. By 8 p.m. we had space, 9 p.m. we had tables and other Amateurs came to help. 10 p.m. we had display posters beautifully drawn, mostly in caricature by Atjo (Secretary). 11 p.m. we had the antenna erected—a half wave dipole at 3.5 MHz. At midnight we had gathered some components and equipment for display. After laying out where everything would go the next day, we all left the hall at 0100, all very tired but satisfied.

At 0700 on the 17th we again met at the hall and began organising power, display boards, literature to be printed and distributed to interested spectators, covering of tables, etc. By this time there were Amateurs everywhere, all doing their respective parts. I don't remember anyone having breakfast or lunch as it was a race against time—the exhibition was to be opened by the Governor at 1600 hours.

Somewhere it was done and the result? One of the most colourful and most visited displays at the exhibition. Even the Governor made special mention at the opening.

It will carry on until 24th August and a timetable was drawn up allowing ample time to have someone in attendance to take and answer the many numerous enquiries from people in all walks of life. The name given to the stand "Expo Orati" (Organisation of Radio Amateurs of the Republic of Indonesia) was very apt.

For me personally the whole operation had a deeper meaning. I was an Australian working in a foreign country—but in this case I was not accepted as a foreigner. I was an Amateur regardless of race, creed or colour and no special considerations were given. My hands got just as dirty as theirs in trying to overcome the many problems that arose.

Lately that night I said a temporary goodbye to all concerned because I was expected many miles away the following day to begin my work. However, I shall always remember that day and a half at Bogor where I played a very small part and saw the true Amateur co-operative spirit at its very best.
Today’s sophisticated communications equipment calls for crystals that meet the most exacting standards of the art.

Standards that were acceptable a few years ago cannot meet the requirements of design engineers today. Today’s tight tolerances demand quartz blanks with precision selected angles of cut, and Hy-Q use X-ray diffraction equipment to determine this most important factor.

Long term stability is assured by close engineering control of all processing in an air-conditioned environment. The blanks are then checked to determine the frequency change over the temperature range. The crystal is then precision calibrated to frequency using a crystal impedance meter which simulates the manufacturer’s oscillator specifications. Hy-Q crystals are custom manufactured to meet all these exacting requirements.

It is for these reasons that Hy-Q crystals have been readily accepted as a standard by the Communications Industry and why we can guarantee them against defective material and workmanship or any deterioration in performance when they are used in equipment for which they were specifically made.

Australia’s largest independent crystal manufacturers.

Write for details.

Hy-Q Electronics Pty. Ltd.

10-12 Rosella Street,
P.O. Box 256,
Frankston, Victoria, 3199.
Telephone 783-9811.
Area Code 03.
Cables: Hyque Melbourne.
Telex 31630.

AGENTS:

NSW: General Equipments Pty. Ltd., Artarmon. Phone 439-2705.
NT: Combined Electronics Pty. Ltd., Darwin. Phone 6981.

A TABLE OF DISTANCES BETWEEN AUSTRALASIAN V.H.F. LOCATIONS

DEREK BRUMLEY,* VK3AVW

It has long been felt that a table of distances between some of the most popular v.h.f. locations in Australasia would be very useful. Three applications come especially to mind:

1. The compilation of field day and contest logs, where scoring is dependent on the distance covered;
2. The planning of possible paths for attempts at distance records, and
3. Calculation of path loss for scatter circuits.

Small distances may be obtained fairly accurately by reading directly off a map, but above a few hundred miles it becomes necessary to calculate the great circle distance between the points of interest. This is a long and tedious process if done manually, but fortunately it is well within the capabilities of the modern digital computer.

A programme has been developed which calculates the angle subtended at the earth’s centre by any two points on the earth’s surface, given their latitudes and longitudes. This is then multiplied by the earth’s radius to give the required great circle distance.

The programme makes allowance for the difference between the polar and equatorial radii of the earth by using the latitudes of each pair of locations to calculate an “average” radius for each path. Although this is only a first order correction, it is sufficient for the present application. The accuracy of distances in the table is limited by that of the latitudes and longitudes which were taken to the nearest minute of arc.

Those within Victoria were obtained from survey maps; the rest were found from the “Times World Index”. The computer calculates the distances to several significant figures, but rounds them off to the nearest integer before printing.

No apologies are offered for the choice of locations. It was hard enough to restrict the number to sixty, but any increase would have made the table prohibitively large.

The table appears on pages 14 and 15.

* 32 Faversham Rd., Canterbury, Vic., 3126.
The Federal Contest Committee of the Wireless Institute of Australia invites all Australian Amateurs and Short Wave Listeners to participate in this Annual Contest, which is held to perpetuate the memory of John Moyle, whose efforts advanced the Amateur Radio Service.

There are two divisions of this Contest, one of 24 hours continuous duration, and the other of 6 hours continuous duration. The six-hour period has been included to encourage the operator who is unable to participate for the full 24-hour period. The 24-hour continuous operation is to be chosen by an operator from the 26-hour period.

An operator using 25 watts or less input to the final stage will be considered for a certificate where his activity warrants its issue.

DATE
From 0600 GMT, 12th February, 1972, to 0800 GMT, 13th February, 1972.

OBJECTS
The operators of Portable and Mobile Stations within all VK Call Areas will endeavour to contact other Portable/Mobile and Fixed Stations in VK Call Areas and Foreign Call Areas.

RULES
1. There are two divisions, one of six (6) hours, and one of twenty-four (24) hours duration. The six-hour period for operating may be chosen from any time during the Contest, but the six-hour period so chosen must be continuous. In each division, there are six sections:—
   (a) Portable/Mobile Transmitting, Phone.
   (b) Portable/Mobile Transmitting, C.w.
   (c) Portable/Mobile Transmitting, Open.
   (d) Portable/Mobile Transmitting, Multiple Operation, open only.
   (e) Fixed Transmitting Stations working Portable/Mobile Stations, open only.
   (f) Reception of Portable/Mobile Stations.

2. All Australian Amateurs are encouraged to take part. Operators will be limited to their licensed power. For Portable entries, power shall be derived from a self-contained and fully portable source.

   (a) Portable/Mobile Stations shall not be situated in any occupied dwelling or building. Portable/Mobile Stations may be moved from place to place during the Contest.

   No apparatus shall be set up on the site earlier than 24 hours prior to the Contest.

   All Amateur bands may be used, but no cross band operating is permitted. Cross mode operation is permitted.

3. Entrants in Section (d) for Multiple Operator Stations can set up separate transmitters to work on different bands at the same time. All such units of a Multiple Operator Station must be located within an area that can be encompassed by a circle not greater than 1/2 mile diameter.

4. For each transmitter of a Multiple Operator Station a separate log shall be kept with serial numbers starting from 001, and increasing by one for each successive contact. All logs of a Multiple Operator Station shall be submitted by the operator whose transmitters are working. No two transmitters of a Multiple Operator Station are permitted to operate on the same band at any time.

5. Amateurs may enter for any section.

6. One contact per station for phone to phone also one per band is permitted. Cross mode operation will be accepted for scoring.

7. Scoring—
   (a) Portable/Mobile Stations:
      For contacts with Portable/Mobile Stations outside entrant's Call Area ............................................. 15 points
      For contacts with Portable/Mobile Stations within entrant's Call Area .............................. 10 points
      For contacts with Fixed Stations outside the entrant's Call Area ............................................. 5 points
      For contacts with Fixed Stations within the entrant's Call Area ............................................. 2 points
   (b) Fixed Stations:
      For contacts with Portable/Mobile Stations outside entrant's Call Area ..................... 15 points
      For contacts with Portable/Mobile Stations within entrant's Call Area .............................. 10 points

   Operation via active repeaters or translators is not allowed for scoring purposes.

8. The following shall constitute a contact:
      VK1, VK2, VK3, VK4, VK5, VK6, VK7, VK8, VK9 and VK10.

9. All logs shall be set out under the following headings: Date/Time (G.M.T.), Band, Emission, Call Sign, RST/No. Sent, RST/No. Received, Points Claimed. Contacts must be listed in numerical order.

10. In addition, there shall be a front sheet showing the following information:

   Name ______________________ Address ______________________
   Call Sign __________________ Section ______________________
   Division ____________ (6-hour or 24-hour)
   Points Claimed ______________
   Call Sign of other op/s (if any) ______________
   Location of Portable/Mobile Station __________________________________________
   From ____________ hours to ____________ hours

11. A brief description of equipment used, and points claimed, followed by the signature of the operator shall be attached to the log sheet.

   "I hereby certify that I have operated in accordance with the rules and spirit of the Contest."

   Signed _______ Date ________

12. Certificates will be awarded to the highest scorer of each section of each 6 or 24-hour division. Additional certificates may be issued at the discretion of the F.C.C. The 6-hour certificate cannot be won by a 24-hour entrant.

13. Return of Logs: All entries must be postmarked not later than 6th March, 1972, and be clearly marked "John Moyle Memorial National Field Day Contest, 1972", and addressed to:

   Federal Contest Manager, W.I.A., Box 638, G.P.O., Brisbane, Qld., 4001.

   Written comments are invited from all contestants.

RECEIVING SECTION
14. 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/Mobile Station heard, the serial number sent by it, and the Call Sign of the Station being worked.

   Scoring will be on the same basis as for Transmitting Stations. It will not be sufficient to log a station calling CQ. A portable/mobile station may be logged once only for phone and once only for c.w. in each band.

   Awards: A certificate will be awarded to the highest scorer of each of the 6-hour and the 24-hour divisions.
You will note that compared to last year, ref. "A.R." Nov. 1970, we are not holding our own. This is not good because the Institute is moving forward quite steadily and successfully. Why have we not advanced with the R.D. Contest? Looking further, note the high participation level of VK7 + VK0. Even by adding a high average top six logs VK7 + VK0 would not have won this year. They needed more State points.

VK5 + VK8 and VK6 + VK9 would doubtless be on the top with a higher participation level as their average points per log is above VK4.

VK2 put up a good show, but together with VK3, seems to have the problem of participation. Why can't these States have a higher level?

There are some interesting solutions to your problem.

Most States seem to have their own form of log which goes out with their bulletin. This helps, but, as VK4 has found, is not sufficient. There must be a drive to get operators in the contest. VK4's success of the last two years has been assisted by the activities of Northern W.I.A. members. I hope that after considering these results, you do something about making your State a winner next year.

Given his log as a token to his late friend Ray who went "Silent Key" just before the contest started. We hope that there will be more on c.w. next year. Trevor Murray VK4KX was also disappointed there were not more c.w. ops. Others hoped for a better ZL participation next year. As our contest details to ZL were a little late this year, I am sure that there will be more ZLS next year.

Thanks for reading so far. I won't hold you up any longer as I suppose you want to get ready for the Ross Hull and John Moyle contests.

Peter VK4PJ, Federal Contest Manager.
### Western Australia

<table>
<thead>
<tr>
<th>Phone</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK7AX</td>
<td>328</td>
</tr>
<tr>
<td>VK7BF</td>
<td>25</td>
</tr>
<tr>
<td>VK7BE</td>
<td>24</td>
</tr>
<tr>
<td>VK7BS</td>
<td>23</td>
</tr>
<tr>
<td>VK7BY</td>
<td>22</td>
</tr>
<tr>
<td>VK7C</td>
<td>21</td>
</tr>
<tr>
<td>VK7D</td>
<td>20</td>
</tr>
<tr>
<td>VK7F</td>
<td>19</td>
</tr>
<tr>
<td>VK7G</td>
<td>18</td>
</tr>
<tr>
<td>VK7H</td>
<td>17</td>
</tr>
<tr>
<td>VK7I</td>
<td>16</td>
</tr>
<tr>
<td>VK7J</td>
<td>15</td>
</tr>
<tr>
<td>VK7K</td>
<td>14</td>
</tr>
<tr>
<td>VK7L</td>
<td>13</td>
</tr>
<tr>
<td>VK7M</td>
<td>12</td>
</tr>
<tr>
<td>VK7N</td>
<td>11</td>
</tr>
<tr>
<td>VK7O</td>
<td>10</td>
</tr>
<tr>
<td>VK7P</td>
<td>9</td>
</tr>
<tr>
<td>VK7Q</td>
<td>8</td>
</tr>
<tr>
<td>VK7R</td>
<td>7</td>
</tr>
<tr>
<td>VK7S</td>
<td>6</td>
</tr>
<tr>
<td>VK7T</td>
<td>5</td>
</tr>
<tr>
<td>VK7U</td>
<td>4</td>
</tr>
<tr>
<td>VK7V</td>
<td>3</td>
</tr>
<tr>
<td>VK7W</td>
<td>2</td>
</tr>
<tr>
<td>VK7X</td>
<td>1</td>
</tr>
<tr>
<td>VK7Y</td>
<td>0</td>
</tr>
</tbody>
</table>

### Queensland

<table>
<thead>
<tr>
<th>Phone</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK9AX</td>
<td>307</td>
</tr>
<tr>
<td>VK9BY</td>
<td>296</td>
</tr>
<tr>
<td>VK9C</td>
<td>285</td>
</tr>
<tr>
<td>VK9D</td>
<td>274</td>
</tr>
<tr>
<td>VK9E</td>
<td>263</td>
</tr>
<tr>
<td>VK9F</td>
<td>252</td>
</tr>
<tr>
<td>VK9G</td>
<td>241</td>
</tr>
<tr>
<td>VK9H</td>
<td>230</td>
</tr>
<tr>
<td>VK9I</td>
<td>219</td>
</tr>
<tr>
<td>VK9J</td>
<td>208</td>
</tr>
<tr>
<td>VK9K</td>
<td>197</td>
</tr>
<tr>
<td>VK9L</td>
<td>186</td>
</tr>
<tr>
<td>VK9M</td>
<td>175</td>
</tr>
<tr>
<td>VK9N</td>
<td>164</td>
</tr>
<tr>
<td>VK9O</td>
<td>153</td>
</tr>
<tr>
<td>VK9P</td>
<td>142</td>
</tr>
<tr>
<td>VK9Q</td>
<td>131</td>
</tr>
<tr>
<td>VK9R</td>
<td>120</td>
</tr>
<tr>
<td>VK9S</td>
<td>109</td>
</tr>
<tr>
<td>VK9T</td>
<td>98</td>
</tr>
<tr>
<td>VK9U</td>
<td>87</td>
</tr>
<tr>
<td>VK9V</td>
<td>76</td>
</tr>
<tr>
<td>VK9W</td>
<td>65</td>
</tr>
<tr>
<td>VK9X</td>
<td>54</td>
</tr>
<tr>
<td>VK9Y</td>
<td>43</td>
</tr>
<tr>
<td>VK9Z</td>
<td>32</td>
</tr>
<tr>
<td>VK10A</td>
<td>21</td>
</tr>
<tr>
<td>VK10B</td>
<td>10</td>
</tr>
</tbody>
</table>

### Northern Territory

<table>
<thead>
<tr>
<th>Phone</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK11X</td>
<td>298</td>
</tr>
<tr>
<td>VK11Y</td>
<td>287</td>
</tr>
<tr>
<td>VK11Z</td>
<td>276</td>
</tr>
<tr>
<td>VK12A</td>
<td>265</td>
</tr>
<tr>
<td>VK12B</td>
<td>254</td>
</tr>
<tr>
<td>VK12C</td>
<td>243</td>
</tr>
<tr>
<td>VK12D</td>
<td>232</td>
</tr>
<tr>
<td>VK12E</td>
<td>221</td>
</tr>
<tr>
<td>VK12F</td>
<td>210</td>
</tr>
<tr>
<td>VK12G</td>
<td>199</td>
</tr>
<tr>
<td>VK12H</td>
<td>188</td>
</tr>
<tr>
<td>VK12I</td>
<td>177</td>
</tr>
<tr>
<td>VK12J</td>
<td>166</td>
</tr>
<tr>
<td>VK12K</td>
<td>155</td>
</tr>
<tr>
<td>VK12L</td>
<td>144</td>
</tr>
<tr>
<td>VK12M</td>
<td>133</td>
</tr>
<tr>
<td>VK12N</td>
<td>122</td>
</tr>
<tr>
<td>VK12O</td>
<td>111</td>
</tr>
<tr>
<td>VK12P</td>
<td>100</td>
</tr>
<tr>
<td>VK12Q</td>
<td>90</td>
</tr>
<tr>
<td>VK12R</td>
<td>80</td>
</tr>
<tr>
<td>VK12S</td>
<td>70</td>
</tr>
<tr>
<td>VK12T</td>
<td>60</td>
</tr>
<tr>
<td>VK12U</td>
<td>50</td>
</tr>
<tr>
<td>VK12V</td>
<td>40</td>
</tr>
<tr>
<td>VK12W</td>
<td>30</td>
</tr>
<tr>
<td>VK12X</td>
<td>20</td>
</tr>
<tr>
<td>VK12Y</td>
<td>10</td>
</tr>
<tr>
<td>VK12Z</td>
<td>0</td>
</tr>
</tbody>
</table>

### Tasmania

<table>
<thead>
<tr>
<th>Phone</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK13X</td>
<td>287</td>
</tr>
<tr>
<td>VK13Y</td>
<td>276</td>
</tr>
<tr>
<td>VK13Z</td>
<td>265</td>
</tr>
<tr>
<td>VK14A</td>
<td>254</td>
</tr>
<tr>
<td>VK14B</td>
<td>243</td>
</tr>
<tr>
<td>VK14C</td>
<td>232</td>
</tr>
<tr>
<td>VK14D</td>
<td>221</td>
</tr>
<tr>
<td>VK14E</td>
<td>210</td>
</tr>
<tr>
<td>VK14F</td>
<td>199</td>
</tr>
<tr>
<td>VK14G</td>
<td>188</td>
</tr>
<tr>
<td>VK14H</td>
<td>177</td>
</tr>
<tr>
<td>VK14I</td>
<td>166</td>
</tr>
<tr>
<td>VK14J</td>
<td>155</td>
</tr>
<tr>
<td>VK14K</td>
<td>144</td>
</tr>
<tr>
<td>VK14L</td>
<td>133</td>
</tr>
<tr>
<td>VK14M</td>
<td>122</td>
</tr>
<tr>
<td>VK14N</td>
<td>111</td>
</tr>
<tr>
<td>VK14O</td>
<td>100</td>
</tr>
<tr>
<td>VK14P</td>
<td>90</td>
</tr>
<tr>
<td>VK14Q</td>
<td>80</td>
</tr>
<tr>
<td>VK14R</td>
<td>70</td>
</tr>
<tr>
<td>VK14S</td>
<td>60</td>
</tr>
<tr>
<td>VK14T</td>
<td>50</td>
</tr>
<tr>
<td>VK14U</td>
<td>40</td>
</tr>
<tr>
<td>VK14V</td>
<td>30</td>
</tr>
<tr>
<td>VK14W</td>
<td>20</td>
</tr>
<tr>
<td>VK14X</td>
<td>10</td>
</tr>
<tr>
<td>VK14Y</td>
<td>0</td>
</tr>
</tbody>
</table>

### South Australia

<table>
<thead>
<tr>
<th>Phone</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK15X</td>
<td>276</td>
</tr>
<tr>
<td>VK15Y</td>
<td>265</td>
</tr>
<tr>
<td>VK15Z</td>
<td>254</td>
</tr>
<tr>
<td>VK16A</td>
<td>243</td>
</tr>
<tr>
<td>VK16B</td>
<td>232</td>
</tr>
<tr>
<td>VK16C</td>
<td>221</td>
</tr>
<tr>
<td>VK16D</td>
<td>210</td>
</tr>
<tr>
<td>VK16E</td>
<td>199</td>
</tr>
<tr>
<td>VK16F</td>
<td>188</td>
</tr>
<tr>
<td>VK16G</td>
<td>177</td>
</tr>
<tr>
<td>VK16H</td>
<td>166</td>
</tr>
<tr>
<td>VK16I</td>
<td>155</td>
</tr>
<tr>
<td>VK16J</td>
<td>144</td>
</tr>
<tr>
<td>VK16K</td>
<td>133</td>
</tr>
<tr>
<td>VK16L</td>
<td>122</td>
</tr>
<tr>
<td>VK16M</td>
<td>111</td>
</tr>
<tr>
<td>VK16N</td>
<td>100</td>
</tr>
<tr>
<td>VK16O</td>
<td>90</td>
</tr>
<tr>
<td>VK16P</td>
<td>80</td>
</tr>
<tr>
<td>VK16Q</td>
<td>70</td>
</tr>
<tr>
<td>VK16R</td>
<td>60</td>
</tr>
<tr>
<td>VK16S</td>
<td>50</td>
</tr>
<tr>
<td>VK16T</td>
<td>40</td>
</tr>
<tr>
<td>VK16U</td>
<td>30</td>
</tr>
<tr>
<td>VK16V</td>
<td>20</td>
</tr>
<tr>
<td>VK16W</td>
<td>10</td>
</tr>
<tr>
<td>VK16X</td>
<td>0</td>
</tr>
</tbody>
</table>

### Resin Core Solders

O. T. Lempriere & Co. Ltd.
Head Office: 31-41 Bowden St., Alexandria, N.S.W., 1971
and at Melbourne — Brisbane — Adelaide — Perth — Newcastle

**Choose the best — it costs no more**
**144 MHz. Dual Conversion AM Receiver Kit**

**SPECIFICATIONS:**
- Frequency coverage: 144 - 145 MHz.
- Sensitivity: 0.3 uV. for 6 dB. S + N/N.
- Bandpass Filter at 455 KHz.
- Input Impedance: 50 - 75 Ohms.
- Audio output: 1 watt r.m.s. into 8 ohms.
- Audio output impedance: 8 or 15 ohms.

Incorporates BFO and Noise Limiter.
Supply voltage: 9 - 16 volts; negative earth.
Varicap tuned VFO.
Kit includes all Capacitors, Resistors, I.F's, Pots, Switches and 14 Transistors.
Front end uses TIS88s; I.F., Dual Gate Mosfets.

Complete with Instructions and pre-drilled and etched Circuit Board

**Special Introductory Price $42.00**

**SPECIAL! 2N3055 115 watt 15 amp. 60 volt Silicon NPN Power Transistors $1.50 ea.**

Come and inspect the full range of equipment and components at

**WAYNE COMMUNICATION ELECTRONICS**
757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122
Phone 81-2818

---

**TRIMAX for a complete transformer range!**

Trimax have available most types of transformers, ranging in weight from a fraction of an ounce to half a ton. You bring us the problem— we will supply the transformer.

---

**LM ERICSSON PTY. LTD.**
FACTORY: Cnr. Williams Rd. & Charles St., North Coburg, Victoria. Phone: 35 1255... Telegraphic Address: "TRIMAX" MELB.
The Wireless Institute of Australia is pleased to invite Australian Amateurs to become members of the Key Section. The aims of the Key Section and qualifications for membership are as follows:

1. The Key Section of the W.I.A. is an association of Australian Amateurs interested in the use of Morse for communication.
2. Membership is open to any Amateur who holds a VK call sign; other interested persons may be admitted as associates.
3. Amateurs may become members by applying to the Key Section; applicants may be asked to provide proof that they satisfy the conditions for membership.
4. For the purpose of assessing membership of the Key Section, the following conditions define a contact with another Amateur station:
   1) The communication must be by A1 or A2 mode by both stations.
   2) The contact must last at least 15 min.
   3) The speed of sending is not a condition of these rules.
   4) Contacts made during contests are not admissible.
   5) Contacts made before 1st January, 1971, are not admissible.
   6) Any one call sign may be used only once in assessing scores.
5. Membership is open to Amateurs who communicate at least 50 points by the rules of paragraph 6, at least 25 of which must arise from contacts with other VK stations.
6. Points are obtained as follows:
   1) A contact as defined in paragraph 4 counts one point.
   2) If one station in the contact is operating 52 MHz or above, the contact counts two points; if both stations are operating 52 MHz or above the contact counts four points.
7. All applications for membership of the Key Section should be sent to: Federal Manager, Key Section, W.I.A., P.O. Box 67. East Melbourne, Vic., 3002. The consideration of such applications for membership will be undertaken by Divisional Co-ordinators, who are appointed by Divisional Councils, or their nominated deputies. In the event of dispute, the ruling of the Federal Manager will be final.
8. A certificate of membership will be issued. New members of the Key Section will be listed from time to time in "A.R." It is planned to offer associate membership to overseas Amateurs, and perhaps also to S.w.l.'s. These schemes, and others, will be made known when our numbers have grown. I look forward to hearing from you! 73, Deane VK3TX.

**STOLEN**

From the house garage of VK3BDD, D. Vlasopoulos, 2 Sandgate Ave., Glen Waverley, Vic., 3150 (phone 232-3469) about July were the following:

Iwoue IC-770T Tx, IC-700R Rx, IC-700P p.s.u., home-brew linear 1kw, in., digital freq. meter, home-brew nearly complete, Lafayette v.o.m. and l.v. rejuvenator, Philips r.f. f.m. generator, home-brew audio generator.

The matter is under police investigation. If anybody is offered any item from the above list or has any useful knowledge concerning them, please contact the police or the operator concerned.

**SONNENSHEIN BATTERY RANGE**

A new series dryfit battery has been developed by Sonnenschein to meet the need for float service in stationary operation. The new series can be distinguished by the marking dryfit ST, while the constant charge/discharge type is marked dryfit PC.

Further information from the Australian agents, R. H. Cunningham Pty. Ltd., 608 Collins St., Melbourne, Vic., 3000.

---

**PREDICTION CHARTS FOR NOVEMBER 1971**

(Prediction Charts by courtesy of Ionospheric Prediction Service)
The VK3 Federal Councillor, Geoff VKSTY, announced at a recent W.I.A. meeting in Adelaide that as a result of the I.T.U. Space Conference, the allocation of 21.000 to 22.000 GHz is to be withdrawn, and a new allocation of 23.040 to 24.035 GHz as an exclusive allocation, and 24.530 to 24.500 1 GHz, a shared allocation with the other spectrum allocations, which improves satellite frequency efficiency. There will be a gain with the new allocation as the new parameters of the new band are considered to be more favourable as it is away from a peak of absorption for the 10-centimetre band, and there is a high amount of atmospheric attenuation which makes operation of satellites more efficient. There will be a gain with the new allocation as the new parameters of the new band are considered to be more favourable as it is away from a peak of absorption for the 10-centimetre band, and there is a high amount of atmospheric attenuation which makes operation of satellites more efficient.

The VK3 Federal Councillor, Geoff VKSTY, announced at a recent W.I.A. meeting in Adelaide that as a result of the I.T.U. Space Conference, the allocation of 21.000 to 22.000 GHz is to be withdrawn, and a new allocation of 23.040 to 24.035 GHz as an exclusive allocation, and 24.530 to 24.500 GHz, a shared allocation with the other spectrum allocations, which improves satellite frequency efficiency. There will be a gain with the new allocation as the new parameters of the new band are considered to be more favourable as it is away from a peak of absorption for the 10-centimetre band, and there is a high amount of atmospheric attenuation which makes operation of satellites more efficient. There will be a gain with the new allocation as the new parameters of the new band are considered to be more favourable as it is away from a peak of absorption for the 10-centimetre band, and there is a high amount of atmospheric attenuation which makes operation of satellites more efficient.
News seems scarce this month. That is to say, news which is not out of date by the time you read it. When we receive DX from the Southern Hemisphere, the DX-peditions are few and far between. The best DX of the season, Rockall at this season But where are the Southern Hemisphere DX-peditions? Perhaps we have been too good a time to look ahead. We have become so accustomed to thinking about the bands from 1.8 to 28 MHz, as a matter of course, that we have not often thought about the overflow bands from 30 MHz to 90 MHz, and again that they are known simply as the "overflow" bands. No explanations. Everyone knows what you mean.

In a few years we may have to change our thinking. The DX-peditions from the Southern Hemisphere may be becoming more frequent, and more reliable to work into Kansas or Oklahoma. This is the opinion of many DX-peditions through the natural terrestrial methods we use now—when we can get through at all. Another breakthrough, if the equipment is available to allow the use of some of the channels available on 30 MHz, may be a little further down the road. Someone— maybe you—will discover something else is done.

It is always disconcerting when you think of DX-peditions. Often the DX bands and suddenly become aware of a certain diehard DX band which only appears the same week after week. More disconcerting could this be if you were having a telephone-type contact on 2 meters from another continent, believe your equipment was working well, and then be aware of a broker motoring off to this DX band. When I first heard these sort of QSOS were to be heard. In the past but today the reality seems closer. What triggered my thoughts were the Project Australia notes and the article in the Victorian F.H.Fer by VK3AFW.

It is possible that the days of prediction charts might be numbered. Looking through the charts for November the other day was an interesting exercise in speculating how they would work out in practice.

Looking in the term "DX bands" before all our Amateur bands may become DX bands. The development of repeaters in the U.S.A., has already extended to our Amateur bands, may become DX bands. This is almost certain—why not to? After all, the exchange of signals between continents is much as it was when the DX-peditions of the past worked. The QRM from non-Amateur stations, par-ticularly from Europe, often gives a strong signal. The DX-peditions of the past were not always so stark. The DX peditions of the past were often held in great expectation, and reporting. This is required work requiring many operators, much time and great patience. A DX-pedition to the Southern Hemisphere is fraught with many problems. It is a DX-pedition to the Southern Hemisphere is fraught with many problems. It is a DX-pedition to the Southern Hemisphere is fraught with many problems.

A DX-pedition to the Southern Hemisphere is fraught with many problems. It is a DX-pedition to the Southern Hemisphere is fraught with many problems.

With the DX-peditions of the past it is almost certain that the QRM from non-Amateur stations, particularly on 7 MHz, is much as it was when the DX-peditions of the past worked. The QRM from non-Amateur stations, particularly on 7 MHz, is much as it was when the DX-peditions of the past worked. The QRM from non-Amateur stations, particularly on 7 MHz, is much as it was when the DX-peditions of the past worked.
NEW CALL SIGNS

**JULY 1971**

**VK1HD**—H. Daniel, 14 Dianella St., O'Connor, 2060.

**VK2GD**—A. D. Nutt, 7 Attow St., Winston Hills, 2153.

**VK2OE**—F. T. Ferrill, 44 Angelhora Cres., Forestville, 2087.

**VK2TK**—P. J. McKeever, 5 Bell Pt., Mt. Pritchard, 2170.

**VK2AE**—M. Matherstone, 650 Penrith Rd. West, Penrith Post, 2120.

**VK2BCN**—T. B. Corney, 14/122 Ragan St., Mosman, 2088.

**VK2BEU**—I. Abel, O'Connell House, 4A O'Connell St., Parramatta, 2150.

**VK2ZAF**—A. Blake, 32 Lynwood Ave., Killara, 2071.

**VK2CAW**—K. Warchot, 1/19 Nagle Ave., Maroubra, 2035.

**VK2BYY**—J. L. Pages, 62 First Ave., Berala, 2171.

**VK2BPP**—B. P. Pinkerton, 1 Kings PI., Carlton, 2050.

**VK2ZVX**—R. Wilson, "Greenbank," R.M.B. 18, 2070.

**VK2ZUU**—M. S. Horne, 6 Kaling PL, Cooma, 2630.

**VK2ZUT**—A. V. Bull, 67 Fernleigh Rd., Wagga Wagga, 2650.

**VK2ZNT**—C. B. Moore, Drummond College, Wagga Wagga, 2650.

**VK2ZMR**—M. Richter, 86 Anderson Ave., Mt. Lawley, 2070.

**VK2ZGO**—G. Markwart, Hoddle St., Robina, 2210.

**VK2ZYX**—J. Colebatch, 17 Mooramie Ave., Yarrawonga, 2210.

**VK2ZPQ**—P. D. Angilley, 10 Hinkler Cres., Blacktown, 2148.

**VK3AXO**—G. J. Gill, 19 Dorset Rd., Croydon, 3136.

**VK3ZVB**—M. H. Adnams, Station: 6 Saer Crt., Northcote, 3070.

**VK9HB**—H. Buehler, C/o. Gulf Fisheries N.G., Brisbane, 4001.


**VK6JR**—S. J. Ryan, 23 Ballarat St., Morley, 2120.

**VK6CG**—R. C. Crowe, 23 Rosser St., Cottesloe, 2087.

**VK1JR**—J. Ryan, 23 Ballarat Park, Morley, 2087.

**VK2NN**—J. R. B. Nicholls, 3rd Ave., Eastwood, 2122.

**VK2ZNM**—R. Moore, Drummond College, Uni. of New England, Armidale, 2351.

**VK2PF**—R. Angiley, 10 Hinkler Cres., Long Cheng, 2170.

**VK2ZUT**—A. V. Bull, 67 Fernleigh Rd., Wagga Wagga, 2650.

**VK2ZSU**—J. S. Horne, 6 Kaling PL, Cooma, 2630.

**VK2ZVT**—J. Wilson, "Greenbank," R.M.B. 18, Millthorpe, 2798.

**VK2ZYS**—L. Adams, 13 Frederick St., North Benmore, 2015.

**VK2ZXY**—J. Colebatch, 17 Mooramie Ave., Yarrawonga, 2210.

**VK2ZSF**—R. H. Williams, Queens College, Uni. of Melbourne, Parkville, 3055.

**VK2W/7**—R. Neale, 3 Cooma Pl., Australia, Eastern Zone, 6 King St., Mafra, 3860.

**VK2ZGK**—R. Shaw, 2 Bourke St., West End, 3040.

**VK2XQ**—J. Gill, 19 Orset Rd., Croydon, 3136.

**VK2BCD**—E. G. Egan, 1 Clunes Ross Cres., Maroubra, 2035.

**VK2BFA**—P. H. McKean, 247 Princes H'way, Woodville, 2035.

**VK2BRF**—U. Shaw, 29 Cecil St., Benalla, 3672.

**VK2CBP**—C. L. Wilson, 8 Dixon Gr., Blackburn, 3130.

**VK2BHS**—Benalla High School, Barkly St, Benalla, 3672.

**VK3BBR**—R. J. Beavers, Station: 11th St., Mildura, 3500; Postal: P.O. Box 22, Mildura, 3500.

**VK3YAA**—J. Wood, 115 Boyd St., Mildura, 3500.

**VK3YAH**—J. R. Wright, 2 Neath St., Surrey Hills, 3127.

**VK3YAK**—A. A. Knox, Cnr Angus St. and Ave. St., Warrandyte, 3113.

**VK3YAYA**—J. Wood, 115 Boyd St., Mildura, 3500.

**VK3YAV**—J. R. Wright, 2 Neath St., Surrey Hills, 3127.

**VK3YBK**—A. A. Knox, Cnr Angus St. and Ave. St., Warrandyte, 3113.

**VK3YBR**—U. Shaw, 29 Cecil St., Benalla, 3672.

**VK3YBP**—C. L. Wilson, 8 Dixon Gr., Blackburn, 3130.

**VK3BHS**—Benalla High School, Barkly St, Benalla, 3672.

**VK3BBR**—R. J. Beavers, Station: 11th St., Mildura, 3500; Postal: P.O. Box 22, Mildura, 3500.

**VK3YAA**—J. Wood, 115 Boyd St., Mildura, 3500.

**VK3YAH**—J. R. Wright, 2 Neath St., Surrey Hills, 3127.

**VK3YAK**—A. A. Knox, Cnr Angus St. and Ave. St., Warrandyte, 3113.

**VK3YAYA**—J. Wood, 115 Boyd St., Mildura, 3500.

**VK3YAV**—J. R. Wright, 2 Neath St., Surrey Hills, 3127.

**VK3YBK**—A. A. Knox, Cnr Angus St. and Ave. St., Warrandyte, 3113.
CORRESPONDENCE:

NOVICE LICENCING

Editor "A.R.\ce{\text{"}} Dear Sir,

I feel that the "pears of wisdom" of VK4RN (\"A.R.\ce{\text{"}}) are somewhat out of context. A Government supporter, VK3DIH (\"A.R.\ce{\text{"}}) Sept. '71 concerning Novice licences to be like an exclusive old gentlemen's club. It is very fortunate for them that they are already members of this exclusive association, but it is unfortunate for the rest of us who are trying to get in. I am not one of those who are expected that the doors are kept a little tighter closed than some of us would like.

What about your high school teacher of science, Mr. Morgan? You must be joking! Booragul High School and I am studying science at the First level. Without any preparation in the report its support and that soon we may have the Morse telegraphy requirement as has been proposed. Without any preparation whatsoever is a mystery to many of us. I have read the report on Novice licensing prepared under the chairmanship of Mr. Rex Black. I certainly believe that the report may be amended, and I certainly will be flattered and pleased if Mr. Morgan and other well disposed Amateurs would accept the idea of being an Associate member of the Institute rather than a Full member, and I could well accept the fact that the older and more experienced members would be more involved and that my part of the candidate outside the classroom.

F. R. Overvliet, VK2ZFO
Science Dept., Brookmeadow H.S.

Editor "A.R.\ce{\text{"}} Dear Sir,

Having read the latest correspondence on the important matter of Novice licensing. I would like to offer a few comments from the point of view of an A.O.C.P. correspondence student, associate member No. 9823 of the W.A.A. and a would-be Amateur.

Your first correspondent, Mr. Morgan, decries the suggestion of a lower level Amateur licence and quotes the cases of boys who have passed the P.M.G. on the basis of school physics alone "without any preparation whatsoever". This statement, of course, is designed to stress the opinion which he presumably holds, that the A.O.C.P. is within the capacities of anyone with two arms and two legs. I do not know what occupation Mr. Morgan follows and I regard with respect his view of an A.O.C.P. correspondence student, trusting to luck that seven of them will pass the A.O.L.C.P. and quotes the cases of boys who have passed the A.O.L.C.P. at Matriculation level could pass the A.O.C.P. Perhaps they did then Mr. Morgan; but they don't do so now. Even teacher members of this club have two systems of learning to gain the necessary material for the A.O.C.P., so how will Matriculation students could accomplish this without any preparation whatsoever is a mystery to many of our members.

Conduct surveys by this club indicate that an A.O.C.P. course quite different from the A.O.C.P. course as published in the Sept. issue of "A.R." I am quite convinced that your correspondent has been misled. The electronics content in the high school physics course constitutes a minute fraction of the mass of knowledge needed to pass the A.O.C.P.

The fact that some high school boys can pass the Amateur examination in radio theory is most likely due to considerable effort of the part of the candidate outside the classroom.

—E. C. Brockbank, Secretary,
Westlakes Radio Club.

Editor "A.R.\ce{\text{"}} Dear Sir,

I have read with interest Mr. Morgan's letter as published in the Sept. issue. "A.R." I consider his statement that a boy doing physics at Matriculation level could pass the A.O.C.P. without any preparation whatsoever to be rather irresponsible.

Speaking as a high school teacher of science, I am quite convinced that your correspondent has been misled. The electronics content in the high school physics course constitutes a minute fraction of the mass of knowledge needed to pass the A.O.C.P.

The fact that some high school boys can pass the Amateur examination in radio theory is most likely due to considerable effort of the part of the candidate outside the classroom.

—F. R. Overvliet, VK2ZFO
Science Dept., Brookmeadow H.S.
would appear in the A.O.C.P. paper which I attempted. I realise that this method would offer a very limited radio knowledge even if one did succeed in narrowly leaping over the 70 per cent. marks barrier. But, if a Novice licence could be provided it would be enough. I am certain that the practical work involved in building my own gear and operating it made me a better experimenter than a crash course on a limited number of questions would have done. Indeed, the imaginative and fledgling amateur operator when I finally passed the A.O.C.P. My friend C. Morgan has stated that "the regulations can be learned in one evening prior to the Morse Code section of the Novice course, the handbook, and I am quite sure that such a cursory survey is far more useful background in building my own gear and operating it than a course of one evening in a limited number of questions. The kindergarten group, the kids, who get on the air will be with a sound knowledge of regulations—not merely a hasty scanning to pass a fairly simple test.

I must state that the most sensible contribution to the A.O.C.P. issue have appeared in letters from Mr. Shawsmith, VK4SS, and Mr. Oulton, VK5WW, both of whom suggest a trial period of (average) five years. No doubt after this period the Institute and the P.M.G. representatives would consider the success or failure of the experiment and act accordingly. This is a very fair approach to the position.

—Mick Rodden.

Editor A.R. Dear Sir.

During this week I received from the Federal Manager a photostat copy of a letter addressed to him by a P.M.G. official. The letter was written by Mr. Ivan Morgan, 3DDX, and prompted to his to clarify and discuss various items relating to this allegedly contentious topic. He was loud and clear and friendly in tone and certainly did not warrant the oblique manner in which they were presented. I feel that my right to your query will be sera in the nature of his letter, and I feel that you might consider printing it. —R. C. Black, VK2YA.

Editor A.R. Dear Sir.

Count me in on this entrance exam. controversy. I belong to the minority group of genuine AMateurs and Experimenters. I have had experience more than with this same exam, having failed it five or six times in a period of (average) five years. No doubt after the period I have been on the A.O.C.P. I believe that there is room for more recognition. That they be given more recognition. That they be allowed to take the exam and be given a pass mark. —R. C. Black, VK2YA.

BRIGHT STAR CRYSTALS
FOR ACCURACY, STABILITY, ACTIVITY AND OUTPUT
COMMERCIAL CRYSTALS
IN HC6U HOLDER, 0.005% TOLERANCE, FREQUENCY RANGE 6 TO 15 MHz.
$6.00 plus Sales Tax and Postage
WRITE FOR LIST OF OTHER TOLERANCES AND FREQUENCIES AVAILABLE
COMPREHENSIVE PRICE LIST NOW AVAILABLE
New Zealand Representatives: Messrs. Carroll & Carroll, Box 2102, Auckland Contractors to Federal and State Government Departments

BRIGHT STAR CRYSTALS PTY. LTD.
LOT 6, EILEEN ROAD, CLAYTON, VIC. 3168
Phone 546-5076

With the co-operation of our overseas associates our crystal manufacturing methods are the latest.
INTRUDER WATCH
By Alf Chandler, VK3LIC, Federal Co-ordinator

At long last tangible interest in the Intruder Watch organisation is beginning to be evident. Reports are commencing to come through, and we still need more Observers, and if you wish to free your bands of intruders, it is very desirable to report them when you hear them, and "that is all the time"!

The following extract from the U.S. is interesting: 'Notwithstanding the frequency agreements, non-Amateur stations will be heard in the exclusive Amateur bands from time to time. There is unfortunately an anomaly in the regulations which allows an Administration to assign any station any frequency provided that no interference is caused to any station of another country operating in accordance with the allocations tabled. In other words, if Amateurs fail to object to interference from non-Amateur stations in the Amateur bands, the Administration concerned is justified in feeling it is complying with the regulations. Enough reports often result in the removal of the intruder concerned.' Thus you see how important it is for us to appoint as many Observers as possible.

Another quote from overseas may be of interest: 'I happen to catch two tactical stations working each other, and arranged for someone to break into their net in order to be classified and messenger for it.' What a good idea to have! It is only a pity the transmitting station has not called them by a slow 'S' repeated for the receiving station to break it into the 'S' business and begin taking evasive action.' When the calling was persisted in, by breaking their communication, they lapsed back into the 'S' business and began taking evasive action moving up and down without any apparent co-ordination, as though such evasive action is prescribed automatically as part of their procedure. When persisted in following them they went QRX, returning in three or five minutes.' I wonder if this procedure is ethical? It is very interesting though. What say?

OBITUARY
JIM NEIDEC, VK3AIC (ex ZM3EW)
Known to many who are active on the h.f. bands, Jim has been an active member of both the W.I.A. and the Eastern and District Radio Club since arriving here in Australia to live over three years ago.

Jim was born in Pennsylvania and lived in the town of Bethlehem, Penn., where he was employed as a Chief Engineer of the Pennsylvania-Baltimore Railroad Co. Jim took part in many early developments of the telegraph system used for communication, and later became a h.f. operator.

Later his daughter married and moved to Australia to live. Her name is Laurie VY3ASO. Jim later also moved to Australia and, together with Laurie, gave workshops to many thousands of children in the primary schools.

Jim is considered a great loss, not only to Amateur Radio, but also to all groups and associations to which he belonged. Jim leaves a wife, VI VK3BAK, and sister Mrs. Hanson, to whom we offer condolences.

CLIFFORD C. M. COUCHMAN, VK4KZ
Known to many who are active on the h.f. bands, Cliff was born in Pennsylvania and lived in the town of Bethlehem, Penn., where he was employed as a Chief Engineer of the Pennsylvania-Baltimore Railroad Co. Jim took part in many early developments of the telegraph system used for communication, and later became a h.f. operator.

Cliff was on the staff of National Broadcasting Station 4QS, Dalby, for 10 years, but left to devote full time to his electrical repair business and was widely known throughout the district as "Mr. Fix-It!".

Although not active on the Amateur bands, Cliff was a great interested in Amateur Radio. Cliff never married, and is survived by his sister. Miss Jean Couchman, to whom we offer our sincere sympathy.

WIA NOVICE INVESTIGATION COMMITTEE
Since the original Novice Report was submitted to the W.I.A. Convention in Brisbane the following proposals have been received from various sources and are submitted for consideration and opinion.

NOVICE LICENSING
Scheme No. 1—
That there should be a range of five grades of Amateur transmitting licences on the following basis:
(a) Preliminary Licence—No Morse code test; Regulations as for A.O.C.P.; no Theory examination; no restrictions on power; leading to the Third Class Commercial Licence (i.e., to operators of fishing craft, pleasure craft, on or near coast, operating in accordance with the allocations tabled). This would avoid the rivalry that exists between Amateur Radio and C.B. in U.S.A. and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(b) A.O.P. Theory examination at sub-A.O.C.P. level with concentration on v.h.f. bands and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(c) A.O.P. Theory examination at sub-A.O.C.P. level with concentration on v.h.f. bands and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(d) A.O.C.P. Theory examination at sub-A.O.C.P. level with concentration on v.h.f. bands and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(e) A.O.L. and A.O.C.P. as at present.

Scheme No. 2—
That there should be a range of three grades of Amateur transmitting licences on the following basis:
(a) Preliminary Licence—Morse code test at 5 w.p.m.; Regulations as for A.O.C.P.; no Theory examination; no restrictions on power; leading to the Third Class Commercial Licence (i.e., to operators of fishing craft, pleasure craft, on or near coast, operating in accordance with the allocations tabled). This would avoid the rivalry that exists between Amateur Radio and C.B. in U.S.A. and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(b) A.O.P. Theory examination at sub-A.O.C.P. level with concentration on v.h.f. bands and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(c) A.O.C.P. Theory examination at sub-A.O.C.P. level with concentration on v.h.f. bands and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(d) A.O.L. and A.O.C.P. as at present.

Scheme No. 3—
That there should be a range of four grades of Amateur transmitting licences on the following basis:
(a) Preliminary Licence—Morse code test at 5 w.p.m.; Regulations as for A.O.C.P.; no Theory examination; no restrictions on power; leading to the Third Class Commercial Licence (i.e., to operators of fishing craft, pleasure craft, on or near coast, operating in accordance with the allocations tabled). This would avoid the rivalry that exists between Amateur Radio and C.B. in U.S.A. and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(b) A.O.P. Theory examination at sub-A.O.C.P. level with concentration on v.h.f. bands and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(c) A.O.C.P. Theory examination at sub-A.O.C.P. level with concentration on v.h.f. bands and would add a group to the W.I.A. who would not enter the Amateur society under its present regulations.
(d) A.O.L. and A.O.C.P. as at present.

Note: This form of licence would suit those who are "communicators" rather than "technicians." It could be set up within the W.I.A. framework and is highly desirable to possible radio amateurs who would like to have a licence and operate without any further formal requirements. This would suit those who would not enter the Amateur society under its present regulations.

W.I.A. TIES
Order now or hint to the XYL that you would like a pair for Christmas! only $2.75 each from your Division
Available in Blue or Red

OSL card of VI VK3BAK and her husband, the late Jim Neideck, VK3AIC (ex WM3EW)

Amateur Radio, November, 1971 Page 25
Exciting Sounds . . . PLUS

Comfort You Will Appreciate

Sennheiser HD414 Stereo Headphones

CAN be used with Glasses too!

Sennheiser HD414 Stereo Headphones are "so easy on the ears". They do away with the heavy "closed in" feeling of conventional headphones. You hear the sound not only through the ear pieces, but also from the air around you—giving you a sound that is breathtakingly real.

• No "shut-in" feeling
• 20 - 20,000 Hz.

For FULL Details — Mail this COUPON TODAY!
AVAILABLE from Leading Resellers or from:

R.H. Cunningham
PTY.LTD.

For FULL Details — Mail this COUPON TODAY!
AVAILABLE from Leading Resellers or from:

VIC.: 508 Collins St., Melbourne, 3000.
Phone 61-264.
N.S.W.: 64 Alfred St., Milsons Point, 2061.
Phone 928-0655.
Phone 49-4699.
OLD.: L.E. BOUGHEN & CO., 30 Grimes St., Auchenflower, 4066.

CW—PHONE
Accessories

KATSUMI MODEL EK-26
ELECTRONIC KEYER

Features:
• 11 transistors and 12 diodes solid state electronic keyer.
• Variable speed key capable of 8 to 60 w.p.m., semi or fully automatic.
• Fully digital-dot-dash ratio, always perfect, and space adjustment.
• Relay or transistor switch output option. (Tr. switch: max. 110v., 100 mA.
Relay: max. 700v. 500 mA.)
• Built-in break-in QSO (VOX-CW) terminal.
• Paddle is incorporated.
• Built-in monitor oscillator with speaker, and phone jack.
• Power Supply: 230v. 50-60 Hz. AC built-in, or from ext. batt.: 2 x 6v. DC.
• Small in size: 140 (w.) x 70 (h.) x 190 (d.) mm. Weight: 3 lb. 12 oz.

Price $75.00

KATSUMI MODEL MC-22
MIC. COMPRESSOR
NEW IMPROVED MODEL

Specifications:
Compression level: 26 dB. (1 KHz.) with meter (comp. level variable).
Output voltage: 50 mV. max. at input 3 mV.
Microphone impedance: 10-100K ohms.
Frequency response: 300 - 5,000 Hz. plus or minus 2 dB.
S/N ratio: more than —50 dB.
Transistors used: 3 transistors and 2 diodes.
Power source; consumption: Battery type 216 or 006P (9v.), 2 mA. max.
Dimensions: 120 (w.) x 70 (h.) x 80 (d.) mm.
Weight: 1 lb. 5 oz.
Accessories: Cable with TRS plugs attached.

Price $28.00

P. & P. add $1.00. Prices and Specifications subject to change.

AUSTRALIAN AGENT:
BAIL ELECTRONIC SERVICES

N.S.W. Rep.: STEPHEN KUHL, P.O. Box 56, Mascot, N.S.W., 2020.
Western Aust.: Rep.: H.R. PRIDE, 26 Lockhart Street, Como, W.A., 6152.

60 SHANNON STREET, BOX HILL NORTH, VIC., 3129.
Telephone 89-2213
DIVISIONAL CALENDAR

Listen also to Divisional Broadcasts:

5 Nov. VK3—V.h.f. meeting; Hunter Branch meeting; Gosford meeting.
7 Nov. VK3—V.h.f. Field Day, 1100-1600 EST.
10 Nov. VK3—V.h.f. meeting.
21 Nov. VK3—Midland Zone's H.f. and V.h.f. on 7 MHz. AM at 0800.
25 Nov. VK5—V.h.f. Group Picnic, Miranda.
24 Nov. VK2—V.h.f. Fox Hunt
27 Nov. VK7—Zone Hamfest, Evandale Memorial Hall from 1200 hours.
3 Dec. VK2—V.h.f. meeting (auction night!); Hunter Branch meeting; Gosford meeting.
5 Dec. VK3—V.h.f. Field Day, 1100-1600 and 1230-1530 EST.
11 Dec. VK2—V.h.f. Christmas Party: V.h.f. at 10.15 p.m. (Carl VK2ZGX, Contest Manager.)
12 Dec. VK3—E. & Mt. Dist. Rod Club Xmas outing at 11.00 a.m.
17 Dec. VK2—General meeting note third Philt.; Gosford meeting.

NEW SOUTH WALES

SEPTEMBER GENERAL MEETING

The Sept. general meeting held on Friday, 14th, heard a most interesting lecture given by Mr. C. A. Greenhill, S.W. Civil Defence Communications Officer. Charlie's subject was the new Civil Defence Organisation. A vote of thanks was moved by P. Healy and carried in the usual manner.

Remember, the Division member general meeting is on Friday, 17th, which is the third Friday of the month.

CONCESSIONAL MEMBERSHIP

That concessional membership be granted to pensioners and full-time students, provided they make application to Council for consideration on an appointed committee which will consider each application on its merits. The rate will be per person, regardless of which normally prevail with no loss of status.

That the previous motion be retrospective to 1st March, 1971, provided application is made before 30th November.

SEPT. 2 METRE FOX HUNT

The fox was VK2OA and the final location was at Meadowbank. 1st. VK2AWZ (in after time and hope to see you all again next year with VK3ER will also count as 2 points to the club's total in the Division contest.

About 100 persons in all enjoyed the R.D.C. Rally at Lake Eppalock. Mr. R. Atkinson, 29 Macdonnell St., Yarra, Victoria, has written a most interesting letter to the Editor of Amateur Radio expressing his hope to see you all again next year. Thanks also to our many members and guests who came from near and far to make this a successful function.

All members observed respect for the memory of Mr. R. J. W. Willmott, late Secretary of the R.D.C., who passed away on November 19th.

MEETING PLACE

On occasion, a meeting will be held at the Bendigo Power Boat Club rooms. The phone number for Bendigo Power Boat Club is 3555.

VICTORIA

MODIFICATION TO MEMORANDUM AND ARTICLES OF ASSOCIATION

Council has given consideration to proposals for additions to the Memorandum and Articles of Association. These proposals have been forwarded to the Federal Executive Council. A vote on these proposals is hoped that they may be implemented soon.

MORSE CLASS

A Saturday morning Morse Class has commenced, preparing students for the February examination. The class is also open to new students, but it is advisable to have completed some Morse training beforehand.

VICTORIAN DIVISION W.I.A.

A multi-colour commemorative QSL card will be printed and distributed to members, to commemorate the 50th anniversary of the Wireless Institute of Australia, Victoria Division.

SOUTH AUSTRALIA

The Sept. Divisional meeting was well attended and heard to see a lecture by Rex Vincomb describing the undeniably successful mobile radio station SW in Liberia, Africa. Members observed respect for the memory of Joe VK3ER, a member of the Division for over 10 years. 56 per cent. did not use the Bureau 50 per cent., get their cards at 3210. Some members who did not use the Bureau suggested that the W.A. Bulletin for further details.

BENDIGO POWER BOAT CLUB ROOMS

Programme includes HF and VHF Scrambles, 2x MF, Fox Hunt, 2x 80 and 3x 15 TSS, Trade Displays and competitions for all the family. Barbecue and Picnic facilities available.

Further details from the W.I.A. Broadcasts and Zone Secretary, Bill Clark, VK3FY. High St., Kangaroo Flat, 3555.
FEDERAL AWARDS

The following additions have been made to the Australian D.X.C.C. Countries list:

3C8—Abu All, Jabal at Tair—Melish Reef

Although operation has not as yet taken place from there, credit will be given to any future operation from there.

D.X.C.C.

VKs HEARD ON 160 METRES

The following table is an analysis of VK calls heard on 160 metres in Western Australia during 1970, showing monthly figures and the results of 289 daily checks. All calls were counted only once on a particular day. The aggregate total shows an increase of 81 per cent.

Month VK1 VK2 VK3 VK4 VK5 VK6 VK7 VK8 Feb. 0 1 0 0 0 0 0 0 Mar. 0 0 0 0 0 0 0 0 Apr. 0 0 0 0 0 0 0 0 May 0 0 0 0 0 0 0 0 June 0 0 0 0 0 0 0 0 July 0 0 0 0 0 0 0 0 Aug. 0 0 0 0 0 0 0 0 Sep. 0 0 0 0 0 0 0 0 Oct. 0 0 0 0 0 0 0 0 Nov. 0 0 0 0 0 0 0 0 Dec. 0 0 0 0 0 0 0 0

Totals 14 22 144 1 73 162 3 1

IF YOU ARE STILL A "HOME-BREW" AMATEUR SEE US FOR YOUR COMPONENTS!

- Air-Wound Inductances.
- GMW Antenna Loading Inductances.
- No Lead Glass-Ceramic Strain Insulators.
- Transistors, I.C.s., Diodes, etc., subject to availability.
- Condensers—Fixed and Variable.
- Transformers—Power and Audio.
- Chokes—R.F. and Filtered.
- Valves—Receiving and Transmitting.
- Microphones and Microphone Transms.
- Cables—Audio and R.F. (Co-axial and Flat Line).
- Speakers—Communication and Hi-Fi.
- Audio—Modulation, Inter-Com., Hi-Fi.
- Resistors, Potentiometers—Wire Wound and Carbon.

Ring, Write or Call

WILLIAM WILLS & CO.

PTY. LTD.

77 CANBERRA ROAD, CANTERBURY, 3124

Phone 836-0707

REPAIRS TO RECEIVERS, TRANSMITTERS

Constructing and testing: xtal conv., any frequency; Q5-ers, R6-ers, and transistored equipment.

ECCLESTON ELECTRONICS

146a Cotham Rd., Kew, Vic. Ph. 30-7777
"FRONTIER"
ADVANCED S.S.B. EQUIPMENT

SUPER 1200GT TRANSCEIVER
- 500 watts PEP, five bands
- VOX and Sidetone
- RIT: Plus or minus 5 KHz.
- Provision for external VFO plus two crystals
- In-built 240 volt Power Supply
- Final amp. forced air cooled by silent blower
- All FETs, ICs and Transistors except RF amp., mixers, driver and final tubes
- Noise limiter, balanced ring demodulator
- Geared anti backlash dial
- AM reception

PRICE: $525 tax inc.

SUPER 3500LA LINEAR AMPLIFIER
- Full legal power
- Electronic ALC
- Input harmonic filter
- Built-in 240 volt Power Supply
- SWR indicator
- Built-in blower for final tubes
- Five 6KD6 GG Triodes for high plate dissipation

PRICE: $314 tax inc.

W.F.S. ELECTRONIC SUPPLY CO.
12 BOWDEN STREET, NORTH PARRAMATTA, N.S.W., 2151
TELEPHONE 630-1621
Distributors
For Australian and International Manufacturers . . .

TEST EQUIPMENT:
RAPAR • SWE-CHECK
BWD • HORWOOD
Call and see our large range of test equipment

SEMI-CONDUCTORS:
TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

1971-72 CATALOGUE NOW AVAILABLE, $3

RAPAR Model F75K Multimeter

radio parts
GROUP
562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921

OPEN SATURDAY MORNINGS!
Vol. 39, No. 12
DECEMBER, 1971
Registered at G.P.O., Melbourne, for transmission by post as a periodical
Category B
Price 30 Cents
AMERICAN RECORDING TAPE
(New, in sealed boxes)
1500 feet, 7-inch, Acetate, 1/2 mil, .......... $3.50
1200 feet, 7-inch, Acetate, 1/2 mil, .......... $2.50
1000 feet, 7-inch, Mylar, 1 mil, .......... $3.00
1200 feet, 5%-inch, Acetate, 1 mil, .......... $2.20
1200 feet, 5%-inch, Mylar, 1 mil, .......... $2.50
Postage 10c.

LAFFAYETTE SOLID STATE
HA600 COMM. RECEIVER
Five bands, a.m., c.w., s.s.b., Amateur and Short Wave, 150 to 400 KHz. and 500 KHz. to 30 MHz. with a.F and F.E.T front end. Two mechanical filters. Hugie dial. Speaker.
Price $199.50 nett.

TRIO COMM. RECEIVER
MODEL 9R-59DS
Four-band receiver covering 550 KHz. to 30 MHz. continuous, and electrical bandspread on 10, 15, 20, and 40 metres. 8 valves plus 7 diode circuits. 4/8 ohm output and phone jack. SSB-CW-AM, ANL variable BFO, S meter, sep. bandspread dial, f.f. 455 KHz., audio output 1 3/4v. i.f. and AF gain controls. 115/250v. AC mains. Beautifully designed. Size: 5 3/4 x 5 x 10 in. With instruction manual and service data.
Price $178.50 including sales tax
Speaker to suit, type SP5D, $15.50 incl. tax.

"REALISTIC" DX150 COMM. RECEIVER
Solid state, four bands covering 550 KHz. to 30 MHz., fully transistorised. SW/CW/SSB/AM board-cast. 240v. a.c. or 12v. d.c. operation. Product detector for SSB/CW plus fast and slow a.v.c. and variable pitch b.f.o.; illuminated electrical bandspread, fully calibrated for Amateur bands, cascode r.f. stage; a.m. for r.f. and a.m. and audio. Size: 15 x 9 3/4 x 8 7/4 inches. Weight 18 lb. With instruction manual and service data.
Price $234.20 incl. tax

BROADCAST BAND TUNER
Locally made, Model 401 uses a shielded 3-stage transistor. An AGC voltage is developed and applied to the I.F. stage. High sensitivity is obtained with a ferrite rod. 8-inch long. Full frequency range. 500 KHz. to 30 MHz. with a.f. and f.e.t. front end. 1 3/4v. i.f. and AF gain controls. 115/250v. AC mains. Beautifully designed. Size: 7 x 15 x 10 in. With instruction manual and service data.
Price $178.50 including sales tax

POCKET CRYSTAL RADIO
Type ER22. Set complete. Price $1.50.
A.C. ADAPTOR—BATTERY SAVER
Type PS66—240 volts to 6 or 9 volts, 300 ma. $12.50
Type PS67—240 volts to 6 or 9 volts, 100 ma. $8.50
Postage 30c.

NEW HEADPHONES AND MIKE
Phones 8 ohms, Mike 25 ohms
Price $15.75

THE NEW PEAK HS-250 SPEAKER
A completely new speaker designed to complement the best stereo equipment. Featuring a 10-inch two-way woofier and mid range cone speaker with ferrite magnet and a co-axial 2%-inch. horn-type tweeter. Resonant frequency 40 plus or minus 10 Hz. Frequency range, 50 to 30,000 Hz.; maximum power, 25 watts nominal, 10 inch; mounting diameter, 9 3/4 inches; voice coil impedance, 8 or 16 ohms; net weight, 55 oz. For the best in sound, fit the Peak HS-250!
Priced at a reasonable $34.50. Postage 50c.

TELEPHONE INTER-COM. SETS
Telephone Inter-communication Set with signal bulb, two 1/2 batteries. Ideal for children. Price $17.75.

EGG INSULATORS
For your Aerial. 8c each.

VARIABLE CONDENSERS
Single gang, 10-415 pF. Price $2.20.

LOW PASS FILTERS
A "Cobben" Low Pass Filter will fix T.V.I. Cut-off frequency, 30 MHz.; attenuation at 60 MHz. better than 30 db.: insertion loss, negligible. Price $11.50. Postage 10c.

SOLID STATE STEREO AMPLIFIER
8 watts r.m.s. per channel. Input for magnetic, crystal and ceramic type microphone. P.V. cartridge, tape recorder input and output, input, stereo headphone jack.
Reduced to $55.00. Postage $1.20.

FIVE-CORE CABLE
5 x 5/0076. Ideal for Intercoms., Telephones. etc.
New, 100 yd. rolls, 37 (postage 75c), or 20c yd.
Price $6.75. Postage 50c.

STEREO HEADPHONES
Professional quality (well known brand). Large ear pads, standard stereo plug. 6 ft. lead. Price $6.75. Postage 50c.

CRYSTAL CALIBRATOR No. 10
Nominal range: 500 KHz. to 30 MHz. 500 KHz. xtal and 250 KHz.500 KHz. BFO. Provides heterodyne output in steps of 1 KHz. Dial driven by machine cut strip gears, calibrated in 2 KHz. div. Easily read to 250 cycles. Output "spikes" approx. 1 sec. intervals, identifies best note. Power requirements: 12v. DC at 0.3 amp, 250 volts at 15 ma. This is a precision instrument. Complete with crystal.
Price $23.50

EXTENSION SPEAKERS
Type TS30 Tubular Extension Speakers, 8 ohms, new. Complete with lead and two plugs 2.5 and 3.5 mm. Price $4.30. Postage 20c.

RADIO SUPPLIERS
323 ELIZABETH STREET, MELBOURNE, VIC., 3000
Phones: 67-7329, 67-4286 All Mail to be addressed to above address

Our Disposals Store at 104 HIGHTET ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 10.30 a.m. to 5.0 p.m., and on Saturdays to midday.
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.

A & R OUTPUT TRANSFORMER
TYPE ED 10
Primary impedance, 8000 ohms c.t.; ultra-linear screen taps. 43% turns; ult. secondary impedance, 2, 8 and 15 ohms; power rating, 10 watts; frequency response, plus or minus 2 db at 50 Hz. 30 KHz.
Sizes: 0.1, 0.22, 0.33, 0.39, 0.47 uF. Price 18c each.

RESISTORS
1/2 watt 8c each, 1 watt 10c each.

A & R OUTPUT TRANSFORMER
TYPE ED M10
Primary impedance, 8000 ohms c.t.; ultra-linear screen taps. 43% turns; ult. secondary impedance, 2, 8 and 15 ohms; power rating, 10 watts; frequency response, plus or minus 2 db at 50 Hz. 30 KHz.
Sizes: 0.1, 0.22, 0.33, 0.39, 0.47 uF. Price 18c each.

GREEN CAP CONDENSERS
Sizes: 0.001, 0.0002, 0.0003, 0.00047, 0.00056, 0.00062, 0.0008, 0.001, 0.0012, 0.0015, 0.0018, 0.0021, 0.0024, 0.0027, 0.003, 0.0033, 0.0039, 0.0047, 0.0056, 0.0062, 0.007, 0.0076, 0.008, 0.0084, 0.0087, 0.009, 0.0093, 0.0096, 0.01. Price 15c each.
Sizes: 0.1, 0.12, 0.13, 0.19, 0.25, 0.3, 0.38, 0.47 uF. Price 15c each.
1 uF. (200w.v.), 2 uF. (200w.v.) Price 50c each.

WEBSITE
CONTENTS

Technical Articles—

Equipment Recommended for Operation with Amsat-Oscar B .......... 14
Filter Type S.S.B. Transmitter ........................................ 10
Regulated Power Supply for Transistor and Integrated Circuit Projects .......... 7
VK3 Six Metre Converter ............................................. 3

General—

Army Trek to Ayers Rock ........................................... 13
Correspondence ......................................................... 15
Divisional Notes ....................................................... 17
DX ................................................................. 18
Federal Comment: "Four People" .................................... 2
Index to Volume 39—1971 ............................................. 24
Licensed Amateurs in VK ............................................. 22
Linctus Synapsiosae .................................................... 21
National Policy for Scientific and Technological Information Services .... 11
New Call Signs ......................................................... 22
Obituary .............................................................. 21
On with the Show ....................................................... 9
Oscillator Kits for the Amateur ...................................... 8
Overseas Magazine Index ............................................. 23
Pile-ups on 435? ........................................................ 21
Prediction Charts for December 1971 ................................ 15
Reciprocal Licensing .................................................. 23
Silent Keys ........................................................... 23
VHF ................................................................. 19
W.I.A. D.X.C.C. ....................................................... 11
W.I.A. 52 MHz. W.A.S. Award ..................................... 17

COVER STORY

The Yaesu YC-305 Frequency Counter is the latest product from that world famous company to appear on the market. Five-digit display with eight-digit capability reading to 30 MHz., and operating from 117/234V AC or 12V DC, makes this a very versatile instrument. Further information from the Australian agent, Bail Electronic Services.
FEDERAL COMMENT:

Christmas and the end of 1971 is now only a few weeks away.

I wish to look back at the year just past in one particular aspect, that is the role that has been played in our Federal affairs by four people. Each of these people have been members of the Federal Executive; each has in one way or another made a great contribution to the Federal organisation. It is only right that I should draw your attention to their work at the close of this year, as in each case the Executive has lost their services during 1971.

During this year Peter Williams, VK3IZ, resigned both as a member of the Federal Executive and as Federal Secretary. Peter first became a member of the Federal Executive in January 1965, and was Federal Secretary from Easter 1965 to his retirement, with a break of only one year, when he was Assistant Federal Secretary to John Battrick.

Peter was, of course, the last honorary Federal Secretary. The role of the Federal Secretary is now undertaken by the Federal Manager. The Federal Secretary is a person that in the past has determined the effectiveness of the Federal Executive. As I pointed out so many times prior to the engagement of a paid Federal Manager, the work-load on the Federal Executive became in recent years, intolerable. A large part of this burden fell naturally upon the shoulders of the Federal Secretary.

Apart from long experience, Peter Williams brought to the job a real and lively interest in international affairs. He was one of those responsible for the Wireless Institute of Australia taking the initiative in inviting Amateur Societies in other countries to participate in the Inaugural Congress of the I.A.R.U. Region 3 Society in 1968. It was only natural that Peter would become the first Secretary of the Regional organisation. Peter has, of course, retained that role and whilst he has stepped down from the Executive he has retained his interest in the Wireless Institute as a member of the Victorian Division Council.

The second person to whom I wish to refer is Ken Pincott, VK3AFJ. Ken has been a member of the Publications Committee since 1954 and has been Editor of "Amateur Radio" for five years. He has been a member of the Federal Executive for three years and before that has, at various times, been a member of the Victorian Division Council and was President of the Victorian Division from mid 1965 to mid 1968. A little over a year ago, Ken indicated that he wished to resign as Editor of "Amateur Radio". He was persuaded to remain to allow the Institute time to employ a Manager who would undertake a significant part of the work associated with the production of the magazine and has remained until now both Editor and a member of the Federal Executive.

He has now finally resigned, both as Editor and as a member of the Executive. His service to the Institute has been recognised by the granting of an Honorary Life Membership which was presented to him at the Federal Convention in Brisbane at Easter this year. Ken, as Editor of "Amateur Radio," undertook an enormous work-load. He brought both experience and innovation to the magazine. During the period of his editorship I am sure most of the readers of the magazine will agree that it improved in all ways. As a member of the Executive, Ken contributed much with his long experience and critical approach.

Bill Roper, VK3ARZ, was a member of the Federal Executive for only 18 months. Bill, of course, had prior to this appointment, been a member of the Victorian Council, a member of the Publications Committee and at one time or another had undertaken virtually every job going within the Victorian Division. He was the Treasurer for the Federal Executive during a critical period. Without his assistance, I am sure the Federal Executive would, on the financial side, have had considerable difficulties. It was Bill who set the pattern that the Manager has been able to continue. Bill was forced to resign during 1971 because of ill health. He remains interested in the Institute and I would not really be surprised if one day we were not able to lure him back to the Federal team.

We were all saddened by the passing of George Pither, VK3VX, on 2nd July, 1971. George had been a member of the Federal Executive since early in 1967. He had been particularly concerned with Intruder Watch and with I.T.U. representation. He had only become an Amateur following his retirement from the Royal Australian Air Force as an Air Commodore, and we were lucky that the Institute was one of his many interests. I have read so many sincere tributes to George that I find it hard, even after this lapse of time, to express the tremendous debt that the Institute owes to this man. George had his own particular brand of enthusiasm, it was quite infectious and coupled with his great experience, he was an invaluable member of the Federal team. The reality of his enthusiasm for Amateur Radio can perhaps be best demonstrated by the fact that he, accompanied by his wife, went to Tokyo for the Region 3 Conference at his own expense, using the conference as the centre point for a tour of South-East Asia only a few months before his death. I respected his judgment, admired his enthusiasm and valued his support.

I have called this Federal Comment "Four People". To each of them we all owe a lot. I draw your attention to their contribution, and for us all I say, simply, thank you.

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

Seasons Greetings and best wishes to you all for a Very Merry Christmas and a Happy and Prosperous New Year.
There have been many new developments in the type and diversity of semiconductor design and techniques since the development of the 6 Metre Converter by the VK3 V.h.f. Group in 1967. The committee responsible for the development of this updated model felt that Amateurs wishing to use the 6 metre band of 52-54 MHz. would appreciate more available using some of the more modern techniques and semiconductors.

DESIGN CONSIDERATIONS

The design parameters set down by the committee for this Converter were as follows:

1. A low noise figure, consistent with the inherent atmospheric noise found on the 6 metre band.
2. Excellent cross modulation characteristics, particularly against adjacent television transmissions.
3. Sufficient conversion gain, to allow the converter to be used with tunable i.f. receivers which have wide differences in their input sensitivities.
4. The converter should have an untuned, impedance matching output stage.
5. The output frequency range should be from the broadcast band to 28 MHz.
6. The converter should use locally available components and cost less than $25 to construct. This price should also include the price of the crystal.

Many discussions have taken place in this magazine on the subject of converter noise. In the articles on the design of the 2 metre and 70 cm. converters this topic has been dealt with in excellent form and there is very little to add. During the development of this converter it was felt that the lowest noise figure was desirable, however there is a limit below which reducing the converter noise figure would bring no real benefit. External noise at 6 metres is made up of man-made electrical noise (a real problem), atmospheric and cosmic noise. Although a quiet location may eliminate man-made electrical interference, the atmospheric and cosmic components are still present. These combined are generally considered to average out at about 4 dB. at 52 MHz.

Without becoming involved in a discussion on noise measuring techniques it was decided to measure the noise and gain figures of this converter by the same method used on the VK3 V.h.f. Group's 144 and 432 MHz. Converters. The equipment used for these determinations was a Rhode and Swartz Psophometer.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.

DESCRIPTION

The circuit diagram is shown in Fig. 1. The converter has been designed round a double balanced hot-carrier diode mixer. Hot-carrier diodes make high frequency mixing in this type of circuit possible and although diodes may be used it was felt that the extra cost of the HP-2800 diodes were justified when the results of the converter were assessed.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.

**SCHEMATIC OF 11T172 SHOWING TRIFILAR WINDINGS**

**DESCRIPTION**

The circuit diagram is shown in Fig. 1. The converter has been designed round a double balanced hot-carrier diode mixer. Hot-carrier diodes make high frequency mixing in this type of circuit possible and although diodes may be used it was felt that the extra cost of the HP-2800 diodes were justified when the results of the converter were assessed.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.

**SCHEMATIC OF 11T172 SHOWING TRIFILAR WINDINGS**

**DESCRIPTION**

The circuit diagram is shown in Fig. 1. The converter has been designed round a double balanced hot-carrier diode mixer. Hot-carrier diodes make high frequency mixing in this type of circuit possible and although diodes may be used it was felt that the extra cost of the HP-2800 diodes were justified when the results of the converter were assessed.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.

**SCHEMATIC OF 11T172 SHOWING TRIFILAR WINDINGS**

**DESCRIPTION**

The circuit diagram is shown in Fig. 1. The converter has been designed round a double balanced hot-carrier diode mixer. Hot-carrier diodes make high frequency mixing in this type of circuit possible and although diodes may be used it was felt that the extra cost of the HP-2800 diodes were justified when the results of the converter were assessed.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.

**SCHEMATIC OF 11T172 SHOWING TRIFILAR WINDINGS**

**DESCRIPTION**

The circuit diagram is shown in Fig. 1. The converter has been designed round a double balanced hot-carrier diode mixer. Hot-carrier diodes make high frequency mixing in this type of circuit possible and although diodes may be used it was felt that the extra cost of the HP-2800 diodes were justified when the results of the converter were assessed.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.

**SCHEMATIC OF 11T172 SHOWING TRIFILAR WINDINGS**

**DESCRIPTION**

The circuit diagram is shown in Fig. 1. The converter has been designed round a double balanced hot-carrier diode mixer. Hot-carrier diodes make high frequency mixing in this type of circuit possible and although diodes may be used it was felt that the extra cost of the HP-2800 diodes were justified when the results of the converter were assessed.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.

**SCHEMATIC OF 11T172 SHOWING TRIFILAR WINDINGS**

**DESCRIPTION**

The circuit diagram is shown in Fig. 1. The converter has been designed round a double balanced hot-carrier diode mixer. Hot-carrier diodes make high frequency mixing in this type of circuit possible and although diodes may be used it was felt that the extra cost of the HP-2800 diodes were justified when the results of the converter were assessed.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.
SIDEBOARD ELECTRONICS ENGINEERING

After selling my entire stock of YAESU MUSEN Transceivers, imported under by-law privileges at reduced import rates, which cannot possibly be repeated in the future, I have had to disappoint a large number of Amateurs who for one reason or another missed out. Meanwhile the Japanese Yen currency has increased in value, now already 7% with respect to the Australian Dollar and consequently future imports will cost even more than they were before last June or from other sources.

In order to help those unfortunate Amateurs I am willing and prepared to import another limited quantity of YAESU MUSEN Transceivers, paying the full import duties at the higher cost, but selling them strictly at cost price. Under the present monetary situation, and therefore with restriction, those prices will be:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>FT-101 Transceivers, AC/DC solid state</td>
<td>$640</td>
<td></td>
</tr>
<tr>
<td>FT-200 Transceivers, with AC supply/speaker unit</td>
<td>$400</td>
<td></td>
</tr>
<tr>
<td>FT-DX-560 AC Transceivers, equivalent to the FT-DX-400</td>
<td>$540</td>
<td></td>
</tr>
<tr>
<td>FT-DX-401 AC Transceivers, the latest models with CW filter, final amplifier fan and noise blanker</td>
<td>$600</td>
<td></td>
</tr>
</tbody>
</table>

But remember, these are actual cost prices, no profit on them and only a special service for those who came too late in the past and for a limited quantity only, so don’t delay to get that Christmas present! If the Yen goes up further in value, naturally these prices will increase automatically in the same ratio.

OTHER GOODS, STILL IN STOCK:

MIDLAND PRODUCTS

One Watt Transceivers, 27 or 28 MHz. operation ... $37.50
Crystals for 27.065, 27.085, 27.240, 27.880, 28.100, 28.200, 28.300, 28.400, 28.500 operation, per Pair ... $3
12 Volt re-chargeable nickel-cadmium Batteries ....... $10
AC Chargers for nickel-cadmium Batteries ......... $10
SWR METERS, with two 100 micro-amp. Meters, reads forward and reflected power simultaneously ... $20
SWR METERS, single meter, standard type ....... $12

DYNAMIC MICROPHONES:

PTT mobile hand-held type, metal case ........... $10
PTT table type ............ $15
PTT table model with 0-60 db. built-in two-stage pre-amplifier ....... $25
HEADPHONES, light-weight, excellent quality, 8 ohm impedance ........ $6
TRANSCIEVERS, 240V AC, 5 watt type, 27 to 28 MHz., xtal controlled with six sets of crystals, still only $100

HY-GAIN TH6DXX Tri-band Master Beam ....... $220
HY-GAIN 18AVT, new, 10 to 80 mx Vertical, due to arrive soon ... $80
MOSLEY TA33JR Junior Tri-band Beam ........ $105
MOSLEY MUSTANG Tri-band Beam, the high-power version of the TA33JR ....... $130
KATSUMI ELECTRONIC KEYERS, Model EK-26, reduced to ... $50
EIMAC 3-500-Z Linear Amplifier Tubes ........ $37.50
CETRON 572B/160TL Linear Amplifier Tubes, per Pair $45
CRYSTALS, FT-241 type, 400-500 KHz., per box of 80 crystals, clearance sale ...... $10
GALAXY V. VOX Units .............. $25

USED EQUIPMENT

YAESU FT-DX-400 Transceiver, as new, demo. set ... $400
HEATH Maurauder 10-80 mx SSB, etc., tx AC operated $125
HEATH HR-20 10-80 mx Amateur Band Receiver, needs external AC supply ...... $60
BC-348-O and BC-348-R Receivers, clean units ... $50
COLLINS KWM-2 Transceiver, with clip-on AC supply-speaker unit ....... $700

All prices quoted are strictly net, cash with order, sales tax included in all cases, subject to alteration without prior notice.

SIDEBAND ELECTRONICS ENGINEERING

P.O. BOX 23, SPRINGWOOD, N.S.W., 2777

Proprietor: ARIE BLES

Telephone, note the new number: Springwood (STD 047) 511-636

Amateur Radio, December, 1971
The method of winding these transformers is shown in Fig. 2 and provided the drawings are followed it is easy to make an acceptable double balanced mixer. Due to the small size of the ferrite toroids, it is possible to build the complete mixer within the area of a double Neosid can. Not only does this give good isolation, but of greater importance, reduces local oscillator radiation from the converter.

A double tuned bandpass filter is used in the front end, however this is not a mandatory requirement. The input coil L1 can be omitted if required and the input tap from the aerial made on L2. The r.f. amplifier uses the MPP121 MOSFET. Unlike devices as the 3N140, the makers have built into the silicon chip small diode elements which protect the insulated gates and allow the device to be handled in a similar manner to JFETs and bipolar transistors. The output of the pre-amplifier passes into a further tuned pair of L3 and L4. Due to the low input impedance of the balanced mixer, a link L5 over the hot end of L4 is used.

### PERFORMANCE

All prototypes measured had noise figures of better than 3.5 dB. The conversion gain is adjustable from 25 dB to 60 dB. One unit was measured at 52.5 MHz. with an i.f. output of 8 MHz. at a maximum of 68 dB.

When using the double tuned front end with all coils peaked on 52.5 MHz., a —3 dB. bandwidth of 250 KHz. was obtained. By stagger tuning each of the bandpass pairs 250 KHz. either side of the centre frequency, a —3 dB. bandwidth of 750 KHz. was obtained. L1 and L3 were adjusted to the higher side and L2 and L4 to the lower side. Eliminating L1 and peaking all coils on 52.5 MHz., a —3 dB. bandwidth of 460 KHz. was obtained. The stagger tuning of L2, L3 and L4 resulted in a bandpass in excess of 1 MHz.

No measurements of cross modulation have been performed. However, qualitative on-air tests have shown that the converter exhibits excellent characteristics.

### CONSTRUCTION

Full constructional details will be supplied with the kits which will be available early in December. For those not wishing to obtain a kit, a few hints may be useful.

First wind the balanced mixer transformers. This is done by taking three by two-foot lengths of 30 gauge B. & S. enameled wire and carefully twisting them together until five turns per inch is reached. Cut this twisted length in half, one piece for each of the transformers. Wind twelve turns onto each toroid and label the ends as shown in Fig. 2. If a printed circuit board is not being used, the two transformers and four diodes can be mounted on a Neosid type B base and the appropriate wires soldered to the pins. The unit can then be covered with a type B aluminium can.

The remaining components can be mounted in any order. However, we have found it expedient to mount the coil formers and wind the coils as the next step. Although no special pre-
cautions are necessary for handling the semiconductors, they should be pushed down to \( j \) from the board.

**ALIGNMENT**

With the supply voltage connected, tune the oscillator coil L6 for maximum voltage drop across R10. The 5-volt range of a multimeter will be suitable. Switch the supply voltage off and on a number of times to ensure that the oscillator starts reliably each time.

Wind all v.h.f. slugs fully in and then apply a suitable signal to the converter. If a signal generator is not available, an oscillator can be built using the transmitter crystal. A suitable circuit was published in an excellent article written by R. Higginbotham in "Amateur Radio," December 1970, page 9.

Tune L3 until a signal is heard in the receiver. The remaining coils can now be tuned, starting with L4 and working towards the aerial coil L1. As each coil approaches resonance a slight amount of interaction may be noticed. Reduce the signal strength and re-peak each coil, starting at L3 again until maximum sensitivity over the desired bandpass is achieved.

If required, the converter gain can now be adjusted. A number of Amateurs have found it a good rule of thumb to increase the gain until the aerial noise produces a 1-2 dB reading on the signal strength meter, but others increase the gain until a small amount of aerial noise is just heard. However, as this is a matter of choice, it is best left to the Amateur to satisfy his own individual requirements.

### Oscillator Coil, L6:

Close wound with 24 B. & S. wire.

<table>
<thead>
<tr>
<th>Freq of Crystal</th>
<th>No. of Turns</th>
</tr>
</thead>
<tbody>
<tr>
<td>48-52 MHz.</td>
<td>10</td>
</tr>
<tr>
<td>42-48 &quot;</td>
<td>12</td>
</tr>
<tr>
<td>38-42 &quot;</td>
<td>15</td>
</tr>
<tr>
<td>34-38 &quot;</td>
<td>18</td>
</tr>
<tr>
<td>30-32 &quot;</td>
<td>23</td>
</tr>
</tbody>
</table>

### AVAILABILITY

A limited number of these kits will be made available through the Disposals outlet of the VK3 Division. The kit contains all capacitors, resistors, semiconductors, coil formers, ferrites and wire. The builder will need to supply his own crystal at the third overtone frequency. Those made by Hy-Q Electronics (specification number HS291) are suitable. The price of the kit is $15.50 including normal postage and can be obtained by writing to either—

- W.I.A. Disposals (Victorian Division), P.O. Box 65, Mount Waverley, Victoria, 3150,
- or to the Divisional office—
  - 6 Metre Converter, W.I.A. Vic. Division, P.O. Box 36, East Melbourne, Victoria, 3002.

### RESISTANCE R9:

- **Available:**
  - Coils Data:
    - General:
      - L3—8\(\frac{1}{4}\) turns 24 B. & S. wire, close wound.
      - L4—8 turns 24 B. & S. wire, close wound.
    - Double tuned front-end:
      - L1—11 turns 24 B. & S. close wound, aerial input at 3 turns from earth end, output to C9 at 8\(\frac{1}{2}\) turns from earth end.
      - L2—10\(\frac{1}{4}\) turns 24 B. & S. close wound, input from C3 at 8 turns from earth end.
    - Single tuned front-end:
      - L1—not used.
      - L2—10\(\frac{1}{4}\) turns 24 B. & S. close wound, input from C1 at 3 turns from earth end.

Radio Parts in Melbourne have introduced a versatile multimeter that will find many applications for use in laboratories and servicing operations. Designated "Rapar" Model F-75K, this tester offers 30,000 ohms per volt d.c., and 10,000 ohms per volt a.c., and is fitted with a burn-out proof device. Other features include a wide range of voltage and resistance measurements, current and decibel measurements, and an in-built signal injector for checking audio or radio circuits.

Further technical data is available from Radio Parts Group, 562 Spencer St., West Melbourne, Vic., 3003, or Tel. 339-7868.
Regulated Power Supply for Transistor and Integrated Circuit Projects

D. J. McWILLIAM,* VK4ZDJ

The following circuit for a low voltage power supply should be of interest to those who require an inexpensive, but well-regulated variable supply for use with transistor and integrated circuit projects.

The supply is based on the National Semiconductor 5 volt regulator integrated circuit LM309K. This unit is mounted in a TO-3 package and has an output rating of 1 ampere. A TO-5 package is available but the rated maximum output is only 200 mA, provided adequate heat sinking is used.

From the manufacturer's data sheet:
"The regulator is essentially blow-out proof. Current limiting is included to limit the peak output current to a safe value. In addition, thermal shutdown is provided to keep the IC from overheating. If internal dissipation is too great, the regulator switches on and off with a duty cycle that prevents excessive heating."

<table>
<thead>
<tr>
<th>Output DC Input Range</th>
<th>Voltage R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 20 V.</td>
<td>&gt;23 V.</td>
</tr>
<tr>
<td>5 to 25 V.</td>
<td>&gt;28 V.</td>
</tr>
<tr>
<td>5 to 30 V.</td>
<td>&gt;32 V.*</td>
</tr>
</tbody>
</table>

Table 1.

* Note: Maximum input voltage 35 V.

The LM309 is a very complex unit comprising a total of nineteen transistors and fifteen resistors. The device does not use a zener diode for the internal reference. Instead, the reference is developed from the highly-predictable emitter-base voltage of the transistors.

The choice of this device gives all the features available in expensive supplies and only necessitates a few external components.

The circuit described is a dual supply designed for IC projects, but a single supply would be adequate for the majority of transistor projects.

The power supply is assembled in an amplifier cabinet measuring 4½" wide x 4½" high x 6½” deep. This cabinet is readily available from Radio Parts, Melbourne (Type AC3). The two power transformers used have a multi-tapped secondary winding rated at 2 amperes and are available from A and R Transformers (Serial No. 6978). The diodes used are 1 amp. 50 p.i.v. types, available from most suppliers.

The two regulators are mounted on a standard heat sink which is mounted vertically at the rear of the cabinet. All the other components, with the exception of potentiometers and switches, are located on a printed circuit board mounted vertically in the cabinet immediately behind the two meters.

A 0-15 volt, 2" x 2" meter is located on the front panel and is switchable from one supply to the other by a two-pole, two-position switch located at the centre of the front panel.

In series with one of the supplies is a current meter which may be switched to give either 0-100 mA., or 0-1 A. f.s.d. The resistor, R2, is made from a short length of resistance wire such that its value is approximately one-ninth of the internal resistance of the current meter. This can be very easily achieved experimentally.

The data sheets for the LM309K state that for a variation of 7v. to 25v. input, the line regulation is typically 4 mV. and that the load regulation is typically 30 mV. over the current range 0 to 500 mA. The maximum input voltage is 35 volts. Measurements on the constructed supply operating at 10 volts and 20 mA. current showed that the residual ripple voltage at the output was below 1 mV.

Should constructors wish to have a different voltage range, then the 1.0K ohm resistor (R1) should be replaced with one of the values given in Table 1.
Hy-Q Electronics

CRYSTAL OSCILLATORS AND FREQUENCY MARKER KITS for the Amateur and Professional

OSCILLATOR KITS

QQ-1: 3 MHz. to 20 MHz.
QQ-2: 20 MHz. to 60 MHz.

Input: 4V. to 9V. DC, 20 mA.
Output: 200 mV. on 50 ohms.

KIT LESS CRYSTAL: $6.60 including Sales Tax and Postage

20 ppm CRYSTALS if ordered with Kit:
Fundamental (QQ-1) $4.50
3rd O/T (QQ-2) $5.50 including Sales Tax and Postage

FREQUENCY MARKER KIT QO-3

Output: 1 MHz.
500 kHz.
100 kHz.
25 kHz.

Input: 9V. DC, 25 mA.
Stability: Typically within 3 ppm.
Accuracy: Adjustable against WWV to within 1 ppm.

KIT INCL. CRYSTAL: $17.60 incl. Sales Tax and Postage
ASSEMBLED UNIT: $19.60 incl. Sales Tax and Postage

OSCILLATOR KITS FOR THE AMATEUR

Hy-Q Electronics have introduced a range of oscillator kits for the serious Amateur and Professional man. Types QO-1 and QO-2 are supplied as kits containing the components required for the construction of a frequency source of good accuracy. A crystal is not supplied as part of the kit and should be ordered separately.

The oscillators cover the frequency ranges of 3 to 20 MHz. and 20 to 60 MHz. The QO-1 is a fundamental mode oscillator and the QO-2 operates in the third overtone mode.

The oscillators employ a broadly tuned circuit providing crystal controlled operation over the specified frequency ranges.

Power output is 1 milliwatt and is adequate for a wide variety of applications.

Specifications:
Frequency range: QO1 3 to 20 MHz.
QO2 20 to 60 MHz.
Power requirements: 6 volts DC at 20 mA. maximum. The oscillators will operate satisfactorily over the range 4 to 9v.
Operating temperature range: 0° to 60°C.
Dimensions: 1½ x 1½ x 1½ inches (38 x 38 x 32 mm.).
Mounting: Four 1/8 inch (3.1 mm.) holes on 1¼ inch (32 mm.) centres. Tubular spacers are supplied for above chassis mounting, alternatively the oscillators may be mounted over a cut-out 1½ in. (32 mm.) square with 3/18 in. (5 mm.) radius corners.

FREQUENCY MARKER

The type QO-3 is a frequency marker intended for use as a convenient source of reference signals at 1,000, 500, 100 and 25 kHz, with accuracy adequate for many experimental requirements. The signals are available singly or simultaneously, depending on the use of the optional selector switch.

The output at each frequency is of the order of 1 volt peak-to-peak and is of such a waveform as to provide harmonics of adequate amplitude for ready detection up to approximately 30 MHz.

The QO-3 marker is normally supplied in kit form with all of the components including the crystal required to assemble the unit on a single printed circuit board, the optional selector switch is connected to the board by short flexible leads.

Specifications:
Output frequencies: 1 MHz., 500, 100, 25 kHz.
Accuracy: Adjustable against external standard or standard frequency transmission to within 1 ppm.
Stability: Typically over 8-hour period and plus or minus 2% supply voltage change, within 3 ppm.
Output voltage: At each frequency approximately 1 volt peak-to-peak.
Output waveform: Distorted pulse with harmonics to 30 MHz.
Power requirements: 9 volts DC plus or minus 5% at maximum of 25 mA. Other voltages with plus or minus 5% stability by change of resistor.
Mounting hole dimensions: Four 0.125 in. (3.1 mm.) holes on 1.75 in. x 2.75 in. (44.5 x 69.9 mm.) centres. If mounted on chassis without spacers, a 1.75 In. x 2.75 In. (44.5 x 69.9 mm.) cut-out with a 0.3125 in. (8 mm.) radius corners is required.

Hy-Q Electronics Pty. Ltd.
1-10-12 ROSELLA STREET (P.O. BOX 256), FRANKSTON, VICTORIA. 3199.
ON WITH THE SHOW

Up in North Queensland the active Amateur fraternity are members of the Townsville Amateur Radio Club. It is a strong club that believes in actively involving its members in interesting projects and not surprisingly these projects seem to reflect the Amateur’s community spirit. For far too long, the North has been regarded by the rest of Australia as a sleepy hollow that grows a few coconut palms. Yes, we do rig antennas on coconut palms, and yes we do have a good sleep after the R.D. Contest, but there the similarity ends.

Queensland has more cities of 40,000 population and over than has any other State, and Townsville (population 72,000) is regarded as the Capital City of North Queensland. Thus it is important that the Townsville Amateur Radio Club should not just accept affiliation with the W.L.A. Queensland Division, but that it should be able to hold its own with the Capital City Clubs. Indeed, club members have won every section in the Annual State V.H.F./H.F. Contest for the past three years.

As part of the most recent club project, VK4TC, the club station, was taken to the annual Townsville Show. The objects of the display at the Showground were: (1) To recruit starters for the club’s current A.O.C.P. classes, (2) To put the club’s activities before the public, and (3) As a technical exercise for club members.

And what a technical exercise it was! Because Showgrounds are, electrically speaking, very noisy areas the committee decided that the station should transmit from the site but a remote receiver should be set up in a quiet location and that received signals should be linked into the Showgrounds via an FM carrier. In addition, a 53.032 MHz. two-way link was provided as liaison frequency between the transmitting and receiving stations.

Mount St. John, five miles line of sight west of the Showgrounds was chosen as the receiving site. Here the proverbial antenna farm was installed, all co-ax cables feeding a Trio TS510D HF Transceiver. The transceiver audio output was fed electrically to a home-brew ten watt 146 MHz. FM transmitter. A 10 watt 53.032 transceiver and a TV set were also provided for the remote site operator.

At the show, the duty operator monitored his transmission frequency via the 146 MHz. FM link receiver. Instructions to change frequency were sent on the 53 MHz. liaison channel. An FT-200 tx feeding a TA33JR beam was used on HF from the Showgrounds. As a new country was contacted, it was marked on a large map behind the station operator.

Of course there are always eventualities that no committee can really foresee. This display was no exception in this regard. Half way through the show, the local Civil Defence Group decided to fire up their emergency SSB transceivers operating just above 3700 KHz. As their equipment was located next to the T.A.R.C. display, their 80 metre transmissions were blocking our receiver and vice versa.

In true Amateur style, improvisation was immediately necessary. The operator at the Showgrounds fed audio down the 6 metre link to Mt. St. John where he was relayed on HF via the Trio TS510D. The received signal was then linked back to the show via 2 metres FM. In fact, the system was further simplified when the remote station operator put the TS510 into VOX operation. The Showground operator was then able to call and listen automatically.

This year’s display was eminently successful because it involved most members of the Radio Club and equally importantly, many of the general public. Perhaps your club can help fly the Amateur Radio flag and get “on with the show”. It’s certainly a very worthwhile effort.

(Story and Pictures by Peter J. Lindsay, VK4QD-T.)
Being a comparative beginner in s.s.b., the writer desires to cater for beginners by submitting the following step by step explanation of what happens in such a transmitter, using the block diagram to illustrate the steps.

Radio frequency oscillations are generated in the carrier oscillator, this fixed frequency being governed by the frequency to which the carrier crystal has been ground or etched, or perhaps lowered slightly in frequency by rubbing soft solder on one or both faces.

The 3-30 pF. trimmer across the carrier crystal permits a very slight adjustment of the carrier frequency.

As an example, let us say the carrier crystal is at 4994.2 KHz.

This r.f. signal, called the carrier, is fed into the balanced modulator which consists of two small diodes, a 1K potentiometer and a bifilar wound coupling coil, the latter being wound around the carrier oscillator coil.

In the meantime a very low frequency signal is being introduced by the operator's voice, per the microphone, to the first audio stage and amplified in an audio amplifier stage.

From the latter it travels to the balanced modulator as arrowed in the diagram.

It will thus be seen that two signals are now meeting in the balanced modulator, the high frequency carrier signal and the very low frequency audio signal.

To make matters a little clearer, we will assume that the frequency of a single tone of, say, 1,000 Hz. (1 KHz.) is the audio signal instead of the varying frequencies of the human voice.

The carrier signal, assumed as above as being 4994.2 KHz., mixes with the 1 KHz. audio signal to produce two new frequencies by addition and subtraction respectively, thus 4994.2 + 1 = 4995.2 KHz. and 4994.2 — 1 = 4993.2 KHz.

These new frequencies are called upper and lower sidebands respectively of the original 4994.2 KHz. carrier and both of these sidebands proceed to the next stage.

However, the balanced modulator has a further important duty, i.e. it must prevent the original carrier frequency itself from accompanying the sidebands on their way.

The next stage is the sideband filter, comprising mainly in our case four crystals, two being etched to a slightly
higher frequency than that of the carrier crystal and the remaining two to about 1.8 KHz. higher still. For our example, say two at 4995 KHz. and two at 4996 KHz.

(To be a little more technical, the carrier crystal should be located frequency-wise about 20 dB. down the lower slope or skirt of the sideband filter passband curve. A second carrier crystal could be similarly placed on the upper skirt.)

Two other components of the sideband filter are a bifilar wound coil on an annular toroidal core and a 3-30 pf. trimmer, these being tuned to an intermediate position between the crystals.

The sideband filter will close the gate to one of the two sidebands, so that only a single sideband (s.s.b.) will pass on to the mixer stage.

In our example the 4993.2 KHz. signal will be blocked and the 4995.2 KHz. signal will pass to the 6BE6 amplifier and thence to the 6BA6 amplifier where the s.s.b. signal is strengthened sufficiently to be fed via a pi coupler to the antenna.

Reverting to the v.f.o., in my case, for the 40 metre transmitter, the input to the v.f.o. valve was set at one-third of the frequency of the v.f.o. output, so that for the above example, the v.f.o. input would be tuned by means of the bandspread variable capacitor to 12045.2 KHz.

Both condensers of the pi coupler require to be carefully manipulated to dip the filter to resonance coincident with the lighting of a suitable dummy antenna lamp in the first instance (I used a 75w. 240v. lamp), with a further check when the antenna lead-in cable is connected.

I find a small pea lamp inserted in series with the antenna lead gives a good indication of whether the final grid is tuned correctly. One can adjust to have a very good swing of the final current meter on voice and yet not light the pea lamp.

I have altered the above home-brew to suit the 20 metre band and by choosing 14100 KHz. output to set up coil frequencies, the v.f.o. input frequency in this case being set to one half of the v.f.o. output. I arrived at

the following frequencies to which to wind and set the coils:

14100 KHz. for mixer, driver and final stages.

Minus 4996 KHz. approx. s.s.b. from filter,

= 9104 KHz. v.f.o. output frequency required.

and 9104 + 4552 KHz. required input to v.f.o. valve.

NATIONAL POLICY FOR SCIENTIFIC AND TECHNOLOGICAL INFORMATION SERVICES

The committee will examine the needs of individuals in their work with scientific and technical information with a view to bringing forward proposals which will assist in the formation of a national policy in this important area. It will assess the adequacy and availability of existing communication systems and the access to them. It will also study the use of computer-based information services and their development, in particular the development of computer-based information services and their development, in particular the development of information retrieval systems drawing upon overseas experience with such systems. The Committee of Enquiry aims to complete a major part of its work this year. Individuals and organisations wishing to submit comment or for further information about the scope and objectives of the committee are invited to contact the Committee Secretariat, C/o. The National Library of Australia, Canberra, A.C.T.

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 second number represents the total of all the credits given for deleted countries. The third number represents the total of all the credits given for deleted countries. The credits for new members and those whose totals have been amended are also shown.

<table>
<thead>
<tr>
<th>W.I.A.</th>
<th>D.X.C.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK5MS</td>
<td>319</td>
</tr>
<tr>
<td>VK5RU</td>
<td>318</td>
</tr>
<tr>
<td>VK4HG</td>
<td>307</td>
</tr>
<tr>
<td>VK4TK</td>
<td>302</td>
</tr>
<tr>
<td>VK5AB</td>
<td>296</td>
</tr>
<tr>
<td>VK3JW</td>
<td>257</td>
</tr>
</tbody>
</table>

New Members:

Cert. No. Call Tota
177 VK4NJ 106 | 108
178 VK4EA 106 | 108

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 second number represents the total of all the credits given for deleted countries. The third number represents the total of all the credits given for deleted countries. The credits for new members and those whose totals have been amended are also shown.

<table>
<thead>
<tr>
<th>W.I.A.</th>
<th>D.X.C.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK5MS</td>
<td>319</td>
</tr>
<tr>
<td>VK5RU</td>
<td>318</td>
</tr>
<tr>
<td>VK4HG</td>
<td>307</td>
</tr>
<tr>
<td>VK4TK</td>
<td>302</td>
</tr>
<tr>
<td>VK5AB</td>
<td>296</td>
</tr>
<tr>
<td>VK3JW</td>
<td>257</td>
</tr>
</tbody>
</table>

New Members:

Cert. No. Call Tota
177 VK4NJ 106 | 108
178 VK4EA 106 | 108

C.W.

| VK2GL  | 303 | 326 | VK3ARX | 271 | 278 |
| VK3A1H | 300 | 315 | VK3XB | 270 | 284 |
| VK4SIA | 295 | 315 | VK4VT  | 265 | 279 |
| VK2APK  | 288 | 294 | VK4TV  | 258 | 272 |
| VK3LY  | 288 | 303 | VK3TI  | 254 | 260 |
| VK3NC  | 272 | 300 | VK3VR | 244 | 222 |

OPEN

| VK6RU  | 317 | 343 | VK7MK  | 303 | 324 |
| VK4S5D | 315 | 330 | VK2EO | 301 | 325 |
| VK2VIN | 311 | 330 | VK4XAR | 301 | 368 |
| VK4K  | 287 | 307 | VK4AC | 278 | 288 |
| VK5TY  | 366 | 321 | VK4FJ | 297 | 323 |
| VK2APK  | 301 | 308 | VK3RS | 294 | 300 |

New Members:

Cert. No. Call Tota
177 VK4NJ 106 | 108
178 VK4EA 106 | 108

Amendment:

| VK3ACD | 254 | 259 |

Enquiries are invited for the purchase of

COLLINS 390 and 390A Communications Receivers

These units cover 0.5 to 32 MHz. Digital readout, 1 MHz. bands. Dial reading to 200 Hz.

Finance available. Apply in writing to:

Industrial and Medical Electronics Co.

6th Floor, 288 LITTLE COLLINS ST., MELBOURNE. Phone 63-9258
The World’s Most Versatile Circuit Building System!

SIZES: 1/8” and 1/16” WIDTHS
LENGTH: 100 ft. roll, 5 ft. card

IDEAL FOR PROTOTYPE AND PRODUCTION CONSTRUCTION

USEFUL FOR WIRING REPAIRS

★ NO DRILLING ★ FAST ★ NO MESS

Available from all Leading Radio Houses

Marketed by—

ZEPHYR PRODUCTS PTY. LTD.
70 BATESFORD RD., CHADSTONE, VIC., 3148
Telephone 55-7231

MANUFACTURERS OF RADIO AND ELECTRICAL EQUIPMENT AND COMPONENTS

AMATEUR ANTENNAS
Superior Quality
All Imported

ACCESSORIES: Hy-Gain lightning arrestors, baluns, centre insulators.
TRAP-VERTICALS.

COMPREHENSIVE RANGE TO SUIT MOST REQUIREMENTS

MOBILE WHIPS: A large selection of Hy-Gain centre-loaded types, and Mark Mobile Helicals, for 80-10 mx. Mounts and springs, etc.

VHF ANTENNAS: Beams and ground planes, 5/8 and 1/4 wave mobile whips, including gutter-mount types.

Write for details and prices on the types you require.

SEASONS GREETINGS TO ALL READERS

AMATEUR ANTENNAS

K Superior Quality
K All Imported

ACCESSORIES: Hy-Gain lightning arrestors, baluns, centre insulators.
TRAP-VERTICALS.

BAIL ELECTRONIC SERVICES
60 Shannon St., Box Hill North, Vic., 3129. Ph. 89-2213

N.S.W. Rep.: STEPHEN KUHL, P.O. Box 56, Mascot. N.S.W., 2020. Telephone: Day 57-1650 (AH 371-3445)

Western Aust. Rep.: H. R. PRIDE, 26 Lookhart Street, Como, W.A., 6142. Telephone 60-4379

INSTRUCTIONS
Remove paper backing and place adhesive side downwards in the selected position. Press down firmly. When used with plain board drill from the 'Cir-Kit' side. Pass through component leads, bend over and cut to length. Solder in usual way.
When used with punched board lay strip between rows of holes; pass component leads through holes adjacent to strip, bend the leads over the strip, cut to length and solder in the usual way. Alternatively lay strip over the holes and using a drawing pin or scriber prick a hole in the 'Cir-Kit' in the required position.
'Cir-Kit' strip can be bent or curved to whatever form you require and used on either or both sides of the board. When joining two pieces of 'Cir-Kit' bend over the end of the overlapping strip so that a metal to metal contact is made and solder in the usual way.

The World’s Most Versatile Circuit Building System!
Army Trek to Ayers Rock

LIEUT.-COLONEL J. McL. BENNETT,* VK3ZA

Thirty-nine apprentices from the Army Apprentices School, Balcombe, Victoria, left Balcombe on June 4 on a vehicle trek to Ayers Rock.

The trek included a rare "field-day type" h.f. radio link—s.s.b. operation from the summit of the Rock itself.

A total of 16 vehicles took part in the 20-day training exercise which was code named "Exercise Pebble".

Two former members of the Special Air Service Regiment (Capt. John George and Staff Sgt. Jock Lowson), both of whom are now on the Staff at Balcombe, used the Army's latest man-pack h.f. radio, the PRC-F1, to establish the link with the Army Apprentices School, Balcombe, Vic., from Ayers Rock.

EQUIPMENT DETAILS

Manufactured in Australia by A.W.A. Ltd. for the Australian Army, the PRC-F1 has the following characteristics:

Frequency range: 2,000 to 11,999 KHz, in 1 KHz. steps.

Frequency stability: ±25 Hz. between —21°C. and +71°C. over 90 days.

Modes: S.s.b.—u.s.b. only; c.w. and a.m.

Output power: 10w. p.e.p. on s.s.b. and compatible a.m., 5w. p.e.p. on c.w.

Rx sensitivity: 0.5 µV. in series with 50 ohms for 1 mW. audio output in 100 ohms.

Power source: 28v. d.c. from internal re-chargeable nickel-cadmium battery.

It is designed primarily as a man-pack transceiver, using an 8 ft. whip antenna. An adjustable dipole is also provided for sky-wave operation over extended range.

A conversion kit, including an antenna coupler, allows the PRC-F1 to be used as a ground station with greater flexibility by giving a choice of a wide range of antennas. The coupler provides efficient matching from the 50 ohms unbalanced output of the transceiver to antennas with impedances between 5 ohms and 7,000 ohms.

THE TREK

So much for the PRC-F1; now a little more about "Exercise Pebble".

The apprentices and their officers, and civilian instructors, ate combat rations and slept in the open throughout the greater part of the trip.

This living in the field under varying conditions plays an important part in the apprentices' training as do long distance vehicle movement, navigation, geography and geology, driver training and vehicle maintenance, and first aid in the field.

They visited major industries and places of interest along the way.

The expedition was conducted in two phases. During the first phase, the convoy moved from Balcombe, following the coast to Adelaide, then a general north-west route to Alice Springs along the main road.

Phase two included its return to Balcombe going through Ayers Rock, and taking a south-south-east route using the axis of the Alice Springs to Broken Hill railway line, then on through Mildura.

The apprentices spent most nights camped on the showgrounds of the various towns they passed through. In some cases they camped on the outskirts of a town while Army barracks were made available for their overnight stays at Adelaide and Broken Hill.

Fresh rations were purchased at Port Augusta, Alice Springs, Oodnadatta and Broken Hill, and meals were provided for the party by Army units at Adelaide, Woomera and Bendigo as it passed through these areas.

Among the highlights of the trip were inspection tours of the shipyards at Whyalla and the Iron Foundry at Iron Knob; a guided tour of Woomera; Opal prospecting at Cowper Pedy; a day spent climbing Ayers Rock; and a guided tour of Broken Hill.

The apprentices were granted local leave, at the discretion of the Detachment Commander, Capt. A. J. George.

These phases of "Exercise Pebble" provided a break in what was essentially a rigorous training exercise.

But no matter what the conditions, the apprentices were well prepared for their trek.

Each light vehicle was fully self-supporting for the occupants, carrying rations, water and all their personal effects.

A mobile automotive repair shop and an ambulance were among the vehicles in the convoy.

In addition, each vehicle carried two-way radio equipment and communications with the Royal Flying Doctor Service, Balcombe, and Watsonia could be provided, as required, by a Signals Detachment.

The convoy arrived back at Balcombe on June 24 after covering a total of 3,446 miles and maintained communications throughout the trip.

DISTANCE CHART

AUSTRALASIAN LOCATIONS

[centre pages in Nov. "A.R."]

Can be printed on stiff paper for wall mounting, if demand is adequate, at a nominal price.

Please write in to Editor if you require a copy

(Please note that individual letters cannot be acknowledged)

P.O. Box 36, East Melbourne,
Vic., 3002

DISTANCE CHART WALL MOUNTING?

*Assistant Director Army Public Relations, Headquarters Southern Command.

Capt. George and S/Sgt. Lowson pictured near the summit of Ayers Rock with the 'Centre' unfolding below them—the curved horizon proves that the world is not flat! What a take-off for v.h.f.!
BEWARE OF . . .

CHAIN LETTERS

Another batch are in circulation. If you get one, tear it up!
Correspondence

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

V.H.F. TRANSEQUATORIAL PROPAGATION

Editor "A.R.," Dear Sir,

The Ionospheric Prediction Service is currently carrying out investigations into V.H.F. Transequatorial Propagation and would be grateful for the assistance of any Amateurs who have had contacts via this type of propagation or have observed v.h.f. signals originating from countries in the northern hemisphere.

We are interested in reports dating back to 1947 if possible and, in particular, reports from January 1970 to the present.

Reports containing as much of the following information as possible would be appreciated,
(a) Date.
(b) Time (note whether local or GMT).
(c) Frequency or band (most likely to be 50 MHz., however if other signals were noticed, note approximate frequency).
(d) Signal strength.
(e) Fading characteristics.
(f) Location of your station and call sign (plus location if possible) of stations heard or worked.

Other observations, i.e. was sporadic E noticed at the time? If so, 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?

Reports should be sent to:
Dr. L. McNamara,
Ionospheric Prediction Service,
162-166 Goulburn Street,
Darlinghurst, N.S.W., 2010.

We would be grateful for as much publicity as possible concerning this project.

—R. L. Harrison, VK3ZRY/2.

N.Z. NATIONAL JAMBOREE

Editor "A.R.," Dear Sir,

During the first week in 1972 the New Zealand Scout Association will be holding its Sixth National Jamboree at the Pukekohe Showgrounds in South Auckland.

I have been authorised by the New Zealand Post Office as Trustee for the Amateur Radio Station, which will be set up to operate during the activity period, i.e. 1st to 8th January, 1972.

The official call sign will be ZL1JAM.

It is hoped to operate on all h.f. bands daily, and between the hours of 1900 and 2200 hours NZST, although other times can be arranged in the event of any pre-arranged schedules with overseas stations.

Members of the Franklin Amateur Radio Club and the Papakura Amateur Radio Club will be assisting in the setting up and operation of the station, and as it is anticipated that approx 9,000 Scouts and Scouters from New Zealand, Australia, Canada, United States of America, the Pacific Islands, Japan and South-East Asian countries will be attending, the traffic activity should be fairly intensive.

An attractive QSL card is being printed for the occasion, and confirmation will be 100%.

It would be appreciated if you could give this activity some publicity through your magazine and club nets.

—John W. Hannaford, ZL1BBH.

"HIS OLD BEAM"

Editor "A.R.," Dear Sir,

In 1968 I bought, through Hamads, a TA33 Jr. from Bert Hay, VK2AGW. Since then, I have contacted Bert on odd occasions and also worked a fair share of DX using his old beam.

A few days ago I received a letter from Bert which I feel is worth a para. in "A.R."

"A few days after we arrived back in this country on 4th May, 1971, I was preparing to get on the air with my old call sign G2KG (52 years old). I coupled up the rig in my bedroom with a 20 mx dipole coiled up on the floor and as the set warmed up there, without touching the dial, was VK3WW working a ZL4, with a signal from my old beam Q5 SO, but on the speaker."

Sad ending—the beam was smashed during the big blow in Melbourne on 3rd October.

—M. O'Burtill, VK3WW.

PREDICTION CHARTS FOR DECEMBER 1971

(Prediction Charts by courtesy of Ionospheric Prediction Service)
144 MHz. Dual Conversion AM Receiver Kit

SPECIFICATIONS:

Frequency coverage: 144-145 MHz.
Sensitivity: 0.3 uV. for 6 dB. S + N/N.
Bandpass Filter at 455 KHz.
Input Impedance: 50 - 75 Ohms.
Audio output: 1 watt r.m.s. into 8 ohms.
Audio output impedance: 8 or 15 ohms.

Incorporates BFO and Noise Limiter.
Supply voltage: 9 - 16 volts; negative earth.
Varicap tuned VFO.
Kit includes all Capacitors, Resistors, I.F's, Pots, Switches and 14 Transistors.
Front end uses TIS88s; I.F., Dual Gate Mosfets.

Complete with Instructions and pre-drilled and etched Circuit Board

Special Introductory Price $42.00

SPECIAL! 2N3055 115 watt 15 amp. 60 volt Silicon NPN Power Transistors $1.50 ea.

Come and inspect the full range of equipment and components at

WAYNE COMMUNICATION ELECTRONICS
757 GLENFERRIE ROAD, HAWTHORN, VIC., 3122
Phone 81-2818

DX UNSATISFACTORY?
THEN WHY NOT 2 FM?
(especially for that Interstate Holiday Trip)

with the ICOM IC20—BY INOUE!

- 12 Channels, 10 Watts output.
- Modular construction.
- See “A.R.” October for more complete details or write for spec. sheet.

PRICE $325 inc. tax Yes, price is up!
Blame the floating Yen! Terms available.

ALSO AVAILABLE—
- IC71 6 Metre Transceiver, FM-AM-CW using crystal or VFO.
- Collins R390 and R390A Receivers. P.O.A.

Enquiries and Inspection:—  INDUSTRIAL & MEDICAL ELECTRONIC CO.
6TH FLOOR, 288 LITTLE COLLINS STREET, MELBOURNE, VIC., 3000
Phones: 63-9258, AH 848-3018, 848-5790

MAICO ELECTRONICS  A taxtron COMPANY Mount Street, Heidelberg, Vic. Ph. 45-2615
DIVISIONAL NOTES

DIVISIONAL CALENDAR

3 Dec VK2-V.h.f. meeting (Auction Night).
Gosford meeting.

V.K.—V.h.f. meeting (Equipment Display also).

5 Dec VK2—V.h.f. Field Day (1100-1600).

11 Dec VK2—V.h.f. Christmas Party and Fox Hunt.

12 Dec VK3—V.h.f. Dist. R.C. Xmas Outing, Yarra Glen (all day).

14 Dec VK5—V.h.f. Social.

17 Dec VK2-General meeting. Gosford meeting.

NEW SOUTH WALES
MEMBERSHIP APPLICATIONS
The following were presented to the General Meeting on Friday, 24/9/71: Mr. R. Atkins, SMROW Branch; Mr. R. C. D. C., SMROW Branch; Mr. H. W. Buehler, C/o. Gulf Fisheries A.N.Z., P.C. Box 920, Port Moresby. N.G., W.I.A.; Mr. A. S. Brooks, 11 Haw-Hunziker, 26 Chatham Ave., Taree, 2430, VK2 Maitland, 2323, VK2ZDR; Mr. D. Ford, School (pre-8th Sept./Oct. was on site at Dapto. After days’ broadcasts, it is suggested that you have your rigs going. The job of suitably coupling the tx frequency into the dish feed and in getting the tx antenna pmf to operate satisfactory. Parts are also being solicited for a telescope and photo-transistor unit to allow optical sighting of the dish on the sun and moon, to give accurate positioning of the main lobe of energy on the moon.

MORSE TAPE SERVICE
The following clubs made application, but the necessary permits are not yet available:

OXLEY REGION RADIO CLUB
A meeting was held on 3rd Oct. last by Messrs. H. G. Hunt. It was decided to name the hill on the surrounding area. It was decided to name the hill, if you are interested in DXing, notes were prepared for you. Lawrence, P.O. Box 107, Kundiawa, T.P.N.G., 2121, VK2ZVV/T; Mr. M. Francis, 93 Kingdon St., Scone, N.S.W., VK2ZDR/Taree OK Youth Radio Club, C/o. G. M. Hunt, Triumph Rd., West Gosford meeting.

NOON TIME OF F.M. BASE STATIONS
The following clubs have f.m. base stations on loan from W.I.C.E.N. for W.C.I.E.N. purposes:

NEW SOUTH WALES
MEMBERSHIP APPLICATIONS
Our enthusiastic Short Wave Listener representative, Tony VK3KZLQ from Bordertown, South Australia, has demonstrated the committee actively investigating the few alternatives found. A conception of the W.I.A. 52 MHz. W.A.S. AWARD

New Members:

W.I.A. 52 MHz. W.A.S. AWARD

New Members:

A.W. 52 MHz. W.A.S. AWARD

New Members:

Cert. Additional

Call Countries

97 VK7ZBY

98 VK7ZGJ
When I handed this column over to the Editor I was not sure if it was possible that I would be taking it over again within such a short space of time. Difficulties which we had to face and which I believe I have overcome, and this in itself is a big factor in the successful handling of any task. It is my intention to continue giving all the information which will enable the reader to acquire his QSLs. Any information of this nature or concerning the VK operation from Penrith, 2750, will find me, or a call to Springwood 51134, will do the trick.

In a recent newspaper article published in a Sydney week-end broadsheet, Amateur Radio was mentioned, and I thought that the main interest to the writer seemed to be of a purely technical nature, which I believe can be dispensed with.

The writer, in passing, mentioned that it is possible to converse with people in all walks of life on the medium of Amateur Radio. This is very true, as this very brief list will show. A t one stage, three of the princes of Saudi Arabia were active using the calls HZ1AF, HZ1TA and HZ1SS. OE3AH has an item of news, and this month I

Next time you work a W who says "handle your QSL to Box 88, Moscow, and the replies eventually will be answered from behind the iron curtain."

Some of our QSL managers might be interested in the following stations: UH8AE, UH8BG, UH8BO, UH8BV, UH8C, UH8D, UH8E, UH8F, UH8G, UH8H, UH8I, UH8J, UH8K, UH8L, UH8M, UH8N, UH8O, UH8P, UH8Q, UH8R, UH8S, UH8T, UH8U, UH8V, UH8W, UH8X, UH8Y, UH8Z, and UH8A. I would be pleased to hear from any body who has worked either of these calls.

Band conditions at the time of writing are fair, the DX band being open between 80 and 40 m, with 40 m being the best for the W's. The South American countries are still belting in the early afternoon, with several more stations having been loaded. 20 metres has been lively up around 1430z, and most times that have been checked it is clear that there is a plentiful number of contacts available for the taking. Amateurs are on the air for a good part of the summer will be the chasers working the VKs over the weekends. It is appreciated by many of the chasers that they are indulging in verbal and written contact, and this in itself is a big factor in the successful handling of any task. It is my intention to continue giving all the information which will enable the reader to acquire his QSLs. Any information of this nature or concerning the VK operation from Penrith, 2750, will find me, or a call to Springwood 51134, will do the trick.

That is about all I have for this month. I hope you will find that it is one of Hollywood's best known characters, or a group of World War II pilots. Many contacts would be far more interesting if a little more interest was taken in the person on the other end of the wire.

Band conditions at the time of writing are fair, the DX band being open between 80 and 40 m, with 40 m being the best for the W's. The South American countries are still belting in the early afternoon, with several more stations having been loaded. 20 metres has been lively up around 1430z, and most times that have been checked it is clear that there is a plentiful number of contacts available for the taking. Amateurs are on the air for a good part of the summer will be the chasers working the VKs over the weekends. It is appreciated by many of the chasers that they are indulging in verbal and written contact, and this in itself is a big factor in the successful handling of any task. It is my intention to continue giving all the information which will enable the reader to acquire his QSLs. Any information of this nature or concerning the VK operation from Penrith, 2750, will find me, or a call to Springwood 51134, will do the trick.
AMATEUR BAND BEACONS

VK0 52.955 VKOMX, Mawson.

56.544 VK0GR, Casey.

52.525 VKOMX, Mawson.

53.544 VK4OP, Casey.

52.537 VK4OP, Casey.

VK4 144.380 VKAYV, 107m. W. of Brisbane.

53.000 VKSVF, Mt. Lofty.

52.006 VKSVF, Bickley.

52.900 VKETS, Carnarvon.

51.500 VKETT, Carnarvon.

51.550 VKETS, Carnarvon.

52.010 VK0FLB, Bickley.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

VK7 145.100 VK7MB, Kangaroo Island.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.000 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.

52.070 VK0FLB, Bickley.

57.300 VK5J, Carnarvon.

52.900 VK6TS, Carnarvon.

52.006 VK6TS, Carnarvon.

52.900 VK6TS, Carnarvon.
LOW DRIFT CRYSTALS

1.6 Mc. to 10 Mc.,
0.005% Tolerance, $5

10 Mc. to 18 Mc.,
0.005% Tolerance, $6

Regrinds $3

THESE PRICES ARE SUBJECT TO SALES TAX

SPECIAL CRYSTALS: PRICES ON APPLICATION

MAXWELL HOWDEN
15 CLAREMONT CRES., CANTERBURY, VIC., 3126
Phone 83-5090

LOG BOOK

AVAILABLE IN TWO TYPES— VERTICAL OR HORIZONTAL

Larger, spiral-bound pages with more writing space.

Price 75c each
plus 25 Cents Post and Wrapping

Obtainable from your Divisional Secretary, or W.I.A., P.O. Box 36, East Melbourne, Vic., 3002

FOR ALL...
ANTENNA and R.F.
SWITCHING... use
Dow-Key SERIES 60

High Performance COAXIAL RELAYS

The Dow-Key coaxial relays are ruggedly built and individually inspected for complete dependability. Because of the quality and adaptability of the relays, they are now being used in a multitude of applications — including military, industrial, and amateur field. Dow-Key Series 60 Relays are used for many RF switching applications. Write for free technical brochure.

DOW-KEY COAXIAL RELAYS

AVAILABLE from

R.H. Cunningham
15 CLAREMONT CRES., CANTERBURY, VIC., 3126
Phone 83-5090

Dow-Key Relays

A. R. 12/71

Name
Address

Obtainable from your Divisional Secretary, or W.I.A., P.O. Box 36, East Melbourne, Vic., 3002

Dow-Key Email Services
60 SHANNON ST., BOX HILL NTH., VIC., 3129
Phone 89-2213
VHF NOTES
(Continued from Page 19)
to Adelaide. Rob VK5ZDX even worked Kerry on 6 mx as well, but signals were considerably weaker than on 2 mx. Others getting in on this two-way activity east and west included Mick VK5ZD, Noel VK5ST, John VK5QZ and Jim VK5ZMJ. Much grumbling of teeth went on in my shack as the invasion did not reach the 39 miles inland to my location, and I had to content myself with one solitary b.f.o. note from VK5SU and a very weak signal from VK3AOT, no contacts made, not a sound from any other station, but that’s the selective pattern of these openings, and there was nothing I could do about it.

TWO YEARS OF OPERATION
That’s right. That’s the length of time I have been trying to keep you filled in on some of the v.h.f. news of Australia. It has not been easy and still isn’t. It takes a lot of time and much reading and sifting of material to have to be done before copy can be prepared for “A.R.” I am indeed grateful to a few V.h.f. groups to whom I am indebted for much information. I will keep going for the main this way until the March issue. Where we are now daylight saving time as the Editor’s blue pencil comes in!!

I may not be able to include all you send, but improvements are always welcome, news items passed by, time mellows one’s thoughts and the selective pattern of these openings, and there was nothing I could do about it.

LINCTUS SYNAPSIOSAE or Little Morsels
A receiver capable of detecting these transmisions need only consist of a pair of head-phones connected to two earth rods separated by as great a distance as possible. (Rad. Comm. Dec. 79–1 KHz).

They would not care to see c.w. watts (“73,” Mar. ’71). Dressed particular attention to the development of the ultra-high frequencies and television which was the job of the Amateur today. (T. & R. Bull., Jan. 1933).

Two years ago I took a trip to Latin America. I had written to every Amateur Radio Association in the countries I was going to visit, giving them the exact date and time of my arrival, flight number, hotels where I would and I explained that I would like to meet with local Amateurs. I did not get one single (phone) call from them during the entire trip. However, I did manage to meet local Amateurs on my own. (WBAQQC. Re-ceived the thought for Foreign Amateurs visiting New York City, May 1971).

The use of voluntary services by thousands of individuals (Amateurs) on a world-wide basis provides a service to humanity in the advancement of scientific knowledge that cannot be matched by any single country (W.A.R.C. Geneva 1971, extract from U.K. Doc. 313).

The rapid growth of f.m. is beginning to catch up with us. In most major metropolitan centres 146 to 147 MHz. is full with repeaters and simplex operation; the top 10 MHz. of the 430 band is full with repeaters, simplex, up-links, down-links, and various control func-tions. WARC 1970 provided fulling in non-channel 2 areas (fM in “CQ” Oct. ’71).

It is a curious fact that one of the longest standing unsolved riddles in this field (radio astronomy) is commonly studied with a simple equipment. Radio astronomy, in relation to the powerful sporadic radio emissions from, or near, the planet Jupiter, in the spectrum around 15 to 20 MHz.)

H. F. Evertick.

OBITUARY

DUDLEY NOURSE, VKDQ
The key of Dudley Nourse is now and for ever silent. What kind of a man was VKDQ? He was an exponent of the art of c.w., shorthand and typing.
He was one of the pioneers of s.s.b. and with home-construction of early transmitters for the original member of the 80 metre “Sewing Circle”. Ever willing to assist others, his cheery voice full of “sky-larking” could be heard out over 80 metres, and he was well known to all who were close to him and realised the tremen-dous suffering his war injuries caused him. I considered him a close personal friend and deeply regret his sudden passing.

Although his key is now silent, I’ll wager he can hear us on u.s.b. and will some day s.t. again when we finally net in on his frequency.

To his XYL Joan and family Pam, I extend on behalf of those who knew him deep and sincere sympathy.

P. N. Dudley, CU further down the log—VKX5B.

ANdrew John Wrigglesworth, VK2BKW
Andrew’s mother writes from Bangalow that he was only 25 years old when he died on 23rd September, and had always been interested in radio, and was a member of the W.I.A.

He was an lecturer on v.h.f., and had had some experience in transmitting, but had collected W.A.C. after construct-ing his own transmitting and receiving equipment. He was keenly interested in using parabolic dishes for his antennas.

Andrew was keenly interested in radio and had often been heard on 80 metres. He was VK2BKW in “Amsat Newsletter, Sept. ’71.

PIELE-UPS ON 435?
With the continuing progress on A-O-B and the good prospects for SYNCART and SKY-LARGE, DX bands like we will soon have several new DX bands. Unfortunately, different and many DX bands have been needed to work DX at v.h.f/u.h.f.; so, we probably won’t see that many stations on the satellite repeater channels for a while.
If we get SYNCART working, though, the word will get around pretty quick about the new band. One might speculate: How long until we see the first “pile-up” trying to work a rare station? What rules of courtesy do we observe? Will the old DX pile-up problems re-appear in the v.h.f. bands? In satellite relay links, high power and high gain antennas are even more of an advantage than at h.f. Will the first satellite-relay DCC’s award automatically go to the Amateur who is first able to put a kilowatt into a 30-foot parabolic dish?
These are just two questions among others we like to solve. One “pile-up” problem, like strong signal “capture” of the satellite repeats, might be eliminated in future design. Others, like the problem of wideband Amateur t.v. and satellite channels on the same fre-quency, require tact and understanding of everyone’s part. Some problems, like the crank who wants to use his transmitter to hurt everyone else, will probably never go away.

The stakes that ride on these solutions are higher in the satellite game than they were at h.f. At the Space Conference, we were given notice that our performance on 435 will be looked at carefully. Our ability to get new bands for space links, and to determine what we have now, depends on how well we can solve these problems.


Photograph taken at Ockley Radio Club, Narrogin, Western Australia, on 2nd October to mark the visit of the Federal Radio Club of America, with glasses). Operating mobile was Percy Beacher, VK6DD, Vice-President of the VK Division, who drove Michael around.

(Block courtesy Narrogin Observer)
NEW CALL SIGNS  
AUGUST 1971  
VK1DS—P. A. Smith, 6 Rowell Pl., Weston, 3103.
VK1CAW—O. B. Wilson, Youth Hostel, Dryandra St., O'Connor, 2601.
VK25QO—F. N. Walker, 21 Isabel St., Belmore, 2192.
VK2BAA—Armidale Police Citizens' Radio Club, Rusden St., Armidale, 2350.
VK3PM—G. S. Frew, 13 Wellington St., Middle Brighton, 3186.
VK3YV—D. T. K. Johnson, 1 Shirmpton Crt., Box Hill North, 3125.
VK3ABM—W. Porter, 1 Heyington Pl., Toorak, 3142.
VK3AJU—J. J. Upp, 20 Webster St., Dandenong, 3175.
VK3BFT—Collingwood Technical College, 35-41 Johnston St., Collingwood, 3066.
VK3YCO—A. H. Ekund, 8 Nelson St., Bentleigh East, 3155.
VK3YGC/T—R. C. Corrigan, 3 Valewood Dr., Maroubra, 3179.
VK3ZHC—J. D. Mathieson, 3 Cherry Rd., Brighton, 3186.
VK3BPA—N. G. Williams. Transferred to Qld.
VK2YV—G. T. Littlefair. Deceased.
VK2WS—R. N. Sneddon. Deceased.
VK2JZ—A. S. Mather. Deceased.
VK2BED—A. H. Bennett. Not renewed.

ALTERATIONS  
VK1ZVT/T—S. D. Thomas, 2/47 Hampton St., Burnie, 7320.
VK2BVB—Waverley Radio Club, 49 Old bush Rd., Engadine, 2233.
VK2LV—M. C. Elsey, 21 Avoca St., Randwick, 2031.
VK2AB—B. S. Sullivan, 186 Kilaben Bay Rd., West Wollongong, 2560.
VK2KNO—J. A. Simmons, 6 Koorabbe Ave., West Wollongong, 2560.
VK2AK—C. S. Smith, 244 Bacon St., Grafton, 2460.
VK2AS—V. H. S. King, 29 Coutum St., West Kempsey, 2440.
VK2ATZ—Weslake Radio Club, Anzac Pde., Teralba, 2284.
VK2BQV—G. Veron, 60 Dutruc St., Randwick, 2031.
VK2CA—G. Svensen (Sen. Ldr.), Lot 25, Reid Rd., North Springwood, 2777.
VK2FXV—T. F. W. Bowd, Lot 20, Hickey St., Ballina, 2478.
VK2FZF—A. E. Kent, Lot 386, Thirroul Rd., Kanahooka Pl.
VK2ZHE—H. I. Deland, 10 Tyrone St., Chatswood, 2067.
VK2ZUU/T—R. Eccleston Addition of T., NK2ZH—N. Yeomans, 44-45 Durrant St., North Brighton, 3186.
VK3VH—H. F. Payne, 8/42 Clark St., Port Melbourne, 3207.
VK3VP—H. W. Payne, 3 Harrow Ct., Doncaster, 3108.
VK3ABG—J. A. Miller, 554 Malvern Rd., Prahran, 3181.
VK3AGW/T—A. G. Wilkey, Station: Upper Mt. Morford Rd., Belrigde Heights, 3106; Postal: P.O. Box 106, Oakleigh, 3166.
VK3ARS—R. A. Boucher, 11A Hall St., South Yarra, 3141.
VK3BBI—L. Lukes (name amended), 4 Penelope Pl., Middle Brighton, 3186.
VK3ZPG—R. J. Broughton. Addition of T., VK3LZ—G. S. Frew, 8 Comrie Crt., Bayswater, 3155.
VK3ZGC—P. M. Bruer, 21/49 Walsh St., South Yarra, 3141.
VK3OF—K. P. O'Farrell, 37 Amsterdam St., Upper Mt. Gravatt, 4122.
VK3ZDS—S. L. Morrish, 3/4 Morshard St., Bundaberg, 4670.
VK3QZ—T. T. Williams, 7 Peronbaena, M., Kensington Gardens, 5068.
VK3XG—G. N. Antuar, 16 Pine St., Peterborough, 5429.
VK3ZCB—T. R. Friee, 145 North St., Henley Beach, 5022.
VK3ZPF—R. Banks, 3 Park Tce., Enfield, 5085.
VK3BB—R. C. Davies, 57 Waller St., Dryandra St., O'Connor, 2601.
VK3ZIB—Waverley Radio Club, 49 Old Bush Rd., Enfield, 5067.
VK3ZMV—M. H. Winkler (Rev. L). Not renewed.
VK3BA—Brompton Boys' Radio Club. Not renewed.
VK4BF—W. F. Davidson. Not renewed.
VK2BPA—N. G. Williams. Transferred to Qld.
VK2BPA—N. G. Williams. Transferred to Qld.

LICENSED AMATEURS IN VK  
AUGUST 1971  
VK1V—S. S. St. George. 2 Aspect St., Toorak, 3142.
VK2ZAV—D. S. Thomas, 2/47 Hampton St., Kensington Gardens, 5068.
VK2ZAV—D. S. Thomas, 2/47 Hampton St., Kensington Gardens, 5068.

THE MORSE CODE MADE EASY  
An album of three Records produced with Ivan R. Hodder by the Flight Training Centre (Aust.) Pty. Ltd. Revolutionises the learning of Morse Code— all you need is the Family Record Player!  
The F.T.C. course has discarded the old, now outdated system of learning the Morse Code by visual means alone. Those learning the Code by this method rarely progress beyond five words per minute. This course is designed to teach aural recognition of the symbols— the student himself will hear them in actual use. The symbols are always transmitted at the same speed— otherwise their aural characteristics alter—and only the spacing between groups slowed down or speeded up as the student gains proficiency. In addition, the student is taught to "sing" the symbols with the correct rhythm, so becoming his own "transmitter" during the most critical phase of his tuition.  
He hears an oscillator signal for the first time only after becoming proficient at six words per minute using the "singing" technique. He then starts at four words per minute, working back up to and beyond the six words per minute already achieved. Proof of the efficiency of the system is the large increase in passes by those who have used the F.T.C. course, proving that nothing is more effective than the "singing" method.  

PRICE $13.00 post paid  
(Includes three Records and Instructions)
OVERSEAS MAGAZINE INDEX

1. A ground station for satellite communication. (2) A ground station for satellite communication. (3) A ground station for satellite communication. (4) A ground station for satellite communication. (5) A ground station for satellite communication.

HAMADS Minimum $1 for forty words

HAMADS WILL NOT BE PUBLISHED UNLESS ACCOMPANYING REMITTANCE

Advertisements under this heading will be accepted only when the application is in writing. The published will reserve the right to reject any advertising which, in their opinion, is of a commercial nature. Copy must be received at least 3 months before the date of publication.

FOR SALE: Collins 75A4, immaculate, owned since new, only one of the last batch made. Latest Collins mods., mechanical filters 4, 5 2 2 Khez Compton, with Panamascopes, stand, 2 2 2 Vert. S. F. A. P. S. R. T. M., all manuals. $950 N. Stilwell, P.O. Box 194, Bendigo, Vic. Phone 194, 541,490.

FOR SALE: Collins 75A4, immaculate, owned since new, only one of the last batch made. Latest Collins mods., mechanical filters 4, 5 2 2 Khez Compton, with Panamascopes, stand, 2 2 2 Vert. S. F. A. P. S. R. T. M., all manuals. $950 N. Stilwell, P.O. Box 194, Bendigo, Vic. Phone 194, 541,490.


INDEX TO VOLUME 39-1971

ANTENNAS, ETC.
Development of an All-Band Vertical ....................... Oct. p.11
Home Station Antenna for 160 Metres:
Part One—Introduction .................................. May p.3
Part Two—Vertical Polarised Antenna ................... Jun. p.3
Part Three—The Balanced Horizontal ..................... Jul. p.14
Part Four—Practical Applications ......................... Aug.p.13
Part Five—Inverted "L" & Sloping Antenna ................ Sep. p.3
Quad vs. Triband Yagi ................................... Jul. p.5
Results of the 1970 Vic. 432 MHz. Ant. Gain Contest .... Jan. p.10
The VK2AAR Special Ant. ................................ Jul. p.4
The "Z" Match .............................................. Sep. p.7

CONTEST RULES AND RESULTS
"CQ" W.W. DX Contest—Australian Results ................ Feb. p.11
National Field Day Contest:
1971 Results ............................................ May p.16
1972 Rules ............................................... Nov.p.13
Remembrance Day Contest:
1971 Rules ............................................... Jul. p.20
1971 Results ............................................. Nov.p.16
Ross Hull V.h.f. Contest:
1970-71 Results .......................................... May p.16
1971-72 Rules .............................................. Oct. p.15
VK-ZL-Oceania DX Contest:
1970 Results ............................................. Jun. p.14
1971 Rules ............................................... Jul. p.19
VK2 Mid-Winter V.h.f./U.h.f. Contest ...................... Jun. p.22
Winter V.h.f. and U.h.f. Contest ........................ Apr.p.11

INSTRUMENTS
A Tester for Field Effect Transistors ...................... Nov. p.8
Counter used for Frequency Measurement:
Part Two—Gating, Display Time, Reset ..................... Mar.p.13
Notes on the R.F. Bridge .................................. Oct. p.4
The R.F. Bridge ........................................... Jul. p.12

MISCELLANEOUS
Amateur Equipment and Customs Department ................ Feb. p.10
Amateur Radio Co-operation—YB Style ...................... Nov.p.11
Army Trek to Ayers Rock .................................. Dec.p.13

MISCELLANEOUS (Continued)
A Table of Distances between Asian V.h.f. Locations .... Nov.p.12
Tables ................................................................ Nov.p.14
Australian DX Century Club Award Rules .................. Jan. p.11
Australian Standards for Electromagnetic Interference May p.17
Australian V.h.f. Cent. Club Award Rules ................ Jan. p.11
For Technical Articles January .......................... Jan.p.18
Brisbane DX Club Award .................................... Apr.p.16
Central Coast Award ....................................... Jan.p.20
H.A.M. DX Century Club Award .......................... Sep.p.10
Getting to know your Neighbour ............................ Oct.p.12
Key Section ................................................ Jun.p.18
Rules ................................................................ Nov.p.19
La Balsa—A Triumph for Amateur Radio .................. Jan. p.4
New Zealand Counties Award ............................... Jan.p.9
Novice Licensing—Some Important Correspondence .... Jul. p.3
On with the Show .......................................... Dec.p.9
Region 3 Conference, 1971 ................................ Jun.p.21
Southern Cross Award ...................................... Oct.p.14
So you have changed your QTH ............................. Jan.p.18
Space Conference Report .................................. Sep.p.9
SPX Bulletins ............................................... Aug.p.21
Sun's X-Rays to be Mapped Sep. p.20
V.h.f./U.h.f. State Records ................................ Jul. p.28
VK1VP/P Expedition for the N.P.D., 1971 .................. Jul. p.22
W.I.A. Worked All States (Aust.) Award Rules .......... Feb.p.9
"Wind of Change"—Report on 35th Federal Convention May p.23
Zone 29 Award ............................................... Jul. p.25
35th Federal Convention .................................... Jun.p.19

RECEIVING
A Transistorised Carphone:
Part One—The Receiver ..................................... Mar. p.5
Errata, Part One .......................................... Apr.p.16
Some After-Thoughs ....................................... Jun. p.9
Drake 2-B Receiver on Top Band .......................... Nov. p.3
Modifications to the Mute Circuit of the Pye Mk. 2 .... Mar. p.8
VK3 Six Metre Converter .................................... Dec. p.3

TECHNICAL MISCELLANEOUS
A Bit of Light Nonsense .................................... Oct. p.5
Acitron SSB-400 Transceiver ................................ Nov. p.5
Australias:
A-O-5 Performance .......................................... Mar. p.9
Balloon Flights:
A Preliminary Report ....................................... Jun.p.17
Oscar Balloon Report ....................................... Jul. p.17
Equipment Recommended for Oper. with A-O-B .... Dec.p.14
Project Australis Report .................................... Oct. p.11
Circuits for All—A Simple Method of Drafting .......... May p.5
Crystals for Carphone—and Other Things ................. May p.6
Freq. Measuring Equipment ............................... May.p.15
Lectures by VK3AXU:
No. 8A—Power in A.C. Circuits ............................. Mar.p.16
No. 10B—Harmonics ........................................ Jan. p.8
No. 10C—Harmonics ........................................ Feb.p.6
Errata to Nos. 5, 6, 10A .................................... Feb.p.8
No. 11—The Decibel, and Decibels vs. % Distortion Apr.p.8
No. 12—Amplitude Mod. .................................... May p.9
No. 13—The Class C R.F. Amplifier ......................... Jun.p.10
Erratum, No. 14A ......................................... Aug.p.7
No. 14B—Angle Modulation ................................ Aug.p.3
No. 14C—Angle Modulation Sep. p.4
Osc. Kits for the Amateur ................................. Dec.p.8
P.e.p., Average Power, and Related Matters ............. Aug.p.6
Practical V.h.f. & U.h.f. Coil-Winding Data ............. Aug.p.7
Practical VXO Design ...................................... Apr.p.12
The "Sentinel" .............................................. Oct.p.3
The Solar Link ............................................. Oct. p.8
The "Z" Match .............................................. Sep. p.7
Two-Stub Notch Filters for T.V.i. ......................... Jul. p.15
V.h.f. Meteor Scatter Propagation ........................ Aug.p.11
432 MHz. Ant. Gain Contest ............................. Jan.p.10

TRANSMITTING
A Transistorised Carphone:
Part Two—Transmitter ...................................... Apr. p.5
Some After-Thoughs ....................................... Jun. p.9
A 20W. 576 MHz. Varactor Multiplier Transmitter ..... Apr.p.9
Filter Type S.s.b. Transmitter ............................ Dec.p.10
Practical VXO Design ...................................... Apr.p.12
YAESU offers the all new YAESU FT-DX-401 SSB Transceiver. Considered the best buy in Amateur equipment available today, the FT-DX-401 features high power, super sensitivity, and sharp selectivity, in one complete station package. PTT microphone is included. Except for a speaker, no other accessories are needed to be "on the air".

De luxe equipment built-in to the FT-DX-401 at no extra cost includes: AC power supply, noise blanker, dual calibrators (100 KHz. and 25 KHz.), VOX, break-in CW with sidetone, 100 Hz. sharp CW filter, clarifier, phone patch terminal, cooling fan, and WWV 10 MHz. band. Full transceive capability 80 through the complete 10 metre band.

Two blank auxiliary positions are provided on the bandswitch. The FT-DX-401 features velvet smooth tuning with zero backlash planetary gear system. Read-out to 300 Hz. is easily obtainable when calibrated to the nearest 25 KHz. marker. WWV frequency check to crystal calibrator assures "on frequency" operation on all bands.

For DX operation a noise blanker is mandatory... the FT-DX-401 has it! Complete with signal threshold control, the blanker picks out noise spikes completely and leaves only clean signal copy.

DUAL TOROID first I.F. stage provides high gain/bandwidth product for double conversion circuit used in the FT-DX-401. This system guarantees linear tuning rate plus high image rejection.

Twenty tubes plus fifty silicon semiconductors make up the active devices used in the Transceiver. The passive crystal filters are of the six-pole type designed for optimum SSB audio quality and sharp CW reception.

The FT-DX-401 was planned and designed specifically for the World Amateur. Export quality, with superior components and finish, specially tested, and including hand-held PTT microphone. Spare parts, personalised 90-day warranty, and continuing service available through your authorised dealer.

Check the specifications and compare your cost. We believe that the FT-DX-401 is truly the best buy in the Amateur field today.

Sole Authorised Australian Agent:

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 67-1650 (AH 371-5445)


Western Aust. Rep.: H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152. Telephone 50-4379

Prices include Sales Tax. Freight extra. Prices and Specifications subject to change.

Optional Extras: SP-401 Speaker $28.50

FV-401 External VFO $122.00

YD-844 De Luxe Desk Microphone $39.
Distributors
For Australian and
International
Manufacturers . . .

TEST EQUIPMENT:

RAPAR • SWE-CHECK
BWD • HORWOOD

Call and see our large
range of test equipment

SEMI-CONDUCTORS:

TEXAS INSTRUMENTS
FAIRCHILD AUSTRALIA
PHILIPS • DELCO • ANODEON

1971-72 CATALOGUE NOW AVAILABLE, $3

RAPAR Model F75K Multimeter

OPEN SATURDAY MORNINGS!

562 Spencer St., West Melbourne, Vic., 3003. Ph. 329-7888, Orders 30-2224
City Depot: 157 Elizabeth Street, Melbourne, Vic., 3000. Phone 67-2699
Southern Depot: 1103 Dandenong Rd., East Malvern, Vic., 3145. Ph. 211-6921