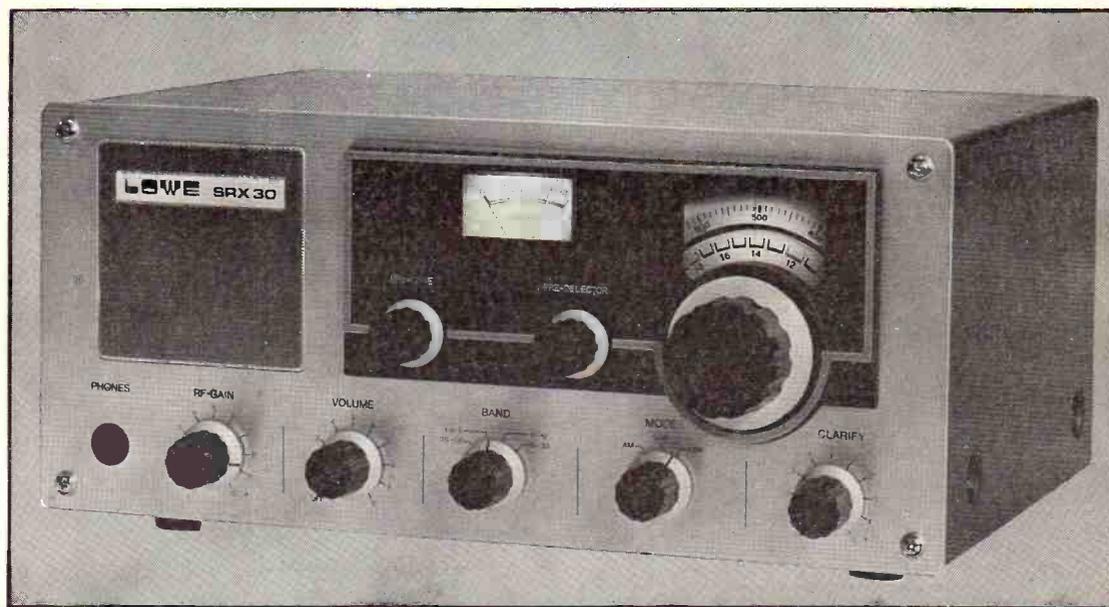


The SHORT WAVE Magazine

VOL. XXXVI

MAY 1978

NUMBER 3



SRX-30

For the advanced, keen short wave listener, the choice of receiver has usually been between cheap and nasty or very good but very expensive equipment. We think that the SRX-30 will provide that listener with excellent performance at a reasonable cost and is the answer to this eternal problem.

The SRX-30 provides AM, CW, USB and LSB reception on all frequencies from 500 kHz to 30 MHz. All right, so does your Sooper Blooper Mk. 3 but you can't set the Sooper Blooper dial to the frequency you want and be sure that it's correct!

The SRX-30 tuning system is so simple to operate. You have a dial reading in MHz from 0-29 and a main tuning dial reading 0-1000 kHz. So—if you know that Radio Slobovia is broadcasting on 10.295 MHz, you set the MHz dial to 10, the kHz dial to 295 and there you are. The MHz dial setting is not critical, as stability is guaranteed by a triple mixing drift cancelling system, thereby overcoming another problem in your Sooper Blooper Mk. 3; drift.

A further drawback to cheap receivers is massive image interference on the higher frequencies due to the use of a low IF, typically 455 kHz. The cure for this problem is the use of a high IF and the SRX-30 employs a first IF of around 40 MHz—so goodbye to first IF images. You could of course find the same system as this in the Racal RA17

series receivers; after all, the SRX-30 has copied the basic idea from this very receiver. The big drawback to the RA17 (apart from the price !!) is that unless you have the muscles of a prize fighter, lifting the RA17 may send you for a holiday at Hernia Bay (staying at the Truss House?).

To summarise, the SRX-30 covers 500 kHz to 30 MHz with excellent dial readout and reset accuracy; it has all mode (AM, CW, SSB) reception and is equally at home in broadcast or amateur bands; it has all the facilities of a top class communications receiver, RF gain, fine tuning, selectable sidebands, built in loudspeaker, operation from ac mains or 12v. Dc, rugged construction and super styling and all at an attractive price—£146.25 inc. VAT.

See it soon at your nearest stockist, you will be agreeably impressed.

SRX-30—£146.25 inc. VAT.

Carriage £3

LOWE ELECTRONICS
Cavendish Road,
Matlock,
Derbyshire

TS520S

Setting new standards in 6 band transceivers



TS520S

The TS520 from Trio was, as we expected, an outstanding success and many thousands are now in use around the world. Following the Trio practice of listening to suggestions and comments from users of the equipment, the TS520 was updated and appears as the TS520S. All accessories such as the TV502, VFO520 and SP520 are fully compatible with both models so there is no obsolescence. Major new features in the TS520S are:

Full band coverage from 160-10 metres with WWV at 15 MHz and a most important uncommitted band which will be used following any expansion or modification of amateur HF bands at WARC in 1979. This provision is typical of Trio advanced planning. Now that LORAN has finally gone from 160 metres, a whole new area of operation has opened up for the amateur and the TS520S gives you top performance for top band.

New speech processor using the latest audio compression techniques to give you extra signal punch when in the pile up but without introducing any clipping or distortion. The compressor can be put into use instantly by front panel switching.

Advanced noise blanker is built into the TS520S for virtual elimination of impulse interference such as ignition noise. The TS520S also incorporates the 35K35 dual gate MOSFET in the RF amplifier for outstanding cross modulation and spurious response characteristics. The 35K35 has a low noise figure (3.5 dB typ) and high gain (18dB typ) which contributes to the excellent receiver performance—less than 0.2µV required for 10dB S/N ratio on all bands. When the signal levels are exceptionally high, a 20dB attenuator can be inserted at the touch of a push button.

Razor sharp selectivity resulting from the use of an 8 pole HF crystal filter with 2.4 kHz bandwidth and better than 2:1 shape factor.

Skirt selectivity and ultimate stop band rejection are outstanding. Dual gate MOSFET devices in all receiver IF stages give first class AGC characteristics with no overloading or popping on speech peaks. The AGC has switchable time constant and can also be turned off for the keen CW operator.

A matching 8 pole 500 Hz CW filter is available and can be fitted by the set owner in a few minutes. This filter gives the CW operator really excellent selectivity with stop band rejection of a very high order.

Multi function metering of signal strength, ALC level, PA input current, RF output and HT voltage to the PA not only keeps the operator informed about the performance of the rig, but also allows instant calculation of power input. A built in low noise cooling fan keeps cabinet temperatures very low, even over extended operating periods. Break in CW with keyed sidetone and an advanced VOX system give easy control at all times.

Tuning up the TS520S is simple and fuss free due to the provision of a low power tune up facility. No need to worry about the crackling noises which are often apparent in transmitters using line output tubes; rugged 6146B tetrodes in the 520S give high power output with very low intermod products—in fact, the Trio TS520 series transceivers have always sounded outstandingly good on the air due to this fact.

The TS520S has all the features desirable in a high quality transceiver—RIT control, 25 kHz calibrator; separate mic gain and carrier level controls; built in speaker; power saving heater switch; provision for up to 4 fixed channels; all connector provision for linear and transverter control and many, many more.

Ask anyone about the TS520S, all reports are the same—it's the best around.



DG-5

The luxury of digital readout is available on your TS520S by connecting the new DG-5 readout unit. More than just the average readout system, the DG-5 mixes the carrier, VFO and heterodyne oscillator outputs to show your exact frequency at all times in all modes. This handsome accessory can sit on the TS520S for in-shack use... or on the dashboard during mobile operation for safety and convenience. Six bold digits display your operating frequency, and the digital hold switch serves as a memory.

Unique feature—the DG-5 can be used as a general purpose counter reading signals from 100 Hz to over 50 MHz so it's more than just a readout system.

N.B.—The DG-5 can be fitted to earlier TS520 models by using the adaptor kit DK-520.

TS520S £489 inc. VAT

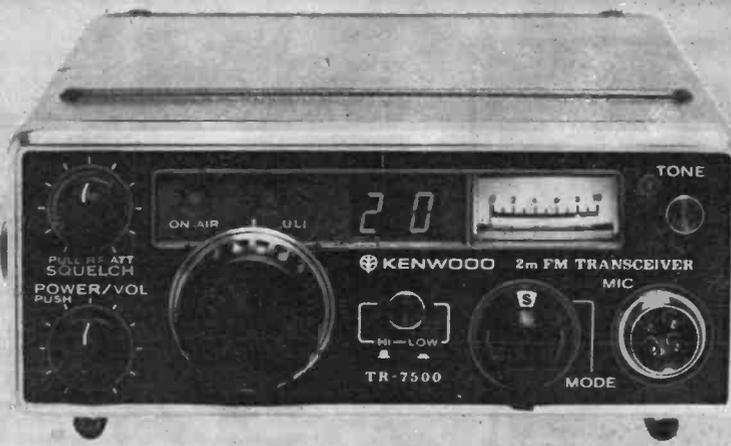
DG-5 £132 inc. VAT

LOWE ELECTRONICS
119 Cavendish Road,
Matlock,
Derbyshire DE4 3HE
0629-2430 or 2817

FOR FULL CATALOGUE SIMPLY SEND 45p in stamps to Matlock.

TR-7500

Why settle for anything less ?



TR7500

The TR7500 is the very latest 2 metre FM mobile to be introduced by TRIO and will delight the owner with its combination of performance, reliability and unique design. It represents another step forward in the TRIO product line and is designed to give you the very best FM transceiver available in its class.

Whatever you now own, or may have been thinking of buying, you would be foolish to settle for anything less than the TR7500.

PLL Synthesiser, no crystals to buy, ever, with the TR7500 since the operating frequencies are generated by a TRIO designed LSI phase locked synthesiser. This provides 80 FM channels at 25 kHz spacing from 144-146 MHz, all 10 repeater and reverse repeater channels. The channels are selected by a single knob and no programming is required from the user—just unpack the rig, connect 12 volt dc and you are on the air.

Unique display

TRIO attention to detail at its very best is shown in the method used to display the channel number. TRIO believe that ease of use is the priority consideration, and have arranged the large LED display to show the correct channel number at all times. If you want to operate on S24, turn the channel knob until the display shows 24—simple isn't it? Need R7? Turn the knob until the display shows 7. There's no need to wonder "did I programme S24 into channel 15 or channel 9?".

Repeater operation

Available at the touch of a front panel switch. Turn this to "N" (normal) and you operate normal repeater with 600 kHz receiver up-shift. If you wish to listen on the input, turn the switch to "S" (Simplex), and you are there—and can operate simplex on the input frequency. Need reverse repeater? Turn the switch to "R" (reverse) and you operate with transmitter up-shift of 600 kHz. This facility is most useful when you hear several stations calling into a repeater with only one (of course) appearing at the output. Using reverse repeater operation, you can call into the pack to invite anyone to a simplex channel for direct QSO.

Automatic tone burst is provided, with a front panel LED to remind you that you have the tone burst on. Needless to say, the 1750Hz is generated by TRIO's unique tuning fork oscillator which guarantees spot on frequency at all times and in all temperatures.

Performance plus

A combination of multi section helical filtering at signal frequency, monolithic crystal filters at 10.7 MHz, and sharp multi pole filters at 455 kHz allows the TR7500 to keep on working under strong adjacent signal conditions when other rigs give up.

The receiver performance for sensitivity is excellent. On the samples checked so far, we obtain 12dB SINAD for a startling 0.18 microvolts and under mobile conditions, we copy repeaters in terrain which previously presented real signal problems.

The transmitter generates a true FM signal at 10.7 MHz which is translated directly to two metres in a fully balanced mixer system. This guarantees a superbly clean signal with no unwanted multiplier products, and an all new PA system with specially developed transistors, gives rugged reliable power in excess of 10 watts.

As a final test for freedom from unwanted in band signals, we ran the TR7500 at full output with a TS700G coupled to it on the bench. Tuning from 144-146 MHz on the TS700G, we found just one signal—the wanted one. It was impossible to find a single unwanted signal coming out of the TR7500 under these extremely severe conditions. Wideband checks using the analyser revealed no spurious outputs detectable above noise level. At this point we retired happy!

Attention to detail

As is well known, TRIO introduced the since copied variable power SWR protection system, and it is of course fitted to the TR7500 with an improved high gain dc amplifier for tighter and faster control.

High/low band change is by push button, with S-meter illumination colour change to remind you of the band in use.

Another simple but typically TRIO thoughtful provision is the special channel knob with a deep moulded indent at 50. You can see this vertical by touch alone and can then count up the channels without even seeing the channel display. Great when mobile and you need your eyes on the road.

Finally the TR7500 with all its potent performance is packaged in a case not much bigger than a TR2200GX!

Accessories

The TR7500 is supplied complete and ready to use with the TRIO, quick release mobile, microphone, power leads, comprehensive manual etc., etc. Nothing more to buy to own the best mobile/fix station FM rig on the market.

**DON'T SETTLE FOR ANYTHING LESS
THAN THE TR7500
£225 inc. VAT**



TR2200GX

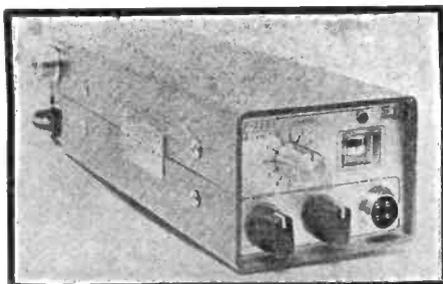
TR2200GX, £139 (3 ch.) £169 (12 ch.) inc. VAT

This is the definitive 2 metre FM portable rig which has won praise from all over the world. Over 2W transmitter output with switched reduction to 400mW for local contacts. High gain receiver with double IF filtering at 10.7 MHz and 455 kHz for razor sharp selectivity.

The TR2200GX is supplied with all accessories including the battery charger for the optional Nicad battery pack, the removable telescopic antenna, the carrying case, the shoulder strap, external power lead, microphone and handbook. Fitted with 12 channels, the price is only £169 inc. VAT. If you wish to start out at a lower price, we can supply the rig fitted 3 channels for only £139. With all its performance, the TR2200GX is a must for the portable operators. At the price, it has to be the best around. Just look around at the next rally and see how many operators are carrying them.

LOWE ELECTRONICS, Cavendish Road, Matlock, Derbyshire. 0629-2817

LOWE ELECTRONICS



KF 430

- * SMALL SIZE only 240 x 85 x 60mm.
- * LIGHT WEIGHT only 1.2 Kg.
- * FREQ. RANGE 433-436 MHz.
- * POWER O/P. 10W. or 3W. swit' d.
- * SENSITIVITY 0.4µV for 20dB qtnq.
- * AF. B/Width. 500-3000Hz.

These brief details cannot convey the sheer quality of construction of the KF430. The entire receiver front end is housed in its' own fully screened enclosure, as is the transmitter output section. Multiple tuned circuits ensure a clean output signal at all power levels. All crystals are fitted with individual trimmers for spot on accuracy. The receiver selectivity is to current UK and European standards and an automatic tone burst is fitted. The KF430 comes with 9 channels fitted to cover all simplex and repeater channels in current use. A matching microphone and mobile mount are included.

SPECIAL PRICE : £180 inc. VAT and fitted nine channels.



NR56

This remarkable little receiver gives the 2m. FM listener everything he wants at a very reasonable price. Excellent sensitivity, stability and selectivity coupled with a built-in VFO and very effective squelch make it the ideal receiver for both beginner and keen listener. Although the built-in VFO more than covers the entire 2m. band, crystal control of FM channels offers many advantages (particularly in mobile operation), so crystals, which are ex-stock, may be fitted for the popular channels and repeaters. It requires 12v. DC for operation and it thus is an excellent mobile receiver for mounting in the car, boat or caravan as well as for home use.

NR56 £54.00 inc. VAT.



ASV1515 VHF FM MONITOR

The ASV1515 is a new development of the well known Lowe Monitor. The ASV1515 carries on in the tradition of providing the ultimate in low cost monitor facilities, but with a much improved specification and incorporating many features requested by previous customers.

The ASV1515 covers the entire 2 metre band and has facilities for fitting up to 12 crystal controlled channels. Its small size and light weight means that it can be fitted almost anywhere.

The ASV1515 has a built in 240v. AC mains power supply and can also be operated from 12v. DC (negative earth). A built in loudspeaker is provided to make the receiver completely self contained.

Further improvements such as the new FET RF stage and a 15 kHz IF filter give the ASV1515 really good performance at low cost. Ashore, afloat or mobile, the ASV1515 is equally at home keeping you in touch with all the activity.

ASV1515. SPECIAL PRICE £29 inc. VAT and post. CRYSTALS £2.40 each inc. VAT.

In addition to the reasonably priced goodies listed above, we have some stock of the Trio VFO 30G 2 metre VFO. With the advent of more and more synthesised rigs, VFO control is going out of fashion and the Tokyo factory want to clear out the VFO 30G at rock bottom price. It's made for the TR7200G and TR2200GX, covers the full 2 metre band and has 600 kHz shift built in. At £45 inc. VAT, it's less than half price so it's first come first served on this one.

Must mention that some of our chaps listed below have been offended by people assuming that they are only selling agents. When we chose our agents, it was only on the basis that they could look after customers in their areas when servicing problems occurred and they are all happy to do this for you—obviously, if a major problem occurs, it's better to send the rig to me at Matlock but I must stress again that in contrast to some of the natty suited, smooth talking but clueless salesmen who seem to be creeping into amateur radio, our folk can help in case of technical problems.

Back to special offers. How about the Uniden 2030 2 metre FM rig at an incredibly low price. It comes to you fitted with 11 popular FM channels and auto tone burst. Power output is around 14 watts and performance is on a par with the TR7200G. People tell us that the Uniden 2030 is the best sounding rig they've heard and we're certainly impressed by it. Here's a really amazing rig at an amazing price, £145.00 inc. VAT and fitted 11 channels. Send for a leaflet now.

HEAD OFFICE : 119 CAVENDISH ROAD, MATLOCK, DERBYSHIRE. Tuesday-Saturday 9 a.m.-5.30 p.m.
Telephone : 0629 2817 or 2430 9 a.m.-9 p.m. Telex 377482.

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This solid state linear mode transverter allows you to operate your 28 MHz units at 432 MHz and 434 MHz by means of a built in 2 MHz upshift facility for OSCAR operation.

This precision built British made unit is available direct from ourselves, or from our many retail outlets throughout this country. Price £133.88 inc. VAT. (£119 + VAT.).

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Frequency coverage	: 432 - 434 MHz & 434 - 436 MHz
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Receive converter noise figure	: 3 dB maximum
D.C. power requirements	: 12.5 Volts nominal
Current consumption	: 2-1 Amps peak
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Power connector	: 5 pin locking DIN
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In 1963 Drake led the way by producing the first commercially available transceiver that employed the now widely copied 9 MHz i-f frequency. Even today, 15 years later, many major competitive transceivers are still being introduced using i-f's in this range.

In 1978 Drake leads the way again by developing the first commercially available amateur transceiver that uses a 48 MHz i-f, through the technique of "Up-Conversion." This system greatly improves image and general coverage performance, and will be copied in the years to come. With Drake you can join the new state of the art today!

Now **RADIO SHACK LTD.** presents a new addition to the famous C Line from the R. L. Drake Co., the "Creme de la Creme" of Radio Communications



DRAKE TR-7 solid state continuous coverage synthesized hf system

0-30 MHz continuous coverage reception capability.

160-10 metres Amateur Band transmission, including capability for Mars, Embassy, Government and future band expansions.

SEE IT AT ALEXANDRA PALACE—MAY 5th and 6th

15p stamps or 4 i.r.c's for details

To answer your next question, the famous C line continues in production led by the big DXer's ideal radio, the R-4C Receiver.

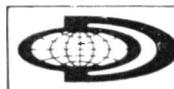


R-4C amateur band receiver, £427.50 inc. VAT

T-4XC matching transmitter with AC-4 psu package deal, £499.95

Join the Elite—use DRAKE, enjoy the best of service from Radio Shack!

RADIO SHACK LTD for



DRAKE

Something else that's new and fantastic from

the UV-3E 2 metre and 70 cm. FM transceiver, fully synthesized



introductory price of **£495.00** inc. VAT. PS-3 psu **£69.75** inc.

This is the receiver that has already been widely copied, but unsurpassed by others.
SSR-1 communications receiver 0.5 — 30 MHz with 10 kHz readout.

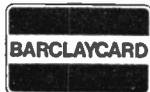


SSR-1 **£149.85** inc. VAT

No other receiver on sale in the UK offers as many features and performance for such a price!
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PLUS FREE SECURICOR DELIVERY and of course our usual FREE SECURICOR pick up on Warranty repair

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RADIO SHACK LTD for DRAKE

There are linears and linears and linears. The DRAKE L-4B is *The Linear*, together with its power supply it is twice the weight of some other 2000w. pep linears offered to the amateur. Obviously there is a reason for this, no corners have been cut or ha'porths of tar saved in the production of the L-4B.

There are some Drake L-4B linears that have been in continuous 24 hour duty service in Embassies here in London for the past eight years by operators who tune to different frequencies by pencil marks! We wonder how long other linears would have lasted?



L-4B Linear 2000w. pep, 10-80 metres (who wants 2kw on 160m.?) **£652.50** inc. VAT

The Famous TR-4CW(RIT) Transceiver, needs no describing



Package Deal TR-4CW(RIT), AC-4 psu & MS-4 speaker

£599.95 inc. VAT

Package Deal TR-4CW(RIT), AC-4 psu & RV-4C Remote VFO/Speaker **£685.00** inc. VAT

SPR-4

Solid State Programmable Receiver
£450.00 inc. VAT

RCS-4

5 way remote control coax antenna switch
£83.25 inc. VAT

RADIO SHACK LTD for TRIO

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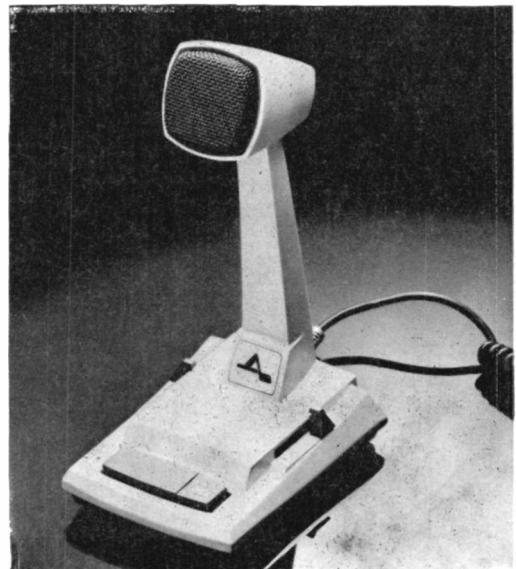
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ATLAS PRICES HAVE BEEN INCREASED. BUY NOW AT OLD PRICES BELOW: ALL PRICES INCLUDE VAT

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DCC	DC Cable	£8.45
MBK	Mobile Bracket Kit	£4.38
MT-1	Mobile Antenna Match Transformer	£18.00
PC-120	Plug-in Noise Blanker	£40.50
10X	Crystal Oscillator	£42.75
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TH3JR	3 element beam for 10/15/20	£121.50
TH2MK3	2 element beam for 10/15/20	£117.56
HY-QUAD	2 element quad for 10/15/20	£182.25
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203BA	3 element 20m. beam	£125.94
402BA	2 element 40m. beam	£168.19
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499	Flush body mount	£8.83
417	De luxe spring	£4.50
492	Miniature spring	£22.84
LA-1	Lightning arrestor	£3.71
LA-2	In-line lightning arrestor	
CDE ROTATORS		
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HOW TO REACH US (EASY PRIVATE PARKING ON OUR 70ft. FORECOURT)

FROM SOUTH AND EAST. We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within ¼ mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.

FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds. veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.

FROM THE WEST AND SOUTH/WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively, leave M5 at Junction 4 or 3 and proceed to inner ring road. Turn South on ring road and leave on A47 (East). We are located three miles from this point.

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**As Factory appointed distributors we offer you—
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It's long been acknowledged that the name YAESU is synonymous with the finest in amateur radio techniques and when it comes to choice of models the story is the same — this month we feature some of Yaesu's top sellers but please remember only the catalogue can give the full story so don't delay send for one today—see our offer below.

A FT-227R Provides new standards of convenience in 2 metre FM communications. A Phase Lock Loop Synthesiser generates 800 channels in 5 kHz steps between 144 and 148 MHz using an "optical coupling" system for channel selection instead of a rotary switch that could wear out. A memory circuit allows you to memorise any of these 800 channels with return to the memorised frequency at the flip of a switch. The standard repeater shift or any other offset frequency can be utilised. Automatic tone burst and advanced circuitry to protect PA transistors from high SWR or reversed supply polarity.

See Catalogue Page 19

B FT-7 The all-solid state FT-7 mobile transceiver provides high performance on the 80 through 10 metre bands. The operator may select upper or lower sideband or CW operation and the compact package provides many features engineered for convenience while mobile. A single knob provides all transceiver tuning and the state-of-the-art noise blanker minimises impulse-type noise such as that found in mobile applications. The FT-7 is designed for operation directly from your car's 12 volt battery. Can also be used as a base station with the matching FP-4 AC PSU.

See Catalogue Page 18

C FT-901DM Unparalleled receiver performance plus advanced transmitter features make the FT-901DM the ham's dream come true. The receiver features rejection tuning, dual-filter variable band width tuning and audio peak frequency tuning for maximum rejection of unwanted signals. Transmitter includes built-in Curtis keyer and RF Speech Processor and features a 10 second "TUNE" timer to safeguard your finals. Includes memory for both transmit and receive frequencies, an advanced noise blanker and off-set tuning on both transmit and receive. All modes, USB, LSB, CW, FSK, AM and FM, 160 thru 10.

See Catalogue Page 3

D FT-221R Here is a compact all-mode transceiver designed for the maximum enjoyment of the 2 metre band. The FT-221R provides SSB, FM, CW, AM operation with repeater off-set capability. Advanced Phase Lock Loop circuitry offers unsurpassed stability and clean spurious-free signals. Modular, computer type construction offers maximum reliability and ease of service. Pre-set pass band tuning provides optimum selectivity and performance needed for easiest operation on today's busy 2 metre band.

See Catalogue Page 21

E FRG-7 The model FRG-7 is a precision built, high performance Communications receiver designed to cover the bands from 0.5 MHz-29.9 MHz without gap. The advanced technology employed in its circuitry includes the famous Wadley Loop System drift cancelling technique. This coupled with a triple conversion super heterodyne system guarantees extremely high sensitivity and exceptional stability. Careful design has minimised unwanted spurious signals so often encountered in cheaper imitations. Features include RF attenuator, selectable audio filter and automatic noise suppression circuit.

See Catalogue Page 13

F FT-101E This is the world's No. 1 160 thru 10 metre transceiver and sets standards that no other manufacturer has been able to achieve. It outshines its competitors on 10 and 15 metre sensitivity where so many receiver sections fall down and the reliability of the FT-101E is a by-word. Noted for its distinctive quality on the air, the switchable Speech Processor gives that extra punch when the going is tough. Advanced computer type modular construction and complete portability are further features of this definitive transceiver.

See Catalogue Page 10

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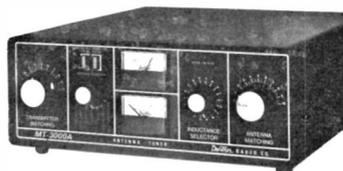
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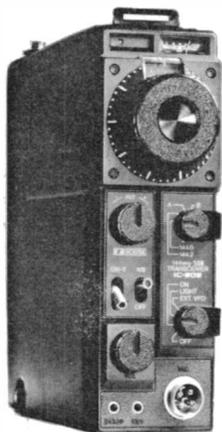
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and delivery

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IC-215 By far the best 2m. FM portable on the market—with more power (3W) than most and batteries some 4 times as big thus giving a reasonable period of operating use. Add to this the superb, clear modulation for which ICOM are so famous and a good receiver, plus a solid, reliable construction and you have really good value for money.

Total channel capacity = 15.
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Giving you FM/CW/USB/LSB, all produced from the amazing ICOM synthesizer and patent LSI chip, Frequency read out is to the nearest 100Hz and is amazingly stable and accurate. You can use the two frequency stores as separate VFOs or for any repeater shift required. The tone burst is automatic, of course, and reverse repeat is available at the flick of a switch. Add a keypad (we will give you the circuit to make your own or you will be able to buy one shortly) and find a new facility which is quite impossible with old-fashioned rigs. The original waiting list has now been dealt with and you can now have one from stock.



IC-245E ▲

£396

This truly amazing little box gets you mobile on FM, USB or (if you really think it a good idea) CW! The synthesizer is the same as the IC-211E and can be tuned to the nearest 100Hz, again with amazing accuracy. Of course such a versatile little box will often be used as a base station and facilities such as keypad operation can be added. They are now ex-stock—but only just!

IC-701



Introducing "SLIM JIM" SJ2

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The HF rig to beat them all, which will be available shortly to those who have their names on the list. ★All solid state including the finals. ★100W RF output Continuous Duty on All Bands, All Modes. ★All bands 1.8-30 MHz. ★USB, LSB, CW, CW (narrow), RTTY. ★Double balanced Schottky Diode mixer used in both Tx and Rx. ★Fully synthesized with Digital readout to 100Hz and two stores to enable split frequency operation. ★ICOM's unique band-pass tune. ★VOX, Semi-break-in CW, RIT, AGC, Noise Blanking. ★Built-in RF speech processor. ★Extremely compact. ★All filters built in. ★12v. or mains operation. ★Electret desk mic. After having used this rig for several weeks on the air we think that it is definitely the nicest HF rig we have ever used.

INTRODUCING A NEW RANGE OF MICROPHONES BY LESON. For the time being available only from Herne Bay. All these are suitable for ICOM transceivers and have a PTT switch and a frequency response 300-2500Hz. They are NOT fitted with a plug.

MODEL	TYPE	BUILT-IN AMPLIFIER	IMPEDANCE	PRICE (inc. VAT)
TW232	Ceramic Desk mic with PTT, Lock sw and gain cont. Silver grey finish	Compression amp 0-30dB var.	<4.5K	£25-00
DH-218	Moving coil dynamic. Hand held	NONE	500Ω	£4-99
DH-233	Moving coil dynamic. Hand held	Pre-amp 0-15dB var.	<3.5K	£9-00
CH-229	Ceramic noise cancelling. Hand held	Compression amp 0-35dB var.	<5K	£15-00

Gain controls are external in all cases

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The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drift cancelling loop for continuous, spin-tuned inclusive coverage of 0.5 to 30 MHz.

The receiver is sensitive (0.5µV for 10dB, 5 + N/N(SSB) and stable with AM, SSB and CW modes catered for. A 3 position audio filter, RF attenuator, dial lamp conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required, 8 dry cells are automatically switched in.

FRG-7 Analogue Readout £154 + VAT COUNTER £50 + VAT

FRG-7 Digital Readout £207 + VAT YH55 Headphones £8.50 + VAT

YAESU for HF from SMC



The SMC, full specification, internally mounted counter (easily installed in existing receivers) provides: a 100Hz readout (100 fold improvement), flashing ± digit (to indicate VFO over-range) and adjustable gate time.



THE FT901 — SIMPLY UNBELIEVABLE PERFORMANCE

160-10m. (+ WWV Rx). 12 and 234v. (PSU Built-in). SSB, AM, CW, FSK and FM (TX & RX). 180W. PIP, 80W. FI. Analogue 1 kHz and Digital to 100 Hz. Sensitive, 4 µV with AGC controlled Mosfet RF to push pull FET RF, Balance active mixer, push pull IF amp. to crystal filter then noise blanker. Overlapping filters give continuously variable selectivity 300 Hz to 2.4 kHz and fixed 600 Hz, 2.4 kHz, 6 kHz and 12 kHz (at 6dB), 80 dB cross mod. rejection, 90 dB desensitisation immunity (at 20 kHz off at 14 MHz). Audio Peak and separate VOX, Curtis electronic keyer, tune button (10 sec. on full power). PLL VFO with memory for any TX, RX or calibrator, 20 dB switchable attenuator, sidetone, clarifier, advance noise blanker are all features of the FT901 — The 1980's Transceiver available from SMC next month. Coming shortly are the Matching VHF transvertors and phase lock loop synthesised external VFO with scanning facility.

THE FT101E COMPLETE HF STATION THE MOST POPULAR IGH IN THE WORLD !!!

The FT-101E a complete mains or 12v. DC station contained in a compact 3U. package, 260W. P.I.P. of SSB (with in-built R.F. speech processor) 180W., CW and 80W. of AM 10 to 160m. (incl) 10 MHz RX). The sensitive and selective (permeability tuned RF stages and 8 pole crystal filter, clarifier (with separate on/off switch), etc., etc. The VFO is stable and linear (readout to 1 kHz) external VFO or crystal control can be selected with LED indicators illuminated accordingly. Carrier level is adjustable for: tune up, AM and for CW operation, whose performance with the semi break in keying, with side tone, and the optional filter installed in a high order. Linear and transverter provisions are made with sockets for: relay contacts, ALC output, all internal HT supplies. low level RF heater links and switches, etc., etc.



THE FT301 RANGE OF SOLID STATE TRANSCEIVERS

The new FT301 transceiver range (with options installed) offers: Full solid-state 12v. DC working, external matching mains power supplies with speaker, and an external VFO are available. Plug in boards. 160-10m. (with MOX) and P.P.T., semi break-in keying with side tone, clarifier with separate switch, 11" x 5" x 13 1/2", 25 kHz crystal calibrator, internal VFO or 11 crystal per band (on external VFO with same facility) 3W audio to internal or external speaker.

The FR101 series of Receivers

The FR101D (de luxe) wide coverage (23 (from 1.5 MHz) 500 kHz bands + 4 and 2 metres) receiver. Analysis of the signal path shows: 0-20dB switchable attenuator, two section permeability tuned input filter, Mosfet R.F. stage and mixer (crystal controlled), 3 section top coupled bandpass filter, no gain at first I.F., IC balanced mixer, 20 kHz wide crystal filter, shunt diode noise blanker, single FET buffer stage, AM, CW or SSB (RTTY) filter, appropriate detector and audio stage. Add to this, two excellent VHF converters, squelch, FM detector, 1 kHz readout, excellent stability, Tx, monitor control, crystal control facility, switchable AGC transceive capability (FT or FL 101) and that digital readout options are available of this (de luxe) or the standard (less the plug-in options of converters, broadcast band crystals, filters etc.) version try an "apparatus communications sine fills" extraordinary.



THE FT7 MOBILE TRANSCEIVER



This is a 10-80m. transceiver, VFO controlled (to 1 kHz accuracy) plus crystal control facility. Selectable sidebands. CW, crystal calibrator, clarifier and an advanced noise blanker are some of the features packed into a cabinet only a few inches high, but through careful design the front panel remains remarkably uncluttered. Designed for a linear 10W. output consuming only a few Amps it eliminates: 30A cables from the passenger compartment and the cooling problems of a massive heat sink. Need more power? Flick in a FL110 (a 200W. PIP linear) installed in any suitable place in your car.



10-160m. Switched L.P.F. 15W → 200W. PIP A1/A3; 4W → 75W. FI. Negative feedback with ALC to exciter. RF sensing (Adjustable hang time) with override.

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FT221 R

VHF — SSB? — FM? — CW? — AM?
SMC — FOR CHOICE

THE FT221R MULTI MODE FROM YAESU

The FT221R. The multimode USB, LSB, AM, FM, CW (with semi-break in and side tone), 2m. transceiver offering the choice of phase locked VFO or 44 crystal channels, simplex or repeater (600Hz up and down shifts), with unique "double push" auto tone burst, mains or 12v. (3A) operation, excellent selectivity SSB 2-4 kHz (1-7% S.F.) or FM 12 kHz. Front panel adjustable VOX and mic gain, a calibrator (1 MHz \pm 10), 1 kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes F.S.K. easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11 1/2" (14") x 5" x 1 1/2", 22 lb. rigid package 600 kHz and 1-6 MHz shifts over 4 MHz.

FT221R £357 + 12 1/2% YC221 £72.50 + 8% MANUAL £9.00

SCANNING DIGITAL II from KYOKUTO

The Digital II offers complete 5 kHz step coverage across 2 metres and now with the Scanner 33, 25 kHz channels from 145 MHz upwards covered in around 10 seconds. It offers full lock and lockout on all channels. The scanner stops on a required channel for 10 seconds, then unless locked moves on. The bright digital readout comes from 6 seven segment LEDs.

Selectable 10 or 1 watt output for simplex or duplex (up and down shifts), across 144-146 (rx to 149 MHz) from a tiny 6 1/2" x 2" x 7 1/2". Easily underdash mounted with the supplied mounting bracket, or slipped in place of the broadcast wireless.

For strong handling, and low noise the R.F. mixer, first I.F. (16.9 MHz) second mixer (and LO) are all FET's. The front end is tuned by varicaps by the DC output of the P.L.L. with superb selectivity provided by a 15 pole (\pm 9 kHz at -6dB \pm 15 kHz at -70dB). Ceramic filter. LED lamps indicate if the P.L.L. is unlocked or the squelch open. The V.C.O. is directly modulated (for exceedingly linear deviation). Selective calling socket.



DIGITAL II 233 SCANNER £49.50 (+VAT 12 1/2%)

The front end is tuned by varicaps by the DC output of the P.L.L. with superb selectivity provided by a 15 pole (\pm 9 kHz at -6dB \pm 15 kHz at -70dB). Ceramic filter. LED lamps indicate if the P.L.L. is unlocked or the squelch open. The V.C.O. is directly modulated (for exceedingly linear deviation). Unitary 6 circuit block construction (for serviceability and screening). Selective calling socket.

FOR VHF MOBILE THE FT227R FROM YAESU EX STOCK

The new FT227R uses a "single knob" tuned digital synthesizer employing a photoelectric sensor or an optical coupled system which eliminates both noisy, unreliable rotary switches, and crystal banks. Full coverage of 2 metres in 5 kHz divisions with a \pm 600 kHz shift plus a memory feature which permits recall of any entered frequency or particular offset.

Bright large, digital readout gives unequivocal readout of the frequency in use. The receiver offers 0.3 μ V (for 20dB S/N) sensitivity into a \pm 6 kHz (at 6dB) bandwidth whilst maintaining a remarkable immunity to overload and image problems. The 20W. DC input transmitter features Hi/low power outputs, AF tone burst on repeaters and an out of band inhibition trip, etc.

Ex stock £179 + VAT (12 1/2%)



FT227R



KYOKUTO DENSHI SCANNING FM2015R



WATTMETER REMOTE RF HEAD



50-150 MHz ideal for mobile use. Separate directional coupler 3" x 2 1/2" x 1 1/2" and illuminated indicator 5" x 2 1/2" x 1 1/2" c/w brackets, etc. Power 200 and 200W FSD (\pm 10%) SWR to 3:1 (\pm 3%). FS711/V P & P 85p + 8% VAT £23.50

The 2015 transceivers across 144-146 (Rx to 149) MHz in 5 kHz steps tuned by coaxial switch stopped at 0 and 9.

A major feature is the 4 channel RAM memory (with an internal Ni Cad back up) which may be programmed direct from the front panel by simply dialling in a frequency, no screw drivers, no soldering irons, no fuses. Frequencies can be recalled from the memory instantly or they may be scanned in either of two modes — searching for a vacant or an occupied channel. 5 split (including + and — 600 kHz) for repeater or transverter (even triplexer) use. Multipurpose tone burst, RIT (centre off with "click"), modular constructions, centre zero meter, accessory socket, mounting bracket, microphone etc., are all provided. The sensitive receiver is varicap tuned by the DC level of the P.L.L. I.F.'s of 16.9 MHz and 455 kHz provide high image rejection and good shape factor 2:1 at 70dB (12 kHz BW). In the transmitter, modulation is applied directly to the V.C.O. (for the ultimate in fidelity), auto power control and varicap tuning keeps power output constant at band edges and spurs way down. **EX-STOCK. £245 + VAT (12 1/2%).**

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Flat 50-150 MHz SWR \pm 3% (to 3:1) 20 & 200W FSD (\pm 10%) 6 1/2" x 2 1/2" x 1 1/2" FS302M P & P 85p + 8% VAT £22.50 30W peak 15W cont. 50 ohms PL259 VSWR 1:2:1 at 150 MHz. DL20 P & P 25p + 8% VAT £4.75

VHF HANDHELD

KEN KP202 TRANSCEIVER (+ VAT Price)
 144 MHz, FM, 2W of RF and 1/2W of audio. Immunity to image and IF breakthrough and performance to rival all walkie-talkies and many a mobile set. C/w F plug, leather handle/whip case and telescopic whip.

Fitted 6 channels S20 & S21 + choice of S (21, 23, 24, 0) R (3, 4, 5, 6, 7) ... £114.50
 R channel only crystal tone burst ... £10.00
 Flexible stubby ant. £5.80 Case £4.95
 F to UHF adaptor £1.65 Ni Cads £9.00
 Base charger KCP2 ... £12.95

VHF Monitor Receiver

SEIWA MR2 AND MS2 (+ VAT prices)
 Ideal for the SWL, the YL or even the XYL as the monitor receiver to keep you in touch. Tiny (2 1/2" x 1 1/2" x 4 1/2") and light (8 ozs.) slip into your pocket or onto your belt with the optional case. Sensitive double conversion superhet with 12 kHz band width, auto squelch, and generous audio output c/w Nicads, Mains Charger, Earpiece, Antenna.

MR2(4) 70 MHz 12 switched channels £70.00
 MR2G 144 MHz 12 switched channels £62.00
 MS2 144 MHz 4 scanning channels £75.00
 Leather Case £1.90 Crystals each £2.20

MR2



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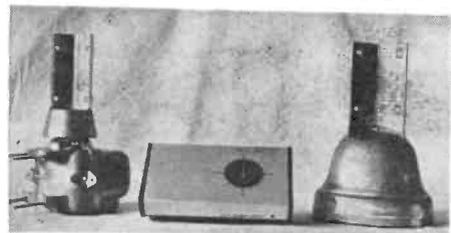
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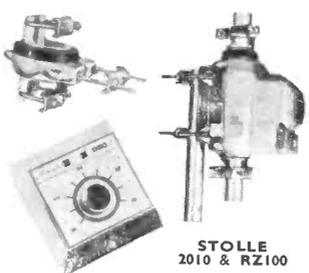
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(GB3SWM)

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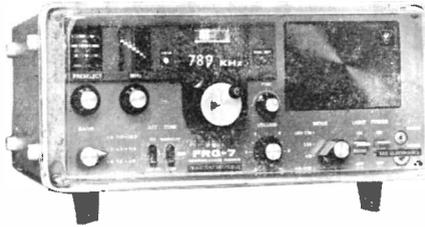
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Articles submitted for Editorial consideration must be typed double-spaced with wide margins on one side only of quarto or foolscap sheets. Photographs should be lightly identified in pencil on the back with details on a separate sheet. All drawings and diagrams should also be shown separately, and tables of values prepared in accordance with our normal setting convention—see any issue. Payment is made for all material used, and it is a condition of acceptance that full copyright passes to the Short Wave Magazine, Ltd. on publication.

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VHF BANDS

NORMAN FITCH, G3FPK

Unacceptable Proposals

WHEN she was briefly Minister of Transport in the 1960's, Barbara Castle had the temerity to propose a ban on mobile operation as she considered it unsafe. This suggestion triggered off an unprecedented campaign by amateurs and commercial users alike *via* MP's, resulting in that idea being dropped like the proverbial hot potato.

The response to the G3RKL proposal for SSB repeaters in the "DX" part of the 2m. band has revealed virtually 100 per cent opposition. By the end of the first week of April, GM8FFX reports 121 letters against, the sole one in favour from G3RKL. Not one letter in favour has been received by your scribe either, and comments on the air have all been hostile. In the light of such unanimous opposition, it seems inconceivable that the RSGB can sanction this "experiment" in the 2m. band.

In the March "VHF Bands," reference was made to G3LEQ's suggestion for the creation of a Citizens' Band in the 430-432 MHz section of the 70 cm. amateur allocation. At present, use of this part of the band is very restricted but eventually it could be restored to full usage. Reaction to this CB idea has been universally hostile, many expressing amazement that any radio amateur should consider giving up 20 per cent of any band. Mr. Adams's further ideas on a lower class of licence only requiring a knowledge of the regulations with no technical examination, has likewise been widely criticised. To be fair, G3LEQ mentioned his ideas in the anticipation of new amateur allocations in the 48-52 MHz band to offset the loss of 2 MHz in the 70 cm. band. However, it is suicidal to indulge in such

horse-trading when there is no indication that a 50 MHz band is likely to eventuate.

A recurring theme in the letters and discussions concerning these proposals, including the "channelising" of 144-145 MHz, is that those originating from amateurs with a financial interest in their implementation should be viewed with suspicion. The correspondence also reveals growing impatience with the increasing number of FM operators to be heard in the internationally agreed 2m. beacon sub-band and in the exclusive SSB segment.

For the benefit of any readers unaware of this aspect of the band-plan, regional beacons are centred about 144-900 MHz, and those who participate in propagation studies would appreciate it if the 144-85-145-00 MHz section be kept clear. The SSB allocation is from 144-150-144-500 MHz. The VHF Bandplans and lists of UK and overseas beacons are contained in the 1978 *RSGB Call Book* available from the *Magazine Publications Dept.*

Satellite News

Oscar 8 is functioning satisfactorily in both modes. The latest radar-checked orbit at the time of editing was no. 451 on April 7 which gave an equatorial crossing time of 0109:52 GMT at 56-24°W. of Greenwich. The inclination is now calculated as 99-992° and the period 103-23162 minutes. The longitude increment works out to 25-80867° west per orbit and these figures will enable very accurate predictions to be made for months ahead. The respective apogee and perigee altitudes are 910-372 and 898-259 kms. respectively.

The 2m. receiver in the transponder is proving very sensitive and so *linear amplifiers are not necessary!* A 10 watts Tx is sufficient into an 8-ele. aerial. However, a good pre-amplifier with a low noise figure for 435 MHz and/or 29-5 MHz is essential. Interference from high power A/TV transmissions on 436 MHz by G8ACN did not affect Mode "J" reception at G3DNQ a few miles away, so it would seem that the two systems can co-exist.

AMSAT has confirmed that the operating schedule for 0-8 is Mondays to Fridays Mode "A" and Saturdays and Sundays Mode "J" with Wednes-

days reserved for special experiments only, previously booked with AMSAT.

AMSAT members will find 0-8 orbit predictions in the next issue of *Oscar News*. W6PAJ calendars covering all orbits to the end of 1978 will be available from Ron Broadbent, G3AAJ, around the end of May. These are free on request to AMSAT Life Members only. To ordinary members they are £1-80 plus large *s.a.s.e.*, and to non-members £3-60 plus *s.a.s.e.* Cheques payable to "AMSAT-UK" and please state your *membership number*. Ron's address is:—94 Herongate Road, London E12 5EQ.

A new "Guide to Oscar Operating" is now available covering 0-8. If you want one, send an *s.a.s.e.* plus 15p in stamps to:—Richard Limebear G3RWL, 60 Willow Road, Enfield, Middx.

Oscar 7's battery temperature is now getting lower so, by the time this appears, it should be back on to the published schedule. Therefore, starting on April 28, the schedule should be B-B-A-B-B-A, etc. If the *day of the year* is divisible by three, that is a Mode "A" day.

Pat Gowen, G3IOR, the Chairman of AMSAT-UK, has become the first amateur to work 100 countries *via* satellites. His "DXCC" was achieved with a QSO on April 1 with J3AAG in Grenada, who is on 0-7, Mode "B" on 145-93-145-94 MHz, CW. Other Caribbean stations active on Mode "A" include:—TG9SO, VP2AR, VP2DD, VP2LCT, VP2VEB, VP2VEC and 6Y5DE. From Africa, C5AAP should be on soon as should 7XØ, the latter being I4AIJ on Mode "B." On Mode "A" 9L1NP is now active. From Svalbard, JW9DM is on Mode "B" SSB. During July/August, I1TEX plans to operate from Sardinia (ISØ) and Corsica (FCØ) all modes.

Awards News

Dr. Peter Skolar, G4EYV, has been awarded VHFCC Certificate No. 295 for 2m. Peter was licensed in April 1976 and his first real taste of 2m. came in December of that year when he was one of the operators of G3OSS in the Fixed Station Contest. His first 2m. station comprised a *Trio* TS-700 and indoor dipole, followed by an

8-over-8 beam at 50ft. outside. In March 1977 he acquired a *Magnum 2* amplifier and last December replaced the TS-700 with the latest TS-700S. With 14 countries and 59 counties, G4EYV is looking for a GI.

Angus McKenzie, G3OSS, has won his Supreme Award No. 21, having finally received all the cards for 4m. at long last. Don Hayter, G3JHM, mentioned a new award in the pipeline for 1.3 GHz and up, based on QTH squares.

Beacon News

GB3IOW on 10.1 GHz (ZK34a) has been QRT for some time due to aerial damage. A new aerial is awaited which should give a gain of 1 dB over the old one. With a new 300 mW Gunn diode, an overall 4.5 dB improvement in signal strength is anticipated.

From Pretoria, South Africa, ZS6PW is reported operational, beaming to the north from 1730-1900 GMT daily, running 50 watts to a 5-ele. Yagi. The Lannion 6m. beacon, FX3VHF, has been heard in ZS. From the Western Hemisphere, in addition to 6Y5RC mentioned last month, WA1EXN in Maine on 50.05 MHz and VE1SIX in New Brunswick on 50.088 MHz are active. In Mexico, XE1SIX on 50.10 MHz is under construction. Thanks to G3USF for this 6m. news.

Another World Record

Australian SHF types can be proud of the new tropospheric DX record of 1185 kms. on 2304 MHz set up on Feb. 18 by VK5QR in Enfield, S. Australia, and VK6WG in Albany, W. Australia.

Moonbounce

A number of British amateurs are now conducting *E-M-E* experiments on 2m. Dave Price, GW4CQT, has concluded QSO's with K1WHS, W6PO, W7FN and SM7BAE to date. The second leg of the ARRL International *E-M-E* Competition takes place on the weekend of May 20/21 over the full 48 hours. Any band above 50 MHz may be used. Short wave listeners are asked to report any stations heard *via* the Moon. Probably the biggest problem—apart from generating enough *e.r.p.* within the licence conditions—is that of *Faraday* rotation, whereby the polarisation of the

THREE BAND ANNUAL VHF TABLE
January to December 1978

Station	FOUR METRES		TWO METRES		70 CENTIMETRES		TOTAL Points
	Counties	Countries	Counties	Countries	Counties	Countries	
G8GXP	—	—	55	12	40	7	114
G3FPK	—	—	62	15	—	—	77
G4ERX	15	1	33	8	15	4	76
G2AXI	9	3	35	8	16	4	75
G3FIJ	22	1	30	5	13	2	73
G4DEZ	—	—	57	16	—	—	73
G8KGF	—	—	59	13	—	—	72
G8HHI	—	—	31	9	23	6	69
G8BKR	—	—	46	8	11	3	68
G8APZ	—	—	50	12	3	1	66
G4BWG	16	3	31	8	1	3	62
G16EWM	—	—	32	9	8	5	54
G8BJC	—	—	45	7	—	—	52
GD2HDZ	15	2	7	6	17	2	49
GM4CXP	—	—	36	11	1	1	49
G8LHT	—	—	36	10	—	—	46
G8KSS	—	—	40	6	—	—	46
G8NYS	—	—	39	6	—	—	45
G8ITS	—	—	22	6	10	3	41
G8BIJ	—	—	32	6	—	—	38
G8MKW	—	—	34	4	—	—	38
GJ8AAZ	—	—	20	6	6	5	37
G8LYH	—	—	25	6	—	—	31
G4FKI	3	1	10	2	7	1	24
GJ8ORH	—	—	5	5	2	4	16

received signal changes. A horizontally polarised transmission may be vertically polarised for a period, rendering it uncopyable on a horizontally polarised receiving system. This often leads to "one-way" communication even though equal *e.r.p.* is being used. However, with patience, it is possible to complete a QSO within an hour.

Meteor Scatter

In view of the increasing amount of MS activity, Clive Penna, G3POI, has suggested a list be published of the frequencies used by the more active operators. On CW, these include:—G3CCH (144.014 MHz); G3POI (022); G3SEK (083); DJ5MS (120); DK5RQ (035); OK3CDI (068); SM3BIU (025) and SM7AED (030). Would any regular operators please mention QRG's used by other overseas

stations and their own usual frequencies? U.K. stations include:—G3WOH, G3IMV, G3WSN, G3WZT, G4CMV, G4DGU, G4DML, G4DSC, G8FUF and GW4CQT. Such a list of QRG's would assist newcomers to the art of avoiding established frequencies when making skeds.

DX Corner

Paul Widger, G8AGU, and Iain McHardy, GM3JFG, plan to operate from the Isle of Barra in the Western Isles region of Scotland between June 6 and 9. As the 57° N. parallel runs through the island, operation from WQ and WR squares is likely. They plan to use 144.260 MHz for both CW and SSB operation beginning at 1830 GMT with an hour of SSB, followed by an hour of CW, then a final half hour of

SSB till 2100 GMT. Those wishing to fix up skeds should contact Paul at "Mayfield," Gunswell Lane, South Molton, Devon. They will have high power available and will operate till 2300 GMT if conditions are good.

Those seeking a QSO with Andorra will be pleased to read that Erwin Seyssens, ON5UN, and his friends will be QRV using the call C310X from August 6-14. They are not making any pre-arranged skeds but, as they will be on the 20m. band too, they ask that use be made of the *Dubus* net on 14.34 MHz for this purpose. They will limit skeds to half-an-hour maximum.

G3POI mentions another Portuguese station on 2m., CT1QG (WY71d) now QRV with 3½ kW *e.r.p.* Ray Bennett, GW4GSS, mentions an Icelandic station soon to be on 2m. with high power, TF0DFT, who can be reached at P.O. Box 1006 Reykjavik.

Contests

Result: The 70 MHz CW Contest on January 22 was won by GU3HFN whose 27 contacts totalled 313 points. In second place was GM3WOJ/P with 292 pts. from 21 QSO's, while G3UKV's 249 pts. from 35 exchanges earned him third spot. Considering the late publicity and poor conditions, some good DX was achieved; *e.g.* GM3WOJ/P to GU3HFN at 590 kms.

Coming events: The weekend May 6/7 sees the 432/1296/2304 MHz IARU event. This is an open affair, fixed and portable, all modes with scoring at one point per kilometre; no band multipliers. The times are 1600-1600 GMT. Spring Bank Holiday weekend, May 27/28 is the time for the 144 MHz Portable Contest from 1600-1600 GMT.

Gigahertz Bands

Don Hayter, G3JHM, reports on the activity on the 3 cm. band. G3KSU (Isle of Wight) has now worked 3 countries and 10 counties, the former comprising G, GU and F, but he has yet to work a station in I.O.W. G3JVL in Hayling Island now runs 6 watts to an 18 inch dish and "fly swatter" at 45ft. During a recent QSO with G3FPK on 2m. Don played a tape of some 10 GHz CW from G3JVL using as a final IF the 6 kHz bandwidth

position of an AR88D.

G3JHM will be operating again from France from August 3 through September 2 from Cap Barfleur, 15 km. east of Cherbourg and a prime site for 3 cm. work. The reciprocal call is F0AKD. Don says there are 150 stations on the band in France and lots of DL's. U.K. microwave equipment though is said to be the best. The band has been available to amateurs in East Germany since January 1, 1978.

John Tindle, G3JXN, was on for the 1296 MHz Open Contest on April 1 and worked 23 stations up

QTH LOCATOR SQUARES TABLE

Station	23 cm.	70 cm.	2 m.	Total
G3POI	—	—	214	214
G8FUF	2	84	207	293
I4EAT	—	25	196	221
G3SEK	—	—	152	152
G3CHN	—	—	148	148
G3FPK	—	—	142	142
GM4CXP	—	25	127	152
9H1CD	—	13	126	139
G4BWG	—	25	110	135
G3XCS	—	21	110	131
G4CMV	—	3	109	112
G4DEZ	—	—	105	105
G3OHC	4	31	98	133
G8HVY	—	48	96	144
9H1BT	—	—	94	94
G8BKR	1	19	93	113
G4BAH	—	32	92	124
G8GML	8	50	89	147
G4FCD	—	22	89	111
G8LEF	4	43	87	134
G4AWU	—	—	85	85
G6UW	—	—	85	85
G3JXN	26	65	83	174
9H1C	—	—	83	83
G8HH1	—	28	82	110
G2AX1	1	47	80	128
G8JJR	—	—	79	79
G8IWA	—	29	77	106
G8JHX	—	—	74	74
G4FBK	—	5	73	78
G3COJ	17	61	72	150
G8LHT	—	1	71	72
G4GET	—	—	69	69

G4DKX	5	30	68	103
G8KGF	—	—	68	68
GJ8AAZ	1	24	66	91
G8KPL	—	—	64	64
G8GII	—	22	63	85
G8JAG	—	—	63	63
G3FIJ	—	27	62	89
G8KLN	—	1	62	63
G4CIK	—	—	62	62
G4GCQ	—	—	61	61
G8KUC	—	7	60	67
G8KSP	—	—	60	60
G3KPU	—	—	60	60
GD2HDZ	10	32	59	101
GD3YEO	—	8	59	67
GM8NCM	—	4	59	63
G8KSS	—	—	58	58
G8JEF	—	—	58	58
G4AEZ	2	22	57	81
GW4FJK	—	—	57	57
G4ERX	1	21	54	76
OZ9IY	—	—	53	53
G8ITS	—	11	51	62
G8IFT	7	18	49	74
G3BW	1	21	47	69
G4GEE	—	23	41	64
G4EYL	—	—	41	41
G8EOP	8	36	38	82
G8LLG	—	1	38	39
G8JAH	—	1	35	36
G8JGK	—	—	34	34
G8JAJ	—	—	24	24
G8JKA	—	—	21	21

Starting Date January 1, 1975. No satellite or repeater QSO's. "Band of the Month" 2m.

to 2000 GMT. Later on he called "CQ" for an hour with no replies. Nothing exotic was worked from London W.5. GD2HDZ spent several hours straining his ears and occasionally calling, "CQ" but Arthur worked nobody and only heard one station. "April 1 of course—I should have known better!" he writes.

From Northern Ireland, Steven Ruff, G18EWM, expects to be on 23 cm. soon. He has a *Microwave Modules* converter and has copied G18HXY at RS 54 via his 70 cm. beam an 25 metres of UR67.

Seventy Centimetres

Ray Elliott, G4ERX (Essex) sent in a detailed report of his club's participation in the 432 MHz Open. The Vange ARS Contest Group, G3YCW/P, operated from Langdon Hill, Basildon, Essex using a Yaesu FT-101E, Modular Electronics 432/28 MHz transverter and home brew amplifier with a pair of 4CX250B's. The aerial array comprised four 18-ele. Parabeams at 36ft. a.g.l. and the estimated e.r.p. was 76 kW. They found conditions very flat, particularly to the east, and made 102 contacts. G3BW (Cumbria) and GD2HDZ were worked with difficulty. In the last hour conditions perked up enough to bring in a string of PA0's. The team consisted of G3IOI, G4EZX, G4GDS, G8GKA and G8FUF. Ray reports the leading stations as G3PMH/A, G3NNG/P and G3VPK.

Dave Storrs, G8GXP (W. Yorks.) has been fairly active mobile this year both on FM and SSB working some, "... surprising DX..." He is always monitoring 432.2 and 433.2 MHz. The home station comprises a Trio TS-700G, MM transverter and 46-ele. Multibeam. A big amplifier is in the offing but Dave's 40 counties and 7 countries has helped put him top of the table, in spite of modest power only.

And now another "first." Geoff Brown, GJ8ORH, after only four weeks operation, has worked EA1CR (XD32d) for the first GJ/EA contact on 70 cm. The date was March 11 at 0005 GMT and he reports RS 59 each way. Geoff was using his Belcom Liner 430 and a Jaybeam 12XY aerial. Immediately afterwards, GJ8KNV and GJ8AAZ exchanged reports with Ruben, who sent some nice photos with his QSL.

Two Metres

In common with several other readers, Gerry Ilbury, G3MMW (Hants.), is concerned about the apparent disregard of the band plan by FM operators. He has heard FM QSO's in the "Oscar" band, on 145-90 MHz, two in the beacon part, one on top of GB3VHF and several in the SSB sector. The trouble is the offenders probably do not read the VHF columns and are likely unaware of any bandplan. Any ideas how we can reach them?

G8GXP has been fairly active with his 400 watts of SSB to an indoor F9FT 10-ele. Yagi. During the *aurora* of April 4 he worked several GM's including GM8LHE. Dave reckons that the latter was giving a QTH locator, YR24j, which puts him in the sea! Julian Moss, G8ILO (Essex), caught a weak tropo. lift on March 19 which brought up signals from the west. On the 26th, the Barking Radio Society's contest produced quite a lot of activity and Julian concluded 68 QSO's worth 1520 points. He remarks on the nil activity from the north. On April 2 a slight lift brought contacts with 2 F's and 6 ON's in BK, BL, CK, CL and ZJ squares. G8ILO is now back at Lancaster University "... for the final reckoning!"

Glen Sweeney, G8NYS (Notts.), uses an Icom IC-202 and home-built amplifier with a QQVO3-10 valve. He found conditions not too good on the whole but did manage G4FES/P on Dartmoor. GD2HDZ confesses to have become somewhat disenchanted with 2m. for a variety of reasons, "... including repeaters!"

There have been several *auroras* some of which were usable in the south of England. An interesting one was on March 26 in the early evening. CW produced QSO's with SM4DHN/4 (GU79j); GM3JII/A (WS59a); SM6GFS (GR11j) and GM3UKG (YR27j) between 1753 and 1831 GMT for your scribe. QTF's were 0° true for all except GM3JII/A in Stornoway (350°). The following day, LA3WU (CU47d) and LA2PT (FT13b) were logged from 1715-1742 GMT at QTF 20° but were quite weak. These two events are rather special since the figures for magnetic activity of 27 and 51 respectively are the lowest ever recorded when stations in southern England were able to work continentals. The *aurora* of April 4 was very weak in the London area with LA6HL (CS09e) and LA3WU only RST 41A. The event faded out at 1847 GMT. However, G8GXP worked 3 GM's, copied SK4MPI (HU46d) at 53A and GB3LER (ZU65f) at 59A. G4CMV (Leeds) worked LA3WU at 1837.

Four Metres

G3FIJ took advantage of the 4m. Open event on March 19 to

add nine more counties, plus a further three at other times. The Vange Group, G3YCW/P, were out on Langdon Hill, Essex for the contest and found the conditions mainly flat. They worked 61 stations worth 278 points, best DX being GM3WOJ (YP27e) in Dumfries at 460 kms. The operators were G3IOI, G4ERX, G8FUF, G8GKA, G8LUP and G8NPM. The station comprised an FT-101E, a Europa "B" transverter and 4-over-4 Yagi at 36ft. a.g.l.

During VHF NFD on July 1/2, 4m. operators will have a unique change to work Belgium. Using the call ON4ERX, the ON6UG Contest Group has special permission to use the band. It is gratifying that some foreign administrations are prepared to grant special privileges from time to time.

Vale

Harold Beaumont, G5YV, died suddenly on March 13. He was a very well known 2m. operator believed to have some 36 countries to his credit. A keen *Sporadic E* watcher, he had been licensed almost 50 years and was always an outstanding signal from Yorkshire. He was a first class CW operator. The cremation was on March 17.

Finale

That's it for another month. Your letters and claims should reach us by May 4 for the June issue and by June 8 for the July feature. The address is:—"VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ. 73 de G3FPK.

STOP PRESS!

Cyprus to Rhodesia on 144 MHz

The first Cyprus to Rhodesia QSO occurred on April 10 between Roland Whiting, 5B4WR, and Ray Cracknell, ZE2JV, between 1800 and 1810z. The distance covered was 5972 km.: signals RS53 with flutter fading, Doppler shift and frequency spread—by transequatorial propagation.

On April 11 at 1659z it is possible that ZS6LN in Pietersburg, Transvaal, copied signals from a 5B4 at over 6600 km. for 40 seconds.

IRT FOR THE HEATHKIT 'SB' RANGE OF TRANSCEIVERS

R. L. GLAISHER, G6LX

IRT (incremental receiver tuning) is a feature which is incorporated in many transceiver designs. This useful refinement allows the receiver to be independently tuned a few kHz above and below the transmitted frequency, which eliminates the problems of working stations who listen slightly off-frequency, or have difficulty in accurately netting. IRT is applicable to both SSB and CW working and its use is often a necessity for contest working and DX-chasing. A small offset between transmit and receive frequencies can sometimes make all the difference between making a contact, of getting lost in the on-frequency pile-up.

The purpose of this article is to describe how IRT can be added to the Heathkit SB-100, SB-101 and SB-102 transceivers; the same circuits are applicable to the Heath HW models and to many other makes of transceiver that do not have the IRT facility. As mechanical considerations and panel layouts differ from those of the SB series, the arrangements for fitting the IRT to these other transceivers is not described in detail, but are left to the individual preferences of the users. The principles are the same, and no great difficulties should be experienced in the application of these circuits to any make of transceiver, except perhaps for the newer Heathkit SB-104: this model uses a different type of VFO, so that of the earlier models and this requires alternative circuits to obtain optimum performance. To date, the writer has not been able to persuade any SB-104 owner to experiment with modifications to the VFO, as they are still within the guarantee period and any breaking of the seals on the Heath LMO voids the maker's warranty.

Circuit Considerations

To fit IRT to a transceiver, provision has to be made to vary the received frequency by a few kHz using a separate front panel control. This shift of frequency has to be independent of the transmitted frequency, so a means has to be provided for disconnecting the IRT, or to nullify the shift during the transmit mode. Although the 'shift' and 'nullify' functions are interconnected, for ease of description, they are dealt with separately.

Fig. 1 is a part circuit diagram of the valve LMO used in the SB-100, SB-101 and HW models: there are slight differences between the models, but for our purpose, they can be regarded as identical. The SB-102 uses a solid-state LMO and the same circuit for obtaining the IRT shift may be used; however there is a short-cut that is possible with the SB-102, and this is covered later in this article.

The small shift in frequency is obtained by connecting a voltage controlled variable capacitance diode (*varicap*), in parallel with the tuned circuit (the varicap diode is essentially a variable condenser that is controlled by a DC voltage instead of a rotating mechanical shaft). The capacitance range of these diodes when operated over their rated voltage range can vary from a few pF to over 200 pF depending on the type used. There are many

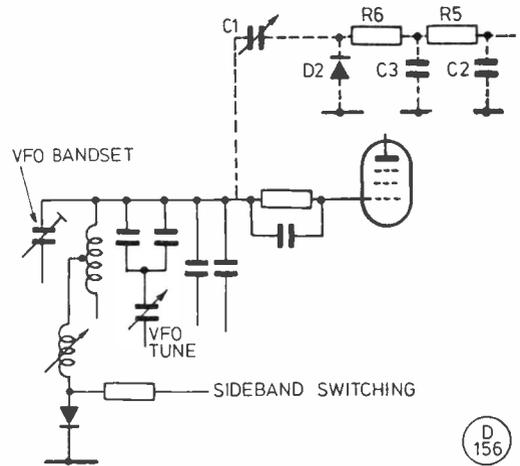


Fig. 1. Part-circuit of the Heath LMO as used in the SB-100, SB-101 and some HW models; shows connection point for IRT components.

different types of varicap diode including those used for VHF and UHF TV tuners, FM and phase modulation, frequency multiplication, mixing and telephone applications. Most types may be used for our purpose, although the higher capacitance types are easier to adjust for optimum IRT range. The writer uses the 1N954, but the Mullard BA-102, BB-105 and BB-110 diodes have been used by other workers.

The trimmer (C1) in series with the varicap is essential, as it controls the effective diode capacitance change across the VFO-tuned circuit: for example, the 1N954 diode has a capacitance change of around 100 pF. If this was directly shunted across the VFO-tuned circuit, the IRT range would be far too great and the diode would act as another bandset condenser. If a 10 pF condenser is used in series, the maximum effective capacity added to the VFO-tuned circuit is only about 9 pF; with the 3-30 pF in circuit (at full mesh), the shunt capacity is still only 23 pF. For the SB-101, about 10 pF total capacitance is required to provide an IRT of ± 2 kHz and this can be obtained from almost all of the available varicap diodes and the proper value of series condenser. It should be noted that the change of capacitance from a varicap diode is not a linear function over the range of the control voltage from 0 to maximum. The series resistor (R4) in the earth leg of the control potentiometers applies a standing minimum voltage to the diode and this helps to improve the linearity over the IRT range.

The additional capacity of the varicap and series condenser (C1) shunted across the VFO-tuned circuit will lower the indicated frequency by anything up to 30 kHz. This is not a problem as all the Heath LMO's have a preset parallel bandset condenser which can be adjusted to bring the VFO back to frequency. As the total parallel capacity is not altered, the linearity of the LMO over the complete tuning range is not degraded.

The complete circuit diagram of the IRT facility is shown in Fig. 2. The series trimmer C1 and varicap D2, together with the RF decoupling components C2, C3, R5 and R6, make up the first part of the circuit. These items are located inside the VFO enclosure and comprise

the frequency shifting section of the IRT facility. The second part of the circuit relates to the DC supply, the IRT control and the method used to nullify the effect of the IRT shift during transmit. In theory it should be possible to arrange for an 'electrical disconnect' to switch the IRT between receive and transmit functions; however, this is not practical and another method is used to hold the transmit frequency constant, while the IRT is in operation.

Most types of varicap diode will provide enough IRT using a maximum control voltage of between 10-12 volts. In the arrangement used, the DC supply to the varicap is obtained via a series resistor R1 from the 150v. supply in the transceiver (for SB-102 see below); a 12v. zener diode provides a degree of stabilisation of the control voltage. The 12v. is fed to the varicap through one of two alternative potentiometers (R2 and R3); switching between the potentiometers is via a spare set of contacts (see below) on the main send-receive relay in the transceiver (R2 is used for transmit and R3 on receive). R3 is the IRT control and is mounted on the front panel; this potentiometer provides a zero frequency shift at the mid-point of rotation and plus/minus the selected IRT at full clockwise or full anti-clockwise rotation. R2 is located at a convenient point on the chassis and is preset to null out the frequency shift caused by the introduction of the varicap and the control parameters.

The SB-102

The LMO used in the SB-102 has integral provision for frequency shift keying, with a separate external connection for this facility. This is not mentioned in the assembly or operating instructions, so it is assumed that Heath had a change of mind, or that there are technical factors that make RTTY or FSK operation unacceptable. The FSK circuit uses a varicap diode, together with the necessary decoupling components, in a similar circuit to that used for IRT. The external connection is located on the rear of the LMO enclosure (labelled FSK) and if connected to the control circuits as used for the other models, a IRT of ± 1 kHz can be obtained. A greater IRT swing can be obtained by increasing the voltage to the FSK connection, but this must be carefully monitored as some SB-102 transceivers have varicap diodes in the circuit which go substantially non-linear with control volts in excess of 15-18 volts. In tests made with several SB-102 units, a IRT of 3 kHz (± 1.5 kHz) seems possible using the FSK connection and 15v. maximum control supply. Some alteration to the value of series resistor (R1) is necessary together with a change of zener diode type to obtain the higher control voltage.

Component Location

The first point to be decided is the location of the IRT control on the front panel. There is a minimum of free space on the SB models, so the best solution is to remove the 'Frequency Control' switch and use the vacated hole to mount the potentiometer. The SB models incorporate a separate crystal oscillator to provide fixed frequency operation for net working or for use on MARS channels. This separate oscillator is switched into circuit in place of the LMO by the 'Frequency Control' front panel control, and as its application has a limited use, it is a very convenient substitution. Some wiring changes

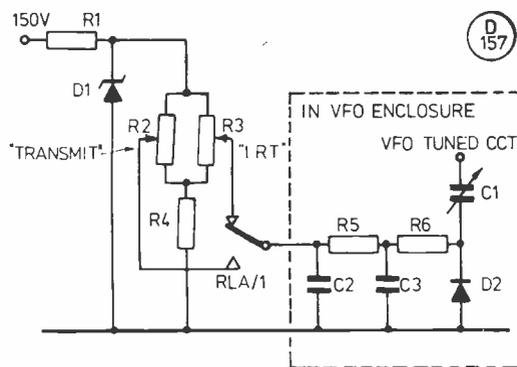


Fig. 2. Complete IRT circuit.

Table of Values

Fig. 2

C1 = Philips 3-30pF concentric trimmer	R1 = 47K 1-watt carbon
C2, C3 = 0.001 μ F LV ceramic disc	R2, R3 = Good quality 22K linear potentiometers (not wirewound)
D1 = 12v. zener diode	R4 = 2.7K $\frac{1}{2}$ -watt carbon
D2 = varicap diode (see text)	RY1 = see text

are required to use the transceiver without the switch in circuit, but these are not difficult and details are provided later in this article. Most other transceivers have spare panel space and the IRT control can be located in any convenient position. One possibility that has been used with the Heath HW models is to remove the phone jack socket and re-locate it in a spare hole on the rear apron of the chassis; the IRT control may then be fitted in the hole originally used for the jack socket. The writer does not favour this solution as the jack socket is located very close to the microphone input socket and this requires that a very small knob is used for the IRT control; however, it is a possibility when the transceiver owner does not wish to drill extra panel holes.

The varicap, series trimmer condenser and RF decoupling components are mounted on a small piece of Veroboard which is fixed to one of the sides of the VFO enclosure so as to locate the connection to the trimmer close to the tuned circuit inside the enclosure. The most convenient side to remove is the one adjacent to the 1F Circuit Board (right-hand-side looking from front). The Veroboard can be glued or screwed to the inside of the removed side as required in a position to ensure that the connection from the trimmer to the VFO-tuned circuit is fairly short; the trimmer is connected to the heavy tinned copper wire between the VFO tuning condenser and coil. Two holes are drilled in the side of the enclosure, one to take the lead from the RF decoupling network and the other to permit the adjustment of the trimmer from outside the enclosure.

As mentioned earlier, the 'transmit' potentiometer R2 is mounted in a non-critical position on the chassis. There is a spare hole on the SB-100, SB-101 and SB-102

models adjacent to the power amplifier enclosure and in the same section of the chassis as other preset potentiometers (bias, headphone volume etc.). If the 'transmit' potentiometer is mounted in this hole, it will be necessary to use a small-diameter component to prevent it fouling the other presets. The writer preferred a larger sized potentiometer and mounted it on the top of the chassis by means of a small 'U' bracket fixed to the metal plate to the right-hand-side (from front) of the power amplifier enclosure. The zener diode and series resistor are mounted on another small piece of Veroboard fixed alongside the 'transmit' potentiometer.

The multipole transmit-receive relay in the Heath models has a set of spare change-over contacts intended to switch external equipment, such as a linear amplifier or transverters. If this is not in use, then the contacts may be used to switch the IRT potentiometers. If the relay is already fully committed, then the contacts used in conjunction with the 'Frequency Control' circuit may be used. Some users may prefer to do this, even if the spare contacts are not being used, as it allows for future additions. The necessary wiring changes are described below.

Transceiver Modifications

Assuming that the IRT control is to be mounted in place of the 'Frequency Control' switch, it is necessary to unsolder the various connections and remove the switch from the front panel. Fig 3 shows the switch wiring diagram and the circuit of the associated relay connections. It should be noted that the switch and relay contacts are numbered in the overall transceiver circuit diagram in the handbooks applicable to each of the Heath SB models. The numbers and colour codes in Fig. 3 are those relative to the SB-101 and these may differ from the designations for the SB-100 and SB-102. Before attempting any modifications, the master circuit diagram should be checked to ensure that the correct contacts are identified, particularly in relation to the relay connections. It should also be noted that the series 100 ohm resistor and associated decoupling condenser (100 pF) in the RF feed to the first transmitter mixer V5A, and the 56 ohm shunt resistor in the RF output from the LMO, are mounted on the switch wafer; these components should be unsoldered from the switch when it is removed from the front panel.

The various leads to the switch have to be linked together and the two resistors and the condenser re-connected in the feed from the LMO and the mixers. The modified wiring is shown in Fig. 4, and again the colours refer to the SB-101. The connections to the relay are no longer required and these leads can be removed from pins 1, 5 and 9 and taped into the wiring harness for possible future use.

The complete IRT facility (Fig. 2) can now be wired into circuit using either the spare set of relay contacts or the set that were used with the crystal oscillator. Apart from the frequency shifting components in the VFO enclosure and the linked coaxial wiring between the LMO output and the mixers, none of the other wiring is critical and the connections between the LMO to the relay, the potentiometers and the DC supply may be run in the existing cable-forms.

Setting-up

The alignment procedure is relatively simple and consists of adjusting the frequency swing of the IRT control, recalibrating the main VFO dial and adjusting the transmitter potentiometer to null out the offset introduced by the IRT components. A digital frequency counter makes these adjustments very easy, but this is not essential and the circuits can be aligned using the internal crystal calibrator together with a separate receiver that will cover either 5.5-5 MHz or 3.5-3.6 MHz.

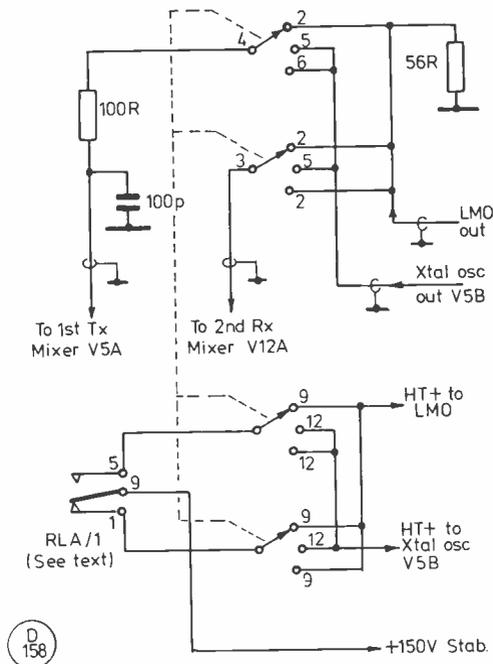


Fig. 3. Wiring to 'Frequency Control' switch before modification (numbers and colour coding refer to original Heathkit circuit designations for the SB-101).

If a counter is available, it should be connected to the VFO output via a small series condenser (5-10 pF). If not, then the transceiver has to be coupled to the external receiver by connecting a coaxial link lead between the 'Rec Ant' socket on the rear apron of the transceiver and the aerial socket of the receiver. The 'Antenna Switch' on the rear of the transceiver should be set to 'Rec' so as to isolate the transceiver aerial input to the receiver section from the transmitter output; a dummy load should be connected to the transceiver 'RF Output' socket. No other test equipment is required and the extra receiver is only needed if a frequency counter is available.

With the transceiver tuned to 3600 kHz, the crystal calibrator in circuit and the IRT control at mid-point, the VFO calibration can be roughly set on frequency. Owing to the extra capacity of the varicap and its associated components, the calibration will have moved low frequency and the zero-beat point corresponding to 3600 kHz may be as much as 25-30 kHz LF. The VFO calibration is corrected by adjustment of the VFO parallel

band-set condenser (at the rear of the LMO enclosure) to regain zero-beat with the calibrator at exactly 3600 kHz. **WARNING:** do not adjust the coil slug on the top surface of the LMO enclosure, as this will alter the shift between upper and lower sidebands and will degrade the linearity over the LMO range.

The next adjustment is to set the total frequency shift of the IRT circuit. This is done by checking the frequency swing at both ends of the potentiometer travel using the counter, or by retuning the VFO to obtain zero-beat and reading off the two frequencies from the VFO dial. If more than 4.5 kHz coverage is obtained, it will be necessary to reduce the capacity of the varicap series trimmer C1. If more variation is required, the trimmer capacity will need to be increased. The writer favours a total IRT variation of ± 2.5 kHz max., but the actual coverage is left to the individual choice of the user.

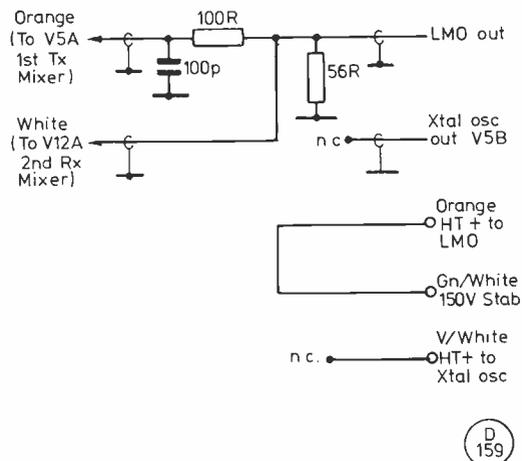


Fig. 4. Modified wiring after removal of 'Frequency Control' switch and connections Nos. 1, 5 and 9 to relay disconnected.

There will be some mutual interaction between the IRT range and the VFO calibration, so it may be necessary to re-calibrate the VFO after each adjustment. Once the IRT range has been fixed, it will hold over the complete range of the transceiver and the frequency shift will be identical for each band. A small label made from card and lettered using dry transfer, decals or engraved strip from a labelling machine may be fitted to show the mid-point (zero IRT), and the LF and HF shifts. The original Heathkit knob as used for the 'Frequency Control' switch is fitted with a pointer and is ideal for the IRT control.

The final adjustment is to zero the transmit offset. With the IRT control at mid-point and the received signal from the calibrator at zero-beat, the VFO frequency should be again checked using the counter or the external receiver; with the transceiver coupled to the receiver as previously described, no difficulty should be experienced in hearing the 5400 kHz (approx.) signal, or the transceiver calibrator signal on the external receiver. If the

3600 kHz frequency is being monitored instead of the VFO output, the external receiver should be tuned exactly to zero-beat with the calibrator signal from the transceiver. The transmitter is operated at low power in the 'Tune' mode with the 'CW Level' control backed off. If too much transmitter power is used, the counter may read the signal frequency rather than the VFO output; it will also be difficult to obtain a clean signal on the external receiver. It is likely that the VFO frequency will change by a few kHz between the 'receive' and 'transmit' modes and the chassis-mounted 'transmit' potentiometer has to be adjusted to compensate for the change. The transceiver can be switched between 'Tune' and 'CW' (key-up) to check that the VFO frequencies are identical. When the 'transmit' potentiometer has been set so as to null out the offset of frequency, the alignment procedure is complete and the external receiver or counter may be disconnected. The 'Antenna Switch' should be returned to 'Com' and the transceiver is ready for normal use with the added advantage of IRT.

In Conclusion

This particular IRT circuit was originally devised by the writer in 1953 for use with a Collins KWM-1 transceiver to overcome the problems of receiving SSB stations that were using homebrew and converted equipment with built-in offsets. It has now been used with over 30 different transceivers, ranging from the KWM-1, KWM-2, various Swan models and the Heathkit SB and HW models. Although different mechanical arrangements have been used, including a few 'outboard' versions with a separate external relay, no difficulty has been reported by any of the transceiver users who have made the modifications. Several *de-luxe* versions have been fitted with an additional switch to permit both IRT and incremental transmitter tuning (ITT); this requires that the two potentiometers are reversed using a double-pole change-over switch. Others have provided a separate switch to disconnect the IRT facility when it is not in use. The writer has not found these extra facilities to be helpful and provided the IRT control is always returned to the mid-point, there will be no offset between 'receive' and 'transmit' frequencies.

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COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

THERE can be little doubt that the Clipperton Is. expedition really stirred things up, and one senses that the rise in the sunspot count has brought out a degree of extra activity; sunspot counting in February yielded a figure of 89·8, while the predictions from Zurich are 52 for March, 56 for April, and 60 for June. Hang on to your hats you newcomers, because we think things are going to hum a bit on the DX bands through the rest of the year—it'll make two metres seem a bit tame!

Sources in Eastern Europe have been very optimistic about the possibility of some Iraq operation; the YU's have actually gone to the length of printing-up some 1500 QSL cards for YI1BGD. As they should be all-but set up by the time this is being written, we may well be able to indicate that the station has in fact surfaced. Turning our attention to the Aves operation, we note that while there has been a hang-up the operation is firm, as indeed is the Cocos-Keeling effort. However, that "new one" in the Caribbean seems to have run aground, the problem not being one of "getting there" but rather that two separate operations were planned in this area, both of which met the same criteria, one being passed OK, and the other one turned down. So, rightly we feel, the question has been wafted back to ARRL's DXAC with a polite request to think again!

Another one which may well not be available soon is ZS2MI (Marion Is.) where we understand that the new crew who will be taking over about a week after this reaches you don't have a licensed amateur with them—so get in there quick. Look for them around 21320 kHz, Saturdays and Sundays; but it's a list operation these days so you might have to practice waiting—until another amateur goes there!

Eighty

Let G3PKS (Wells) have the first ball; Jack has looked into the murk on all bands, but his 3·5 MHz

report refers only to the morning of March 19, when from 0626 onward, he connected with W3AU, K3RA, W1FTX, W4UG, W4BVA, W1PL, W2AEE, all in the space of eighteen minutes. The band was clearly in good shape on that morning.

G2HKU (Sheppey) has a gripe, in that he is still outstanding Wyoming for WAS, and has heard a pair in QSO who commented that a European was calling them, and then went QRT. This was followed by hearing another one, who when called replied "Sorry, east to go out"—and then went QRT without even a report! However, W4QM was a sort of consolation prize!

G6TC (Wolverhampton) reckons Eighty is finished for the season unless you are prepared to rise and go into the shack at an unearthly hour; perhaps Ted is a bit like the writer who means to get up, and sometimes even succeeds but then spends good operating-time in a warm kitchen sipping cups of tea until it's just too late!

G4GIE (Gt. Moulton) has been tackling Eighty alternately with the HW-8 on CW and the old AT5 on AM phone; the latter accounted for G3KRY, and CW for ON5AG, LB1XA, ON6FT, G3INA, ON6MC and G3CSG; the two ON's were both also QRP stations.

GM3XNE (Ardrossan) is on Eighty and Fifteen, the former being all-QRP. Art used 500 milliwatts of CW to contact GM6MD, G6UC, GM6RV and G4FNL, the last-mentioned being a bit of a struggle; the same power output turned into SSB accounted for GM3NJF, GM2FNF (both on Arran), and GM3HLQ. He notes the odd day when conditions are poor to the extent that one looks to one's aerial system and even thinks of opening-up the receiver to find a fault; but with DX going begging most days one soon forgets!

Just before he went off to EI, G4DMN (Wirral), had a few minutes to drop a line. Richard is another who finds the DX either too early or too late, but nevertheless con-

nected with CT2AO, EL2AK, FO0XA, HC1NAS, PJ8CO and 8P6IC.

The usual afternoon operating sessions on the band have not been too good says G2NJ (Peterborough) who found high noise level and severe fading until about 1630 on the clock. Nevertheless, some QRP stations were raised, such as G3GET in Sittingbourne, who uses the inner of his TV aerial at 15 feet and still manages to lay out a cracking signal. G8JU in Blackpool was immediately followed by G8PG, who commented that he and G8JU were operators together at Liverpool airport, G6HM in Amersham who runs a one-lunger 6V6 at three watts, G4CQK with a new ATU, G4BKQ, G4FXN, G6AB and G2NG.

'CDXN' deadlines for the next three months—

June issue—May 4th

July issue—June 1st

August issue—July 6th

Please be sure to note these dates.

Forty

Not a lot of reports, the lift of HF conditions having had the effect of draining off some of the interest. G3PKS just notes VE3BCH, worked on both March 7 and 9, hard going but well after dawn in both cases, on CW.

G4GMW (Bristol) has managed to persuade his trap dipole to do its thing properly, and as a consequence Martyn made SSB noises to K3RP, W1CF and 8P6GN, the latter incidentally dishing out an $S9 \pm 10\text{dB}$ report.

Our next customer is G4EDG (Newton Abbot) who found things quite reasonable to W6/7 around dawn, and managed a few countries and states not previously noted. All were CW, including VU2GW, WA0NCR/HCI, PY0FN, ZP5AO, CO2FA, W5OGO/TG9, N7RK (Arizona), K0ALL (N. Dakota), VE7's, K0ZK (Colorado), ZL2TX, VK2BKH, W7CTT (Montana), VK3MR, 8R1J, VE6ARQ,

KP4EDA, KH6AKX, KH6CC, CO8NP, VK3AE, VK7CH, FO0XD, WA2HYG/CP1, VK3XU, ZS2AD and ZL2ANW, plus a Gotaway in CE0AE who was calling GJ2LU, plus some directional CQ's for the remaining States (Nevada, Utah, Wyoming, and S. Dakota) which didn't have the desired effect.

CW on Forty for G2HKU meant working PY7BJH, PY7CIM and W3LPL.

Most *W* call areas were raised by G6TC, saving the elusive W6 and W7, VE3, ZL2AKW, VK3MR, CM2ER, KP4USN, YV4AOO and the pick of the bunch in WA2HYF/CP1 in La Paz.

G4GIE has an office on the ground floor in the middle of Norwich, so he strung a piece of wire up an inside wall, with a resonant "counterpoise" draped on the floor, with which he worked DL9PE, G4EUE, G4EHT, G2PT, G3VRU, DJ4FT and DJ2JV; from the home station DK5HE, DK1PF and G4GKF were added to the log, all CW with the HW-8.

Here & There

Thanks to G2FWA, we have the news of the death of Wing Cdr. F. Butler, O.B.E., B.Sc., C.Eng. F.I.E.E., F.I.E.R.E. on March 27, while visiting a relative in Nottingham. He will be remembered by older readers for his contributions, and in particular amongst the VHF men for that evolution of the overtone crystal oscillator which bears his name and is probably still one of the easiest circuits to "get going" on the desired overtone regardless of the crystal used. He was also a brilliant mathematician, and had that rare combination of both theoretical and practical talent; precision engineering was a major interest and he wrote many contributions in that direction. He will be sadly missed by those who had the good fortune to know him personally.

To revert to the Clipperton expedition, the gang ran up some 28,000 QSO's between them, which should have mopped-up the demand somewhat on this one. QSL to HB9MX, Kurt Bindschedler, Strahleggweg 28, 8400 Winterthur, Switzerland. Towers were left there for the next group, having been decided that getting them back aboard would be a mite too difficult; as it was, we

understand, the inflatable was up-ended when fully laden with gear being taken off and everything—exciters, linears, ATU's, and all, went over the side and were well dunked in salt water. However, this is probably not the disaster it would have been years ago, as the treatment nowadays is a bath in fresh water, a drying out, and away you go again!

The callsign allocations for the *W*'s are radically changed by new rulings, which will have the effect of making it known to the world just what class of licence the operator has—which puts teeth into the incentive licensing system with a vengeance. Outside U.S.A., the prefixes are understood to be: Canton, *KH1*; Guam, *KH2*; Johnston, *KH3*; Midway, *KH4*; Kingman, *KH5K*; Palmyra, *KH5*; Hawaii, *KH6*; Kure, *KH7*; Samoa, *KH8*; Wake, *KH9*; Navassa, *KP1*; Virgin Is., *KP2*; Serrana Bank, *KP3*; Puerto Rico, *KP4*. There seems to be no change as far as the Marshalls and Guantanamo are concerned, as these two are not under the jurisdiction of FCC. The issue of Special-Activity calls is ceased, and so also the holding of secondary station licenses.

From mid-March, the *ZL*'s have an expanded 7 MHz band, they now being allowed to operate anywhere between 7 and 7.3 MHz.

Ten

Is were the troops have been in action, more than anywhere else; this month's clip is larger than anything ever seen here since your scribe started the task of writing this piece years ago. So—we'll have to do a bit of compression here and there to get the gist of it all in.

G3PKS looked at the band on several days, and it would seem he struck pay-dirt every time; *JA*, *W*'s, a *UB5*, then a *UAI*, a *W4* and *W5FGO/MM* somewhere South-west of Brazil, *PY*'s, *EA80AK*; *UA6* and *PZ0* both 599, *HH1AQ/MM*, near the Virgin Is. and an *LU* who was *RST539*; on querying the report to G3PKS the lad came back with 599+ but 589 in *QSB*". Something a bit warped in the logic of that statement!

G4EDG mentions hooking *KH6IBA*, weak signals both ways on an apparently dead band at 2120z,

plus *PJ7VL*, *TI2LA*, *WA5YTX* (New Mexico), *W6*'s, *W7*'s, *W7WE* (Nevada), *YV1NX*, *VE5RG*, *PY0MAG*, *K0KLS* (Nebraska), *CN8CW*, *W3OGV/VP9*, *JA*'s, *SV1JN*, *ZE3JO*, *J3AAG*, *FO0XF*, *VP1KS*, *ZF2AD*, *9K2EX*, *KP4RF*, and *4T8V*—an OA "special."

So far this year, says David Whittaker, a total of some 173 countries have been reported heard or worked by *G*'s; his own list for the month starts with *UI8* and *JA* around 0700, right round to a *VO1* as late as 2100z—and you can't have a much more westerly direction than *VO*, which just goes to show how far *MUF*'s are up.

Even G2HKU, who normally prowls from Twenty down to Top Band, took a sneaking look at the band on one occasion, on which he came away with *PY0FN* on CW.

The SSB QRP business at *GM3RFR* (Baltasound, Unst), is coming along nicely now, with some 94 countries worked, mostly with SSB; on Ten Sam managed *ZS6*, *PY6*, *UL7*, *CT2*, *W0*, *W9*, *VP5* and a *CX*. Discounting all *W* call areas, all *VE* areas, all the mainland *VK* areas, we are still left with some seventy assorted DX callsigns; no less than five *P29*'s for example, three *9K2*'s, the *FO0XG* Clipperton station, a brace of *FP0*'s and all continents umpteen times over. The only fear, indeed, has been of the risk of damage through high winds, which whistle over Parkgate on the south side of the peninsula and had been going full tilt for a week at the time of his letter.

Turning to G4FUP (Horsham) we find that Neil, on occasion, tuned round only to find more beacons than stations on the band! The Panda Cub is used with an AR88 and a 14AVQ, and it raised most of *W*, *EA8FO*, *EP2LA*, *UL7*, *EP2VW*, *VE*'s, *UA9*, *9J2BO*, *ZE3JO* (Mal keeps on turning up this month!), *VE3AKG*, *ZD7PV*, *KV4CI*, *PY0FN* (without realising this one to be Fernando do Noronha), and a brace of *EA80* stations for good measure. In summary, G4FVP had 201 QSO's of which some 117 were outside Europe, against his previous total of 1600 QSO's of which only 4 per cent were outside Europe—some change!

Off to the Persian Gulf now, whence comes a report from G3ZGC/

MM aboard the *Esso Scotia*. Richard says that most of the activity has been on Ten, which was found to be good all the way along the eastern seaboard of Africa. U.K. signals started to be good off ZS, and continued so right the way up the Mozambique Channel, when our signals disappeared and staying out until they were off Somalia—where G's returned, and continued strongly right into the Persian Gulf. Most European countries were worked, although P29 could not be copied through the QRM and escaped. Near the Comoros a couple of ZS's were raised, SP9VU/P9 who was a mobile. GM3RFQ, G4BPY, G3QS, A9XBJ, G3IAD (he of the SS/TV), G3ZKJ, AP2KS; 9M2DQ was heard calling CQ G and worked but, interestingly, couldn't hear any of the other G's on the band, while at the end of the QSO Richard was still getting them. A similar event occurred over the QSO with VR4CF on the Solomons—after the QSO G3ZGC/MM was called by umpteen Russians which seems to indicate that they were *not* hearing VR4CF!

G8PG (Greasby) sent in a note which was more of an "alert signal" than a report as such—thanks, Gus—but gave a note that the band was open from sunrise to quite late on, he himself having collected a WI with QRP as late as 1900. The skip seems rarely to be under 1000 miles at G8PG, which seems to indicate that Gus is putting all his RF where it belongs! (We know, for the record, that a wire aerial rather than a beam is in use).

G2BJY (Walsall) mentions leaping eagerly out of bed one morning to get on the air and obtaining a dislocated finger by clouting the chimney-breast with it—we'll have to give him a course in inertial navigation! Geoff is pulling 'em in quite happily and hopes to knock up a few before the band goes out, although he has some very definite vacancies in the log for such local signals as LZ, OHØ and such, even though he made WAC for the second month on the run. (*Ed. note: OHØ, which we in amateur radio think of as a country, is in fact some 9000 bits of ground sticking up out of the water, of which 6000 are big enough to be named.*)

G3NOF (Yeovil) offers SSB QSO's



The mostly home-built 160m. station of Rostislav Pospisil, OK2PGU. Tx antenna is a 125-ft. vertical with a capacity hat, while a Beverage is used for receiving. Rosti, who already has 160/WAC, is aiming for DXCC/160—*with 48C/43 so far 'in the bag'.*

(Photo courtesy of WIBB).

with FPOLK, K7VIC (Oregon), K7PXI (Arizona), N5ZH, N7DD, N7ML, VE5QM, VP9BO, W5AWD/5, W5DMK, W6CUT, W9KQO, W6NGN, W6YAG, W7EQ, WA6AIL, WA6INJ, WA7NIN, WB5LSV, WB6ENS, WB6MOZ, WB7RLX and 6Y5HM.

Our old friend E16AS (he was G3JLA in those days!) heard E12VKM/M heading for the Rugged International, and told him about the Ten metre activity; so later in the day E12VKM cast a spell and transformed himself back into G14FUM (Lisburn) and looked at the band. Between 16:30 and 21:16z some 135 Stateside stations were worked, spread over 28 different states, including a first landing in California. Dave brings up a good point when he mentions that the Americans do not now sign /P whatever the call area is—which is a bit of a nuisance for anyone looking for particular states. It means that if for example you are looking for a rare W7 state, you can't confine yourself to W7 or others signing /7, but have to listen carefully and find out where he actually is. For Dave there was the case of K6IR who turned out to be in W4-land! Yet another thought, G14FUM has been on the HF bands just 13 months, and now has the 100 countries confirmed, the 100th being A6XB whose card dropped through the

letterbox on the morning of April 1.

After his long, self-imposed silence, G3DNF (Leeds) returns to the fray. Gordon has built himself an all solid-state CW QRP transmitter, designed for five watts but normally used at an input of four watts to a wire aerial. In addition a further handicap was imposed during March by only operating in short breaks between spells of decorating. Even so, we find UA9XAS, WB2VYA (this was QRP *both* ways), JE1HJJ, EA8BK, UL7FAX, G4BYG; ZD7PV, 9J2BO and ZE3JO all worked during BERU, 9H1EL, UI8ADN, PYØMAG, SV1DU, UA6ALC, EA8ØBK and UH8HAI. This, of course doesn't include the fine collection of Gotaways! On a different note, Gordon still uses the long-wire on Ten, and true to theory it becomes directional off the ends; but it is quite surprising how much energy there is in the minor lobes so that five or six half-waves end-fed is still very much of an all-rounder aerial.

G2ADZ (Chessington) has some rude things to say of the Clipperton DX-pedition operators on Ten. First, it took him some two hours to establish just what the pile-up was about(!); and then, having decided to join, he heard successively 10 up, 15 up and 20 up asked for, and sure enough stations calling at these spots, all of which made a

calculated *mess* of a band that was already well filled. Contrast was VPIKS, a "normal" pile-up even though all Europe was calling him. A good point. Looking at the contacts, G2ADZ found one dead day when even the beacons weren't audible, but otherwise it was DX all the way, so even a quick "CQ Europe" would yield a barrage of *W's*! All *W* call areas, VE1 to 5 all worked, VE6 and VE7 Gotaway, the Canadian variants for special events, VO's, JA's, CX5RV (G5RV underneath), PY9EJ in the forests, YV5GWR, LU7XP at Tierra Del Fuego, UA9, UA0, including UA0BBN who was inside the Arctic Circle, CE3ZW, CE8AA, OX3AB, VU2GO, FR7BE, ZE3JO, ZS's, C6ABA (which Bill describes as "the Garden of Eden,"), VPIKS, VK2, VK3, VK4, VK6, VK8, EP2IA, GJ2LU by scatter when the beam was round to the West (when turned round on to him he disappeared!), VP9CB, G4BKI/VP9, W3OGY/VP9, ZF2AD and HZ1HZ.

A single-element Quad served for G4GMW and with it Martyn traded SSB signals with EA8OFO, J11TDX, PY0FN, SV1IH, SV1IT, UL7EAF and WD0CHW.

14 and 21 MHz

Space runs out fast, so we will start this section with the chaps who have not yet had their mention, and then follow up with the others; this way, if we outrun ourselves, we at least avoid missing anyone out altogether.

G2DHV (Sidcup) now feeds 100 watts of CW into a dipole on 21 MHz and finds the band looking up but noisy with QRM and QSB on occasions. He worked CG3NRC, CZ3IVR, EP2FN, HP8ARK, K7ZVA, JA3AMM/MM, JA4HYD, JR6FCE, KG6OM, OX3FG, VP9L, VP9CB, TF3OF, XE2HLF, 3B8DU, 9H4L, 9G1M, 9M8HG, 9K2EZ, YV10B, KL7GTA, VK5NJ, TI2WR and WA6VPM/MM among others.

G3RCA (Wigan) is a 14 MHz SSB buff; he found band conditions quite good, with both long and short paths open in the mornings to the Antipodean areas. He raised VRIAF, VRIAG, YJ8GH, YJ8KW, 4S7CF, A35AA, OY2MD, HB0LL, PJ8CO, KC4AAA, SV1JH, PY0FN, ZS3WBC (Walvis Bay), FY7BC, VP5BD, CO2NX,

ZL4LR/A (Campbell Is.), 3D2BM, FB8YF, VR4BF, KC6CG, KC6CV, TI9DX, FO0XC, 3B8BL, FH0OM, HC8GI, 5H3FW, 5H3BP, FR7BV, plus just one CW QSO by way of FO0XH.

Quite a while since last we heard from GM4CXM in Glasgow, who stuck to 14 MHz albeit with both CW and SSB modes; the SSB showed C6ABC, GD5CGV, KZ5FR, HI8BMC, PJ8CO, PJ8UQ, TI2CC, TI3ESC, 9K2EX, OA4BZ and VE7AV. The CW list covers CO2FRC, CO5DM, CX1DDA, CX5RV twice, FM7AV, FO0XH, FY7YF, HC2TI, HI8LC, HK3AMV, JA's, JR6RRD, KL7MF, KL7IVX, KP4CW, KV4AA, KV4CI, LU's, PJ7VL, PJ9JT, PY's, PZ1AP, VEI-8, VOI, VO2, VP8QE, VK's, all *W* call areas, XE1ZV, XE1EH, XE1ENF, XE2ABN, YN1Z, YV's, ZL1CO, ZL3UV, ZL4FT, ZP5AL, ZP5NW, 5Z4CW, 8P6HD and 9J2BO.

Thirty-five metres of inverted-L aerial plus an HW-8 at 2.5 watts was the G4CQK tackle, and with it he raised UO5WT, UB5RAF, UK3XAM, WB9VQA, WB0RFH, WB2TWN, K3CR, VE3EGP, UK2GAY, TF3HNN, WA2QEL, OK3KVV and OH6XK; Albert also runs a TS-520 but on this rig he has only one QSO to be noted, namely CX5RV who is of course G5RV.

G4GIE (Gt. Moulton) mentions on Twenty, with his HW-8 and Joystick, new countries by way of CG6CGC, UA9CBQ, IT9PMU and SV1GR and other contacts with Europe and North America, right over to W6SGU which is DX by any standards. Down to 14 MHz, where things were more pedestrian, all in Europe.

GM3XNE remarks that he is short of Oregon and Utah for WAS, but he is still trying. Art runs rather more QRO on 21 MHz CW/SSB than the fleapowered 3.5 MHz rig, and CW gave him QSO's with all *W* call areas, VE2BA, VE6CHW, G3PPE/VE7, VE7BRV, VK's, 9M8HG, all JA areas, JA0SX (Sado), JA6WWH/JR6 (Okinawa), EA8's, EA9FS (Melilla), VU2BK, PY's, 9Y4VU, UI8ACQ, a brace of UA0's both from Vladivostok and 5B4EY; the SSB came up with 5Z4PG, VE7CQX/SU, HZ1AB, JR6RVG and UI8ACQ in Tashkent. G3NOF has a simply enormous

list for 21 MHz, but he notes that 14 MHz has not been wakening as early as in previous years. 21 MHz SSB first—and heavily pruned at that—shows FG7AX, HSIWR, IV3YRN, lots of JA's and W's, KG4FW, PJ8CO, TU2EW/M, VC7CCC, VC7WJ, VE4RP, various other rare VE types, VP8PC, VR4DJ, XK6WQ, WD9FCC/VQ9 on Diego Garcia, ZB2CJ, ZS6JS, 7P8BC, 9V1SW and 9Y4SF. Coming down to Twenty, Don mentions S9JS on 14220 kHz as appearing there regularly at 0730z. A2CAH, CE0AE, EA9EO, FR7AT, FR7ZS, KL7IXV, N4SN/DU2, P29JS, TA1MB, lots of VK's including VK2AGT on Lord Howe Is., YM1ZB, ZL's including ZL4LR/A on Campbell, ZS1Z, ZD9GG (Gough Is.) and 9G1JX were all taken into the log. However, Don missed the Clipperton effort because of a dose of 'flu on the two best reception days!

G2HKU notes Twenty SSB first, with VK3BZ, ZL1VN, ZL3RS, ZL3SE, ZL3FV, ZL1AAE and 9H1EY, plus CW to CX5RV, EP2IA, PY0MAG, W6VD, N6NY/KP4, 9H1CH and WA0NCR/HCI. Stepping up to 21 MHz, it was all CW, including G3LGP/W0, VO1BE, VE2AH and UI8AAF.

G3PKS is evidently addicted to rapid bursts on the bands, as he notes on 14 MHz a string of 7 *W's* in 16 minutes on CW, while 21 MHz gave JA, JH3ETC, PY0MAG, TF3PJJ, K5EIS and WB0QV on one day, the TF being a new country; another QSO of interest was a twenty-minute chat with W7FVR on 21 MHz CW, with no pile-up.

We have already referred to the mighty list of G4DMN, alongside which the 14 and 21 MHz scores are puny—on the first-mentioned band we find FR7ZS, FO0XC and ZL4LR/A, while on the latter FO0XB, PJ8CO, PY0FN and ZB2G.

Final-Final

There it is then: two of the most lively months since the war in terms of DX, excitement, and just good conditions. For next time deadline is May 4, sending to 'CDXN,' SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts., AL6 9EQ.

A DIGITAL FREQUENCY METER, PART 1

COMPLETE CONSTRUCTIONAL
DETAILS OF A PIECE OF GEAR
WHICH COULD WELL OCCUPY
EVERY SHACK

C. J. DAVIS, G3VMU

TRYING to measure frequency can be a wearisome business, both on eardrums and patience if you use the heterodyne wavemeter such as the BC-221 or similar: So, having decided to venture forth on to the HF bands again, the decision was made to build a new frequency-measuring box. Considering all the problems of spurious responses either from the wavemeter or the receiver, it was decided to use a digital frequency meter, even though it was realised that this method brings with it its own set of problems.

How does a digital frequency meter work? The basic unit is a high speed divider, which will divide whatever frequency is presented to it by ten; clearly these can be cascaded and in essence we have a "counter." It must be noted that the output of this arrangement will be in binary code, which must be converted back to decimal notation before being made to drive the display. Binary code is nothing special; just as probably we began in prehistory to count decimally for no better reason than that we have ten fingers, so binary is used because the generality of electronic switching devices or circuits have only two states, namely "on" or "off" if one makes any reasonable allowance for the electronic noise in the instrument's environment. In this form, each number between one and ten is represented by four digits—thus decimal 3 is binary 0011, decimal 7 is binary 0111, and decimal 4 is binary 0100. Now, to turn this binary counting into decimal, and to make it work a display (usually a seven segment LED, as in a pocket calculator) we have to interpose a "decoder-driver" between the divider chain and the display. An extra worth having is some sort of memory, so that the display will hold until the next count is completed before changing; this saves one from being hypnotised by the changing count continuously on the display.

We now have the heart of the machine and giving it an input of, say, 5 volts peak (frequency for the moment can be disregarded), the thing will whirl away to itself—but the readings will be nonsense to us. A little more finesse is necessary to turn a simple counting chain into a device that will measure frequency; a "gate" which can be opened for a predetermined time to let the counter signals in, and then shut again. To do this, we need some sort of "gatekeeper," equipped with a time-piece—and indeed our gatekeeper is very simply a clock derived from a familiar old quartz crystal.

Now consider the position. The quartz crystal oscillator is chosen to give a frequency which can be divided down to give us time periods of, say, one second, 0.1 second, and so on. If we open the gate for one second and see on the output of the display 1000, we can say we are seeing a frequency of 1 kHz. If we had opened the

gate for 1/100 sec. and got the same display, we could say we are looking at a frequency of 100 kHz; so, by altering the gate time, we can, in effect, look at higher frequencies without the need for more display LEDs. Had we held the gate open for one second with an input frequency of 100 kHz, we would end up with a display of 000. The vital '1' can only be seen by changing to the 1/100 second time. Simple people call this "throwing the baby out with the bathwater," but we call it "overflow" as the useful information has disappeared out to the left of the display when we were on the one-second range. It does not take a genius to realise that if we can choose our gate time by way of a switch which brings in more or fewer divide-by-ten stages after the crystal, then we can by switching look at, say, a frequency of megahertz right down to the last cycle by no more effort than turning the time switch, with only the four digit display.

Take a five-digit display, for instance, and a gate time of one millisecond. When the gate is closed the display reads 28765; this is a frequency of 28765 kHz. Now change the gate time to one second, and the display says 65431 Hz, the 287 having disappeared off the left of the display, and the visible bit showing Hz. Combining the two in our head or on a bit of paper says 28765431 Hz, or 28.765431 MHz.

Our third element is some sort of *control*, which with the help of the clock will carry out the following things:

1. Open and close the gate as required
2. Transfer the counted total to the stores
3. Reset the counter to zero
4. Get all ready for the next opening of the gate.

Between steps 3 and 4 there will be some delay, which is usually in the hands of the operator, and in practice controls all the functions of the meter.

Next we have an input unit; this is nothing more or less than a device which takes in the near (we hope!) sine-wave signal we want to count, and turns it into a square wave.

The last requirement is a power supply.

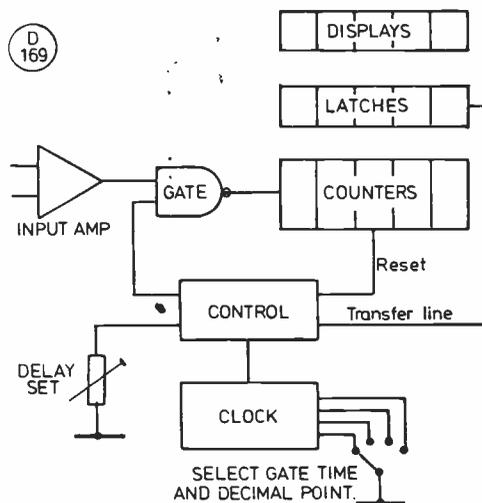


FIG 1 BLOCK DIAGRAM OF COUNTER

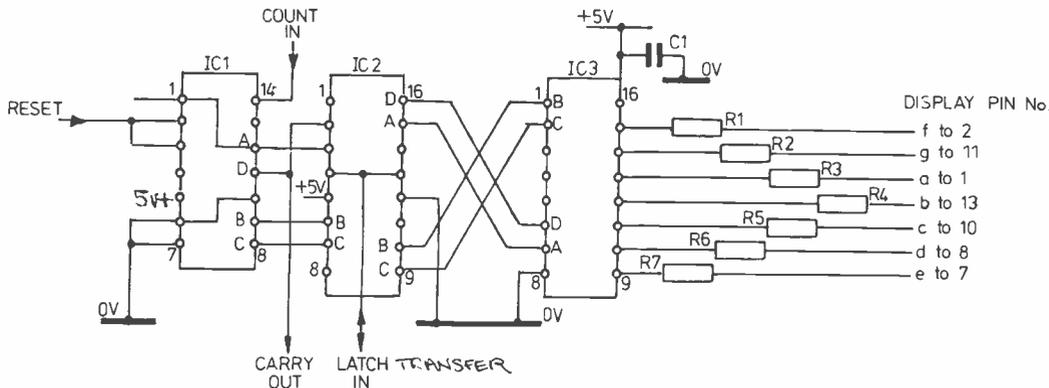


FIG. 2 COUNTER DIAGRAM

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The Design Itself

We now leave the theory for a while, and consider what we want:

1. Maximum frequency 32 MHz—anything more to be regarded as a bonus.
2. Two ranges; with a five digit display we need either a one second count or 1/1000 seconds, which in theory would give us counts of 99,999 Hz and 99-999 MHz.
3. Display time; this is variable between about a quarter second to ten seconds, which enables us almost to follow a VFO up the band on one hand, and on the other slows things right down to take readings without the jitter being too tiring.

Components for each Divider Board
Fig. 2

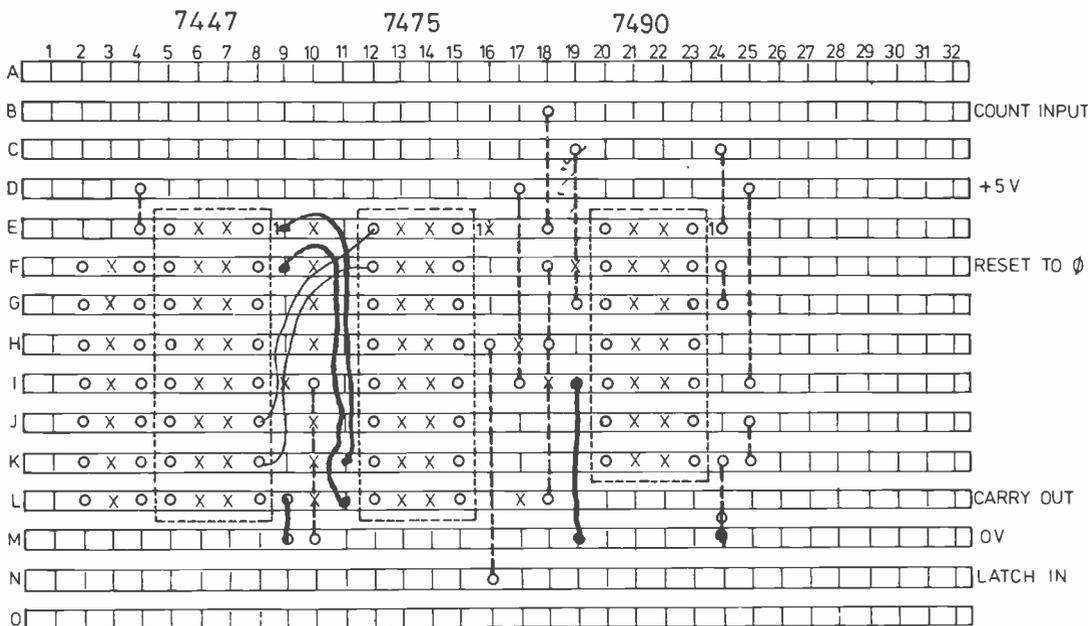
- IC1 = 7490
- IC2 = 7475
- IC3 = 7447
- All resistors = 270 ohm
- C1 = 0.01 μ F ceramic

Note: Five sets of the above are needed for the complete counter.

Apart from the links shown, the following should also be made:

- E9 to K11
- F9 to L11
- E11 to J9
- F11 to K9

Connect the 270 ohm resistors between F, G, H, I, J, K, L, nos. 2 and 4; lines are taken from F, G, H, I, J, K, L to the displays.



ALSO CONNECTED:- E9 / K11. E11 / J9.
F9 / L11. F11 / K9.
F1, G1, H1, I1, J1, K1, L1, TO DISPLAY

270 OHM RESISTORS CONNECTED BETWEEN F, G, H, I, J, K, L 2 AND 4

FIG. 3 COUNTER LAYOUT (UNDERSIDE)

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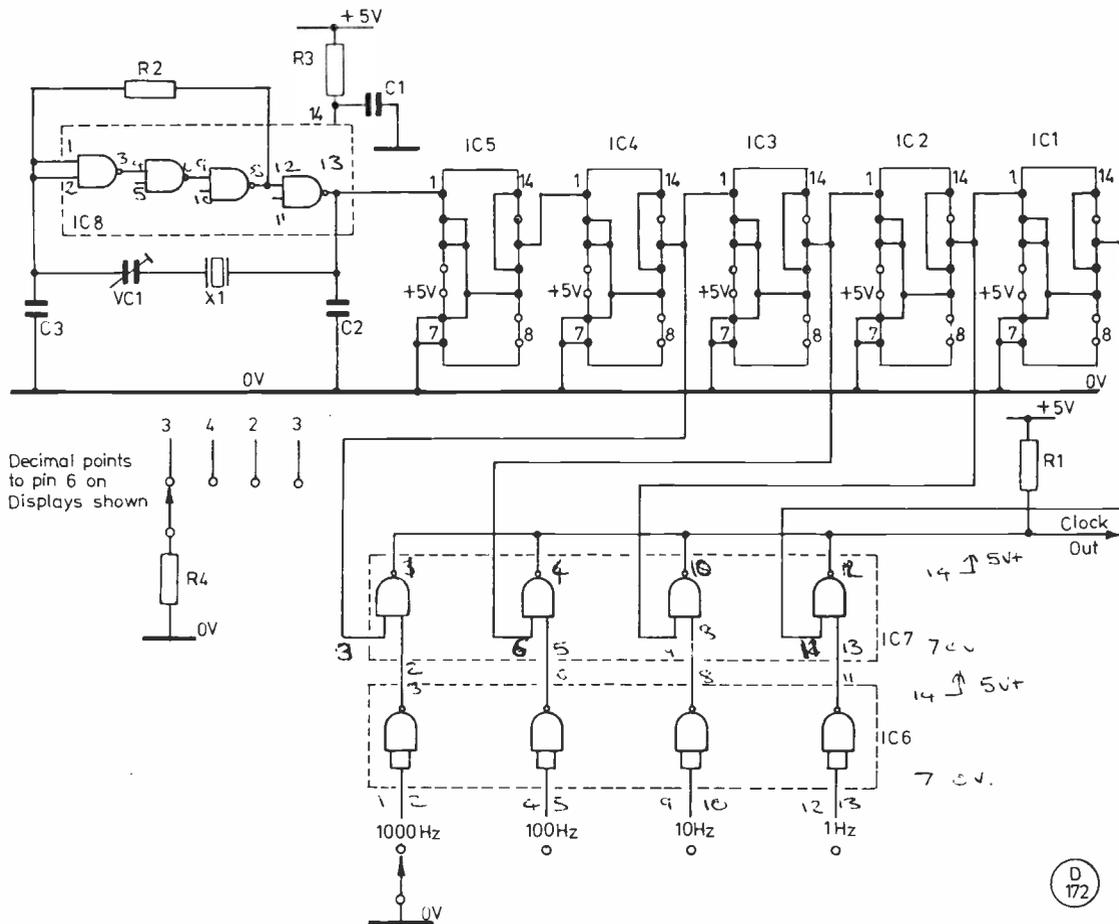


FIG 4 CLOCK LOGIC DIAGRAM

One could use the meter to measure *time*, by just transposing the inputs to the divider chains for gate and signal; thus an input pulse will open the gate, and the count will commence, continuing until another pulse comes along and closes the gate; the display is now the time for which the gate was open (the small complication in switching was not considered worth it).

The Meter

The decision to use five digits ruled out the use of the ZN104OE counter block which has only a four digit readout, and in any case it has an upper limit of 5 MHz; anything higher would require a "pre-scaler" to count down, and to count to 1 Hz the gate-open time would have to be extended to ten seconds. Since the cost of the ZN104OE and the cost of five decade counters with their associated latches and display drivers are not very different, and also by selecting the first decade counter (*i.e.* picking out the fastest one of a group) we can get right up to our design figure of 32 MHz. The rest of the design follows entirely from this decision.

Each decade board, consisting of divider, latch, and decoder-driver is built on to a piece of *Veroboard*. These are then stacked to form the counter unit, and wired to the LEDs. The clock and its divider chain are

built on another board, and the input amplifier on a third. Using an 11 x 6 x 3in. case leaves room for the PSU and enough spare for a VHF pre-scaler to be added later if desired.

The Counter Board

A logic diagram is shown in Fig. 2, and the *Veroboard* layout in Fig. 3. There is nothing particular about this, save that the one placed electrically nearest the input amplifier must have a 7490 IC which will count to 32 MHz. The National DM7490 is claimed to have a count rate of 42 MHz and could be used, or you may get away with just shuffling the boards for the fastest. Another alternative is the 74196 decade counter—but this is not pin-compatible, so a different board layout would be required for the first board. The other two IC's on each board are the 7475 latch and the 7447 display decoder-driver.

The 7475 latch is a simple memory; when pins 4 and 13 are at earth, the outputs will remain constant no matter what goes on at the input. If after the counter has stopped we take these two pins high (that is, up to the +5 volt rail), then whatever number is sitting on the input will be transferred to the output. On pins 4 and 13

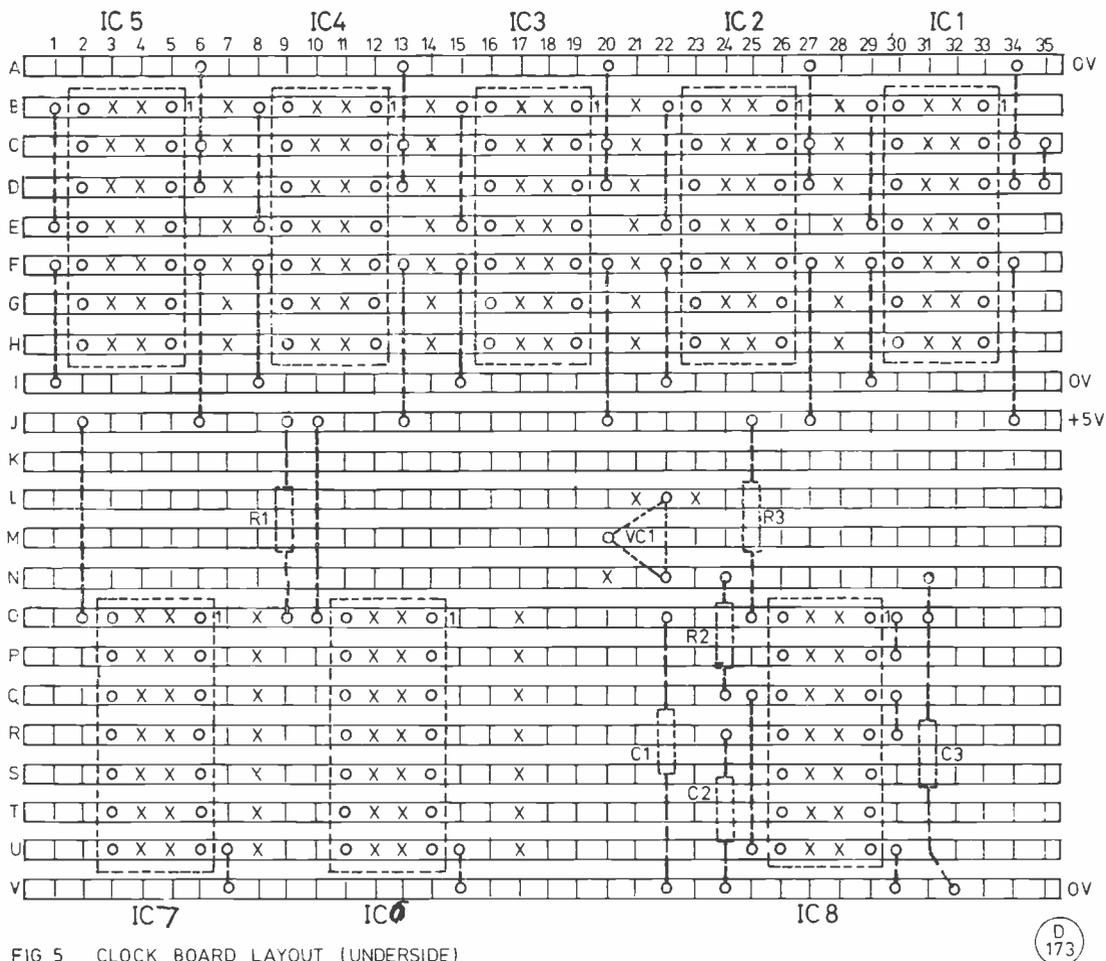


FIG. 5 CLOCK BOARD LAYOUT (UNDERSIDE)

Clock Board Lay-Out and Parts List, and Interconnections Fig. 5

IC1, IC2,
IC3, IC4,
IC5 = 7490
IC6, IC8 = 7400
IC7 = 7401
R1 = 470 ohms
R2 = 2.2K
R3 = 100 ohms
R4 = 270 ohms

C1 = 0.1 μ F ceramic
C2 = 0.005 μ F ceramic
C3 = 1000 pF ceramic
VC1 = 6-60 pF trimmer
Crystal = 100 kHz
Switch = 2-pole, 4-way

On IC6 the following pins are joined below the board: 1 & 2; 4 & 5; 9 & 10; 12 & 13. On IC7 pins 1, 13, 4, 10 are also joined below board. The interconnections between IC6 and IC7 are: Q15 to T7; T15 to Q7; T10 to U2; R10 to R2.

The counter inputs to IC7 are:
1 Hz: D1 to Q10
10 Hz: D8 to U10
100 Hz: D15 to P15
1000 Hz: D22 to S15

The 100 kHz from the oscillator to the dividers goes from R22 to B33. Clock sections are made by earthing wires to: 1 Hz, Q2; 10 Hz, T2; 100 Hz, S7; 1000 Hz, O7; clock output is taken from O7, while xtal itself is connected from M19 to R23.

Main 5v. positive supply is by-passed at several points with 0.1 μ F disc ceramic capacitors.

Also GH5, GH12, GH19, GH26, GH33 are connected to earth rail; these are carried out on underside of the board.

Note: Board is viewed from track side.

going low again the output is locked and does not change regardless of changes in the input.

The outputs from the latch are taken to the 7447 which is organised to take in the binary, turn it into decimal, and drive the seven-segment LED display as may be needed. Thus when you have wired it to the DL707 displays you should have recognisable numbers—if you didn't make a mistake in the wiring!

Clock Unit

Here we have the crystal oscillator and the dividing chain, with the output system organised to feed the control board. A logic diagram appears at Fig. 4, and a layout at Fig. 5.

to be continued

• • • **SWL** • • •

SHORT WAVE LISTENER
FEATURE

By Justin Cooper

OUR first task this time around is to note the death of Mr. A. W. Nielson of 49 Polwarth Street, Hyndland, Glasgow G12 9TH. Thus we lose the last of the group who wrote in to the very first "SWL" feature, back in 1960. There was a time when he was at the top of the HPX Ladder, and although he had dropped from that eminence latterly, it was the result of lack of time—the interest in our hobby had not lessened. Of the remainder who wrote in to that first "SWL" so many years ago, some went on to their transmitting licence, and others dropped out as interest waned, but A. W. Nielson was one of the select band of dedicated listeners, and he never indicated any desire to join the transmitting fraternity, in which he would have shone. We can also add that in all the years we never had occasion to adjust one of his HPX claims, and frequently his letters gave clear indication that "the onlooker sees more of the game" and helped your scribe to put together pieces of the odd-callsigns puzzle. He will be sorely missed, not least by the writer of this column.

Right at the top of the second pack of letters to arrive came another blow; this was a brief note from Jim Grice to tell us of the death of Ken Whiteley in Castleford—a sad loss and the more so as Ken was only in his thirties. He would just about have had time to read the March "SWL" and his own comment that things were well on the mend; a vicious quirk of fate indeed.

The Mail

Our first is H. M. Graham (Harefield) who seems to have been concentrating on Ten, and finds it interesting to note how the pattern of activity has changed from day to day—though always of interest. One day full of W's to the exclusion of all else, and on another DX to SV and down into Africa at the same time of day. The main point is that Maurice notes that all W call areas were heard, which is tantamount to saying openings may be expected to any part of the world on the band.

An interesting little query comes from D. W. Waddell (Herne Bay), who occasionally hears the letters FOC after a CW CQ call. Those letters represent all that is best in Amateur Radio—First-class Operators Club. It is an invitation-only club, and the way of it is that if a member thinks a station he hears is good enough, he may offer to stand for that station. When enough such voluntary offers have come in then, and only then, can one apply. It is a CW-only club and the aims, naturally enough, are to maintain a high standard of amateur radio operating practices and skills.

K. Kniveton (Kingswinford) bought an NR-56 receiver, and had himself an earfull of Two Metres, or at least the channelised and repeaterised half—which very rapidly made Keith resolve to take the Morse test! A good point this, as many OT's on the band who welcomed the chance of DX Phone contacts in comfort given by the narrower bandwidth, absence of carrier heterodynes and apparently bigger signals for the same input, are now going back to CW operation almost exclusively; the reason is that by

some freak of chance the general decline of manners and morals in this "age of change" has for some reason not taken hold of amateur CW to anything like the extent it did on the phone bands or, worse, to black-box VHF operation. To be fair, the repeater-jamming must be left out of the argument, this being the work of sick minds; but the remaining, legitimate, channelised FM and repeater operation is, with a few shining exceptions, pretty awful.

P. Rooney is back at home in Liverpool and waiting the results of his Part 2 Law examinations—if he is successful, May will see him joining a firm of solicitors under articles and then, he says, SWL-ing time will very likely be less than it has been during his "academic" phase of life. True enough, but it is the art of making time for a hobby, no matter what the pressures may be that marks out the healthy from the ulcer-candidate. Relaxation, even for ten minutes, is an essential part of the daily round.

Aerials

J. Irvine doesn't mention his town, but he has a problem—aerials. John says it doesn't seem to make much difference which aerial he tries and asks, sensibly, "Am I being confused by technicalities?" In a way, yes, and at the same time, no! For a start, at the upper end of the sunspot cycle, almost anything goes, simply because they lay down such big signals—but it's a sight different when you try to work 'em. The good aerial will go on receiving those DX stations long after the bit of damp string will have told you the band is dead; and of course, at this stage virtually anything outside Europe is DX. Now, if you were to note what happens when one aerial is either removed or well detuned, compared to the other aerial, and if you notice the directions from which big signals are coming on the Great Circle Map, you will begin to notice that there are most definitely differences; and that these differences are in terms of favoured directions on the one hand, and nulls on the other. We suspect that what is happening is that the signals received by one aerial are in fact being re-radiated to the other one, so that the effective aerial is not either but both. Two aerials on the same band are almost always a snare and a delusion!

R. E. Thomas (Corwen) comments on the difference between what we said in the text and what score we put against his name last time round—the score was right and the text wrong!

Turning now to S. Foster (Metheringham), we note that he is up to country 300, with the 301st heard—if the Walvis Bay, ZS3WBC, operation is passed as being OK for DXCC; as Stew so rightly remarks, "Who knows?"

HPX Rules

G. Brazil (Dublin) argues cogently in favour of a change in the HPX Rules; to Rule 5 in particular. The argument as we have already said is a fair one, and

HPX LADDER

(All-Time Post War)

SWL	PREFIXES	SWL	PREFIXES
PHONE ONLY		PHONE ONLY	
K. Kyezor (Irchester)	1896	K. A. Burch (Plymouth)	646
S. Foster (Lincoln)	1662	S. T. Bowen (Kippax)	641
R. Shilvock (Kingswinford)	1621	M. Shaw (Huddersfield)	638
B. Hughes (Worcester)	1602	I. Wilkinson	
J. Fitzgerald		(Llandudno Junction)	636
(Gt. Missenden)	1519	S. Hammond (Solihull)	576
R. Carter (Blackburn)	1510	S. M. Phillips (Dukinfield)	573
M. J. Quintin		K. Kniveton (Kingswinford)	572
(Wotton-u-Edge)	1377	D. A. Robinson	
P. C. Jane (East Looe)	1360	(Felixstowe)	571
H. A. Londesborough		D. Brooks (Loughborough)	550
(Swanland)	1271	D. Hill (Crawley)	537
E. W. Robinson		J. G. Ollis (Solihull)	522
(Bury St. Edmunds)	1250	P. Ramsay (Steventon)	503
M. C. P. Bennett (Datchet)	1224		
J. H. Sparkes (Trowbridge)	1141		
Mrs. J. B. Jane (East Looe)	1091		
H. M. Graham (Harefield)	1035		
M. Rodgers (Harwood)	980		
W. H. Smyth (Hartlepool)	912		
B. T. Mackness (Dagenham)	876		
D. Taylor (Harborne)	843		
M. Law (Chesterfield)	790		
P. Rooney (Liverpool)	764		
R. Towlson (Nottingham)	745		
K. Linge			
(Willington, Co. Durham)	657		
P. L. Shakespeare			
(Foulness)	653		

Minimum score for an entry is 500 for Phone, 200 for CW. Listings in accordance with HPX Rules and to include only recent claims. A "Nil" return is permissible in order to hold a place.

was considered back in 1960 when HPX was first set up, when it was decided that there was just no rule that would cater for all these anomalies, so any rule would have to be quite arbitrary. Thus evolved Rule 5, and so we don't see any *new* argument to alter the balance of the logic. On an entirely different tack, Gerard has been hearing a most odd sort of net around 3.9 MHz, in what to us would be regarded as the American eighty-metre phone band, in which some thirty or more stations seem to be involved and with a pretty formal sort of procedure: mainly two-letter calls, and a call consists of the two letters of the station being called followed by one's own two letters, e.g. AVUJ indicates that UJ is calling AV. Does anyone know what this net is—it sounds to old J.C. a little as though it is one of the "things" with which we share bands, but which have every right to be there. Of course in Europe its out of our band anyway, so we cannot gripe—but it would be nice to know!

R. Barker (*Workshop*) writes an interesting letter on modifications that may be possible to his FRG-7, to make it more suitable for SSB; it appears that Ron's receiver has a bandwidth across the top of 8.9 kHz before it drops off very steeply. We passed on his letter to the Editor, and we hope that Ron's ideas will make a separate and complete modification, when added to the notions propounded in his letter.

Talking of FRG-7 receivers, we have a letter from D. F. Abbs (*Cromer*) who has just obtained one of these and would like to learn how to drive it to the best advantage—other FRG-7 owners, please drop him a line at 31 Norwich Road, Cromer, Norfolk with your hints and tips.

On to J. Thompson (*Swallowfield*) and the triangle aerial he mentioned last time round. He has tried the

effect of grounding other aerials, and concludes that it does rather look as if the triangle is pretty effective in most directions; it also seems to be resonant on the bands as grounding it tends to make the dipoles perk up. All these interesting comparisons are possible because SWL Thompson is lucky enough to be on a farm, rather than a postage-stamp sized plot with a semi-detached filling most of it and TV timebases all round; no, not sour grapes, just that a careful observer of aerials is rare, and a careful observer with the necessary facilities rarer still, and so his work that much more useful.

K. Piper's double-conversion receiver gave up over Christmas and so has been replaced by a direct-conversion job, which sounds as though it is suffering from rather less than adequate mixer linearity; but work at the moment is concerned more with the restoration of a rather beaten-up AR88D, so that bands other than 14 MHz can be looked at.

Now to *Ventnor, I.o.W.*, where R. Griffiths has sent in three successive reports and, as proof that interest is sustained, has rejoined ISWL after a break of about 14 years! On a different tack, Bob has been alternating his listening on the amateur bands between an AR88 and an Eddystone EA-12—it seems the EA12 is best on the lower bands, and the AR88 on Ten where the EA-12 has too much bandwidth—but on the AR88 the absence of the EA-12's notch filter is very noticeable.

Activity for S. Hammond has been well down, between decorating the shack, revising for examinations, and other hobbies—but he did notice a car registered *SWM 3* fairly closely followed by *JC 2*. As he lives in *Solihull*, it wouldn't have been your scribe chasing ye Editor!

R. Towlson (*Nottingham*) has been hunting through the old logs for extra prefixes to add to the score, to his advantage. However, he notices an odd one in *YU2RNW/X*—odd but perfectly OK on the end of a *YU* call.

Congratulations

These are due from us all to P. Barker (*Sunderland*) who has been with us for some seven years, and knocked up 980 prefixes before finally deciding to take the plunge and become G8OVD, transmitting at the moment with a TR-2200GX and a whip; Morse is under way for the summer and then there will be a G4. SS/TV is still a major interest, and there are hopes to put it on to VHF—meantime some 55 countries have been seen, scattered over all the continents of the world.

D. Brooks (*Loughborough*) is indeed a lucky chap, as his XYL is taking the R.A.E. class at the same time as him, and both are going after G4 calls. At the moment

ANNUAL HPX LADDER

Starting date, January 1, 1978

SWL	PREFIXES	SWL	PREFIXES
R. E. Thomas (Corwen)	495	G. Brazil (Dublin)	291
D. W. Waddell (Herne Bay)	433	K. M. Rogers (Lutterworth 282)	
A. Rimmer (Port Erin)	399	K. Piper (Bognor Regis)	269
N. Rimmer (Port Erin)	342		

200 Prefixes must have been heard for an entry to be made, all heard since January 1, 1978. See HPX Rules.

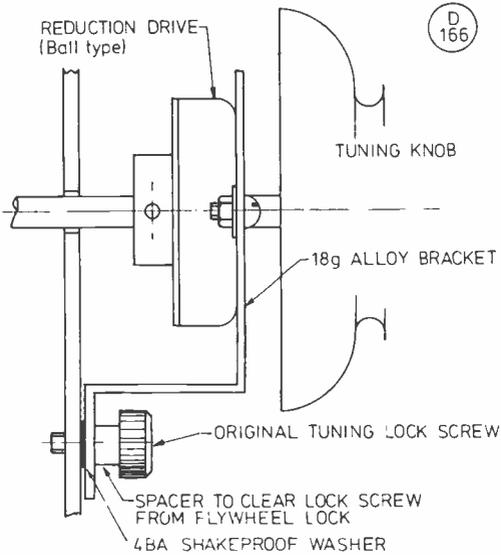


FIG 1

The extra slow-motion drive added to his AR88D by D. A. Robinson, see text.

the gear is an end-fed about 100 feet long, into a JR-500S receiver.

“Getting to know Oscar” was his Christmas present, says *K. Rogers (Lutterworth)*, and as a result he has been listening to the downlink both on 28 and 144 MHz, with *W’s* and *9L* as about the best so far logged.

On now to *E. W. Robinson (Bury St. Edmunds)* who has an HPX total that rises steadily, this time mainly through “infilling” of the odder variations on common countries in Europe and North America.

Son *D. A. Robinson (Felixstowe)* enclosed his list with the OM’s, plus a rather nice little modification to his AR88D to give a bit more in the way of mechanical bandspread. He has obtained a simple slow-motion drive, mounted it on a bracket which in its turn is fixed to the front panel by means of the existing tuning-lock screw; a washer is added also in order that the tightening-down of the screw to lock the bracket does not lock the flywheel. A drawing appears in Fig. 1 (this is, incidentally, the first time that we have included a drawing in the “SWL” column!) We like this modification, the more so because the AR88 can be brought back to its original condition for re-sale, and the station tuning will be vastly improved, given only that you can avoid an excess of backlash in the tuning mechanism considered as a whole.

D. L. Mallet (Maidenhead) mentions that he is interested in other aspects of SWL-ing, such as CB and utilities from overseas; David wonders why we don’t have a section for these sorts of SWL. A very simple reason is that there just isn’t enough space for any more “feature material” in the *Magazine* as things stand at present.

Our first letter to this piece for many a long day from the Isle of Man comes from *N. Rimmer (Port Erin)*, and his son. Norman gave it all up about 15 years ago

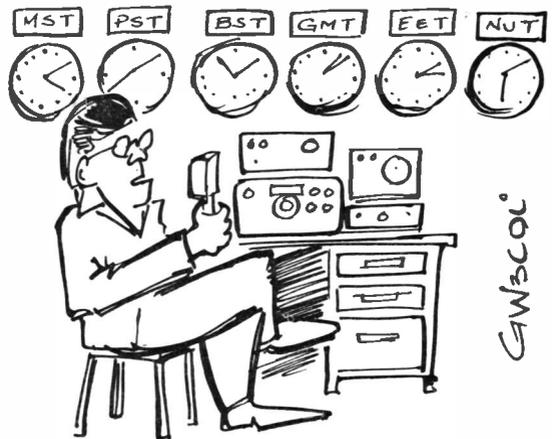
for one reason or another, but the bug lay dormant until on taking over the Argyll Hotel it was noticed that they were fifty feet above sea level with a clear take off to the West across the Irish Sea; naturally a receiver had to be obtained to test theory—which was the signal for the bug to revive, and to infect youngest son Andrew! Thus there are two HPX lists, and as far as Norman is concerned R.A.E. study is the order of things for the May exam. As for Morse, there doesn’t seem to be much problem, so a new GD4 should be on by the end of 1978. Incidentally, Norman would like to look after any amateurs or parties who visit the GD neck of the woods, and we have a sneaking suspicion that he wouldn’t complain if someone brought his rig for a spot of /A! Port Erin 833299 is his phone number.

Those AA calls used during the Bicentennials in the USA are still bugging one or two; the HPX Rules really didn’t bargain for a prefix turning up from somewhere else, so quite arbitrarily we resolved the difficulty by saying that AA can only count once. This, we hope, will answer *M. Shaw (Huddersfield)*.

D. Hill (Crawley) puts in an All-Time list for Phone and CW which he reckons will ensure him the unique distinction of sitting at the bottom of both Tables! A bit of ‘aggro’ over his VHF mast and rotator manifested itself, but the dipoles for the HF bands which had to come down due to this have been replaced by the simple expedient of using the longwire on all bands through an ATU. Which gives us the chance to repeat the distinction between a longwire aerial (a wire several half-waves long at the frequency in question) and a long wire in which case the term is used purely with reference to the mechanical length and with no consideration for its electrical length.

Finale

So . . . that’s it for another piece. Send your next lot of letters and Table entries, addressed to “SWL,” SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ, to arrive by first post on Thursday, May 18. Till then, good hunting.



“. . . sorry to be late OM, didn’t realise the time . . .”

ANTENNAS—THE WEAK LINK

Part III: THE LOW WAVE ANGLE

A. P. ASHTON, G3XAP

MANY authorities believe that the angle of radiation is by far the most important of all properties displayed by an antenna because this factor, more than any other, determines the field strength which signals will produce at the receiving antenna. The fact that DX gains of antennas tend to be much higher than Free Space gains (as discussed in the previous article) lends support to this belief.

In practice high angles of radiation are simple to achieve; in fact, more often than not they are achieved by accident. Low angles, however, are rather more difficult to arrive at—especially on the lower frequencies. The factor which affects angle of radiation more than any other (for a given antenna) is the height of the antenna above ground. This is owing to the fact that the ground acts as a reflector, and rays transmitted from the antenna strike the ground, reflect back up again and in their passage upwards encounter rays that are being radiated directly off the antenna. These 'direct' and 'reflected' rays will either cancel each other out, or reinforce each other, the actual effect depending upon their path difference—*i.e.* the difference in the distance travelled by the two rays before encountering one another. Rays radiated at different angles from the antenna are affected in different ways by the reflected wave, as the path differences will vary with this angle. Hence we get reinforcement at some angles and cancellation at others.

Fig. 1 shows the vertical-plane radiation patterns for horizontal half-wave antennas mounted at various heights above ground. It will be seen that as the height of the antenna is increased two things happen; firstly, the radiation splits up into more lobes, and secondly, the angle of the lowest lobe decreases. So, the angle of radiation can be altered by altering the height of the antenna above ground (raising the height of vertical antennas will have the same effect).

The second method of lowering the angle of radiation is to add additional elements to the array. The most common example of this is the Yagi, and Fig. 2 lists the angle of radiation of the forward lobe of Yagi antennas mounted at various heights above ground. Comparisons between these figures and the lowest lobes shown in Fig. 1 show that at heights from about a half-wave upwards, the angles are relatively unaffected—so as a means of actually lowering the angle of radiation this technique is only valid for antennas mounted close to the ground. However, it will be seen that the high-angle lobes have been considerably suppressed—this has the effect of putting more power into the lower lobes.

In practice this additional power at low angles will give the impression of having lowered the angle of radiation, and this fact is probably responsible for the very common belief that Yagi antennas radiate at much lower angles than simple dipoles.

Another method of introducing 'additional elements' is to 'stack' antennas one above the other. For example, if a half-wave antenna is erected at a height of one half-

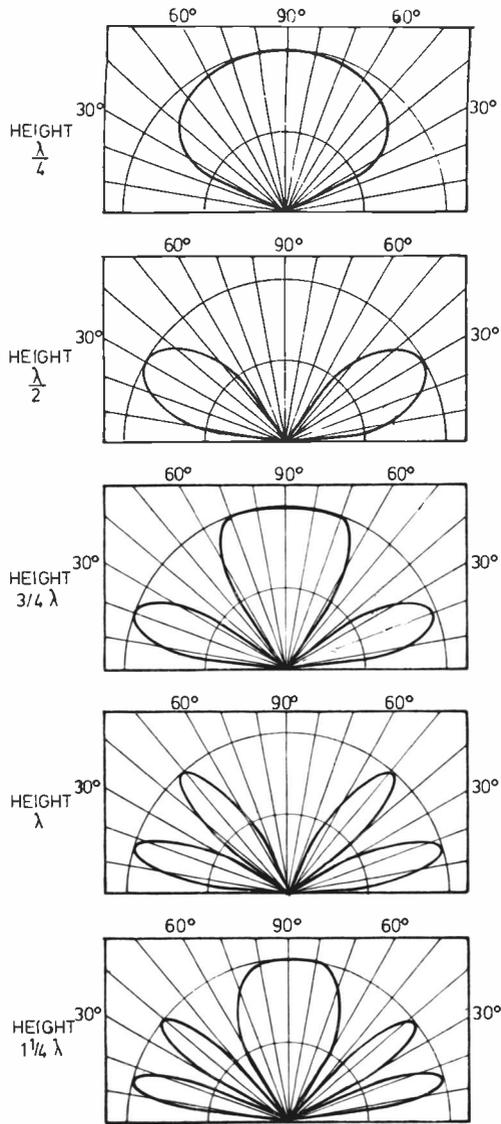


FIG. 1

Vertical-plane radiation patterns of horizontal half-wave antennas above perfectly conducting ground. The pattern is drawn with respect to radiation at right-angles to the wire.

wave above ground, the lobe will be at an angle of about 30°; if we now erect a second antenna of similar type one half-wavelength above the first, and feed them 'in phase,' the angle comes down to about 20°. Adding a third and then a fourth antenna in a similar manner will bring the angle down still further to about 10° and 7° respectively. Also, the high angle lobes that exist with single antennas erected at these heights will be considerably suppressed.

Perhaps the most common method of lowering angles of radiation is the practice of erecting the antenna in the vertical instead of the horizontal plane. A quarter-wave

AERIAL HEIGHT	ANGLE OF LOBES
1/4	40°
1/2	28°
3/4	18° and 60°
1	14° and 48°
1 1/4	12°, 38° and 70°

FIG 2

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Lobe angles from 3-element Yagi antenna at various heights (in wavelengths) above ground.

vertical antenna mounted at ground level will show a single lobe at an angle of around 35°, and a half-wave dipole erected vertically with its centre a quarter-wave above ground will have a single lobe at about 10°. Compare these angles with those from horizontal antennas located a quarter- or even a half-wave above ground!

Also quite widely practised is the technique of erecting a dipole with its centre as high as possible and its two ends at a somewhat lower level. The advantages of this so called "inverted vee" dipole are that an efficient earth system is not required in order to attain a high degree of efficiency and, being fed at the highest point and sloping, the radiation pattern has quite a lot of vertical component in it, with maximum radiation taking place some distance from the ground. The author is not aware of any published figures on actual angles of radiation achieved, but success achieved by many stations with antennas of this type does suggest that low angles are certainly present. W1BB/1 used this type of antenna on 160 metres, and he has worked well over 100 countries on this band!

There has recently been much interest in loop type antennas, especially full wave squares, and it is claimed that even on the lower frequencies, low angles can be achieved by this technique. It is likely that antennas of this type behave in the same way as stacked horizontal antennas—the vertical sides of the square maintaining the correct phase relationship between the two horizontal wires. A full wave loop is, in fact, a single Quad element, and low angles can certainly be attained with this type of antenna.

There have also been reports of work carried out to investigate the effect of mounting antennas over sloping ground; the theory being that if an antenna is mounted on such a site, the radiation angles achieved as measured locally are normal, whereas on a wider scale they are low compared to the overall terrain. Consider the situation shown in Fig. 3: the ground is sloping at an angle of 25° and the angle of radiation from an antenna mounted horizontally above this slope is 40° to the slope. Simple geometry shows that the angle of radiation in relation to the overall terrain is only 15°—a very useful angle to have.

A disadvantage of this technique is that the low angle is achieved only in the direction of the slope but, for DX working into any specified area, this method must surely rank among the simplest of methods of attaining

that elusive low angle! The author has used this method on ground with a mere 15° slope towards PY/VK and can vouch for its effectiveness on 7 MHz.

The Optimum Angle

Looking back to *Part I* of this series, it was stated that the lower the angle of radiation, the greater the distance travelled by a radio wave whilst actually within an ionised layer and, also, the further the distance travelled by the wave in a single 'hop.' If we consider these two facts we will see that there is a conflict of needs: on the one hand low angles are needed in order to cover large distances with as few 'energy absorbing encounters' as possible with the Earth and the ionised layers, whilst on the other hand as the layers absorb energy from our waves, we must arrange our angle of radiation to be such that the waves spend as little time as possible within the layers—i.e. a high angle of radiation!

In fact this is a real conflict, and the optimum angle is a compromise between these two factors. However, to complicate matters still further, there is a third factor to be considered; it has been stated that the lower the frequency, the more the energy is absorbed by the layers. Hence this 'compromise' angle varies with frequency. It is not possible to calculate precisely what angle should be aimed at for any given frequency (and in any case the angle varies with the degree of ionisation of the layers), but experimental work carried out on the angle of arrival of received signals over a wide range of frequencies suggests that the figures quoted in Fig. 4 are about optimum.

In practice it is unlikely that a large proportion of power would be radiated at angles lower than the minimum figures quoted. This section has been included to illustrate the difference in propagation paths on different frequencies and, even more important, to illustrate the need for very low angles to achieve efficient communication on the HF bands—21 and 28 MHz especially.

Practical Considerations

The method used for attaining low angle radiation is, to a large extent, governed by practical considerations and the approach tends to be different on 160, 80 and 40 metres to that commonly used on 20, 15 and 10. For example, the first three methods of lowering angles discussed above are usually completely impracticable on the LF bands.

Let us look at some figures for the 80 metre band: to get our angle down to between 30° and 40° by antenna height alone means erecting our horizontal antenna at about 100-150 feet above the ground. Vertical stacking of two antennas puts the highest one around 250 feet

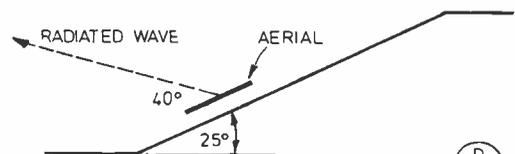


FIG 3

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Effect of mounting antenna over sloping ground: radiated wave is at an angle of 40° to the sloping ground, but 15° to the overall terrain.

up, and the idea of a Yagi antennas with elements up to 140 feet long, mounted on a 90 foot boom some 140 feet up in the air is enough to make even the most ambitious among our ranks tremble! On the other hand, all three of these techniques are both feasible and common on the HF bands.

So, on the LF bands the common approach is to use vertical antennas or to arrange the antenna in such a way that the high current portion of the device, at least, is in the vertical plane. The inverted-vee dipole has not proven to be as effective as a simple quarter-wave vertical at the author's QTH; in fact, exhaustive tests carried out on 7 MHz comparing a vertical mounted at ground level with an inverted-vee with its apex at 47 feet were very enlightening. At distances of about 3000 miles, the vertical was at least two 's' points up on the dipole, whilst in VK/ZL the difference was more like four 's' points—no matter in which direction the dipole was facing!

Vertical versus Horizontal

There is an age-old controversy about the relative merits of vertical and horizontal antennas, and the author would not presume to know all the answers.

Tests carried out at G3XAP have, however, shown up several advantages and disadvantages of both types; that the vertical out-performs the horizontal for DX working on the lower frequencies is one fact that was very quickly learned, and this conclusion has been confirmed by many other amateurs. This is almost certainly owing to the lower angle of radiation shown by the vertical because of the relatively low height of the horizontal) and not to the fact that one radiates vertically polarised waves compared with the other's horizontal polarisation. Work carried out on long distance reception of signals from both vertical and horizontal antennas has shown that the received signals tend to be elliptically polarised and the polarisation is similar for both types of antenna. (N.B. some texts refer to the received signals as being randomly polarised—this is now known to be incorrect).

In the reception mode the vertical does suffer from two severe disadvantages. Firstly, as most man-made electrical noise tends to be vertically polarised, vertical antennas tend to be very 'noisy' on reception—especially when sited in areas of heavy population. Secondly, as verticals are omnidirectional (in theory), QRM from unwanted directions can be extremely troublesome. On the lower frequencies however, the strong signal from a vertical can be very effective in scaring off the opposition! (But please listen first before blasting off—the other station may have been there first).

The other big argument about verticals is whether they are useful or not for local or semi-local work, the argument being that due to their low angle of radiation, they are useful for DX working only. Undoubtedly, if one could erect a 'perfect' vertical antenna—*i.e.* in the clear and over perfectly conducting earth, this statement would be true, but remember that we are considering practical antennas and these tend not to be perfect. So, although a low angle of radiation is certainly present, so too are lobes at high angles; experience has shown that verticals can match horizontals at practically any distance, although individual antennas of any type can display unusual properties—these being brought about by local

BAND	ARRIVAL ANGLES
80	20° — 55°
40	15° — 40°
20	10° — 25°
15	8° — 15°
10	5° — 12°

FIG. 4

Angle of arrival of signals after ionospheric reflection.

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considerations such as the proximity of metallic structures, the conductivity of the ground, the ground slope, etc.

The one point requiring caution, however, is that if the help of an Amateur a mere few miles away is sought to compare signal levels from antennas of different polarisation, he will be receiving 'direct' waves (having undergone no ionospheric reflection), and the polarisation of his receiving antenna can affect the results substantially. Comparisons at short distance may therefore be difficult to evaluate and should be avoided—unless the station concerned is solely interested in very short distance communication!

Another disadvantage of verticals of the quarter-wave variety is the fact that to obtain efficient power transfer to the antenna a good earth system is essential: if this is not provided, a large portion of the transmitter's power output will be dissipated in the form of heat. (This will be discussed in a later article). For this reason, efficiencies of around 25 per cent are common for vertical quarter-waves, whereas for horizontal dipoles, efficiencies approaching 100 per cent are fairly easy to obtain. By using a vertical dipole we can combine high efficiency with very low angles of radiation, and these antennas are excellent for DX working.

However, their size makes them impractical for frequencies below 14 MHz, where the total height required is about 35 feet. The author was able to use one on 7 MHz from a /A site during a major world-wide contest, and the results obtained were far in excess of expectations—VK/ZL being worked with absolute ease!

Summary

It is apparent, therefore, that whereas high angle radiation is easy to achieve, low angles are usually attained only by thoughtful planning of the antenna system, and rarely by accident. Also, low angles are more easily attained on the higher frequency bands than on the lower, and this leads to a different approach to DX antennas on these two sections of the Amateur spectrum. As consistent DX working is achieved only by having low angle radiation present in the antenna's radiation pattern, this is one antenna property that is really worth working for.

Finally, it is much easier to obtain low angles with a single band antenna than it is to have low angle radiation on every band with a multi-bander, so consistent DX working is not easy to achieve on all bands with these antennas; the possibly exception being tri-band beams as used on the HF bands.

to be continued

THE MONTH WITH THE CLUBS

BY 'Club Secretary'

AS in past years, starting to write this piece in the tail-end of winter and knowing it will be read at a time well into spring, adds a foretaste of the summer programme as a savour to the task; more so this time as it is being written on a Good Friday in the knowledge that as recently as yesterday there was a fierce snow-squall which made life outdoors distinctly nasty, while today the wind has been such as to make us look to the safety of the aerial and mast rigging. Yet, you may be reading this in the middle of the first heatwave of summer!

All of which is leading to the point that some sort of outdoor activity is usually a good thing for the club, quite apart from the fact that it knocks another vacant date off the programme. Such things as an evening D/F hunt—the gear need be no more than a loop aerial into a simple mixer stage coming out on to the car-radio as the IF/AF strip, which can be lashed-up in an hour or two (maybe as a club project); and although the results may not be of championship standard, they can be great fun, with a time-scale which will enable everyone to get to some local hostelry to discuss the results and sink a quick pint of bitter before heading off home, even if they *didn't* manage to find the hidden transmitter.

The Mail

Grouped by areas again, starting with the Westerners. **Exmouth** is a new set-up, with a very nice Hq. at Rolle College, in the Science Department, where they can be found on alternate Wednesdays, kicking off at 7.30. They are, at the moment rather short of licensed types, but they have plenty of SWL's and *enthusiasm*, which is the vital ingredient. So—licensed types particularly welcome and visitors and locals alike, whether New Chum or OT, will find something of interest. Enquiries to the Hon. Sec.—see Panel.

It's all go at **Torbay** where they are well into the preparation for summer activities. The base for all this is Bath Lane (rear of 94 Belgrave Road), Torquay, and the details can be obtained from the Hon. Sec.—see Panel. On a different note, founder-member G3FHI is a Silent Key.

Cornish are at the *SWEB* Clubroom, Pool, Camborne, on May 4, when the talk will be by G3NPB, and his topic 'The Radio Amateur Examination'—we understand Dave has the new scheme details, but whether he will be talking about that, or providing a last-minute run-up for the Cornish candidates we don't know.

It is arguable whether Newport is part of Wales or England, and the writer seems to recall that at one time it was permissible to use either G or GW prefixes; be that as it may, the area is well served by **Blackwood**, at their Hq. in Oakdale Community College. Visitors should note the times—7 to 9.30—which result from the choice of Hq. May 5 sees a demonstration of RTTY by GW4EAI, while on 12th GW8LJJ will be talking about 'Practical Construction' based on a regulated PSU. May 19 offers the chance to see the new Yaesu

FT-901D by courtesy of GW3NWS, which leaves 26th for a Film Show called "The Electron Rules the Waves."

Now we head for **Yeovil**, and Building 101 at Houndstone Camp. On May 4 comes the inevitable AGM, and on 11th G3KSK will talk about 'Transmission-line Transformers.' May 18 sees the tape lecture made by the late G6CL, talking about and showing the highlights of his Golden Jubilee Year. This will be rounded off by G3XFW on 25th, when he takes as his subject "Digital IC Packages." When one thinks that G6CL probably never saw an IC in any pack, one begins to realise the rate at which the world of amateur radio is progressing.

Up North

North now to Invergordon, where our advertiser *William Munro Ltd.* lives, and it is George Pople of this company who writes to let us know that a new club is in being there called the **Easter-Ross Radio Club**; contact him for more details. Incidentally, this must be the most northerly of all the clubs we have on file, at least on the mainland.

Deadlines for "Clubs" for the next three months—

(For June issue—April 28th)

For July issue—May 26th)

For August issue—June 30th

For September issue—July 28th

Please be sure to note these dates!

The recent visit to **York** by *Lowe Electronics* was a real crowd-puller, reports the Hon. Sec., having had to admit defeat in the matter of providing a chair for everyone who turned up—for the very first time in the history of the club. However he promises that if anyone comes to visit them or to join, on any Friday (except the third one in each month) at the United Services Club, he will find them *something* to sit on! The address is 61 Mickle-gate; and don't forget that third Friday blank—even the locals find it hard to recall!

Nationals

In this group we have the **G-QRP** lads and lasses, all with an interest in flea-power working and home-brewing equipment. Again, details can be obtained from the Hon. Sec., at the address in the Panel.

It is a very long time now since last we heard from **British Rail**; one gets the impression that they are on the way out of a spell in the doldrums—which is the time to join, come to think of it! For details, the Hon. Sec. is your man, and his address is in the Panel.

Royal Signals Newsletter contains a cry for help from the UHF types; Brigadier R. B. Ridley-Martin, September Cottage, North Road, Brockenhurst, SO4 7RQ, built a model boat hull back in 1935, and now in retirement is getting round to completing it—but in the meantime the techniques of the UHF model-control band seem to have disappeared into space, so some technical "gen" is needed. We would think some reader has the know-how to help—if so please write direct. To revert to the matter of the club, Hq. has moved from Blandford, back to Catterick and this of course has resulted in the change

in the Hon. Sec.—see Panel.

Central England

The coming year's syllabus was being drawn up at the time the **Stowmarket** Hon. Sec. wrote his letter, but he says he should have all the bends straightened out by the time this comes to be read. What is more important to them is that we indicate in this piece their desire to have lots of visitors and new members to enjoy the fun; try the first Monday in each month at the Red Cross Hall, Stowmarket Railway station.

A new grouping is next, formed by some **Wirral** residents who felt the need for another club on the peninsula; there is now a settled booking at West Kirby Sports Concourse, on the second and fourth Wednesdays in every month, and at the time of their letter the first two meetings had shown a rising membership, and a programme ready set up until June.

A D/F contest is planned for May 19 by **Peterborough**, with the assembly point at Hq., and the first transmission set for 7.30. Hq. of course is the Scout Hut, Occupation Road, which gives them something to fall back on if the weather happens to get the "English Disease."

A mild reproof from the ex-Hon. Sec. of **Blackburn** for showing his name in the March issue Panel, as he did write to tell us he was dropping out on retirement; at the time we didn't have anyone else's name to replace his. However, G4DGR has included it in this latest letter—thanks! The group are still based on Blackburn YMCA, on the first Thursday in each month, the May session being devoted to metal detectors.

Earlier on in this section we noticed a new formation: now we have to record that the old Wigan and District set-up has folded. All is not lost, as a new one known as **Douglas Valley** has been formed, with Hq. at the Conservative Club, Shevington, conveniently situated behind the Plough and Harrow pub on the main road through Shevington, the dates being set for the first and third Thursdays of each month. R.A.E. and Morse classes are being planned for the near future—get the details from the Hon. Sec. (see Panel)—or just go along to one of the meetings.

On we go to **Kidderminster** for May 10 and 24; the first date is to be a Junk Sale, and the later one a Night-on-the-Air—a pattern which appears to be the norm, i.e. one 'formal' and one evening when the rig is on and others natter, which mixture seems to find favour with many Clubs. The venue is the Youth Centre, Bromsgrove Street, Kidderminster. On a less happy note, the Hon. Sec. recently had his IC-20 stolen by a character who inflicted some £150 worth of damage to the car with a crowbar to get at it. That pretty clearly argues that the rig was stolen by someone who knew *exactly* what an IC-20 is and does—meaning, sadly, an amateur or an SWL. All one can do is to hope that the offender somehow gives himself away.

Last time round we mentioned that **South Manchester** seemed likely to lose their club shack in Shady Lane, Baguley, and indeed the land has been sold. However, they still have their Fridays at the Sale Moor Community Centre, Norris Road, Sale, each week.

Moving on to **Stourbridge**, we note with regret the sudden death of G3XKM, Roy MacIntosh, their *Newsletter* editor and one of the most active of the members

if the past reports are anything to go by. He will be sorely missed. To turn to the programme, they are at Longlands School, Brook Street, on May 1 for an Activity Night, and May 15 for a discussion of their contest entry, and general chat. The informal is on May 2, at the Shrubbery Cottage, Heath Lane, Oldswinford, from 2100.

A most interesting *Newsletter* from **Hereford** shows that their attendances have been up on the previous year, and their bank balance was healthy, albeit the Treasurer did as all good Treasurers do at AGM's and sounded a note of caution. The first and third Friday in each month sees the gathering of the clans, at the Civil Defence Hq., County Control, Gaol Street, Hereford; details as far forward as May are not given, but by the time this is being read there will doubtless be something organised.

UK FM Group (Western) sent us a copy of their *Newsletter*, in which G3LEQ amplifies some of the comments noted in our March issue by G3FPK in *VHF Bands*; it also indicates the next meeting date is to be Thursday, May 4, in the private bar at the Legh Arms, Chelford Road.

Wolverhampton seem to be a bit out of luck, in that their dates of May 1 and 29 are both scrubbed due to Bank Holidays. May 8 features the home-brew competition, and on 22nd they have a Night-on-the-Air, from the Hq. address at Neachells Cottage, Stockwell End, Tettenhall, Wolverhampton. In fact, the normal way of things is to get together each Monday.

Every Friday evening **Coventry** group foregather at Baden-Powell House, 121 St. Nicholas Street, Radford, Coventry. May 5 is down for a Treasure Hunt, and on May 19 G3BA will be talking about his experience in P.o.W. camps in Siam. In between these highlights are the normal sessions when the club rig is put on the air for some, and others enjoy a quiet and congenial natter.

Ormskirk members take it in turn to entertain the rest each Wednesday evening. In addition, on May 7 they have a visit to the Met. station at Aughton, and over the weekend May 27/28 the gang will be sitting atop some high point with a view to carting off the top spot in the 144 MHz Portable Contest.

Lowe Electronics certainly seem to be getting around, as we have already mentioned them; they turn up again on May 4, at the **Cheltenham** association meeting. This is at the Old Bakery, Chester Walk, behind the Public Library, Clarence Street, Cheltenham. We also understand that plans are being laid for a Picnic near Speech House in the Forest of Dean, for details of which you are referred to G3JFH.

Southerly

Bishops Stortford have been going through a lean patch of late, but things are beginning to look up again, and a pretty firm syllabus is in existence until the end of the year; find them at the **British Legion Club** at the top of Windhill on Monday, May 15, and indeed on the third Monday in every month.

The **Winchester** gang, we are assured, are positively bustin' out all over with new activities and new faces, and on the lookout for still more new members. The meetings now occur on the first Friday and the third Thursday of each month, at the Crown Hotel, Jewry Street, Winchester; latest details from the Hon. Sec.—

see Panel.

We mustn't forget Southgate where G3MWF, who does a lot of things for the *Magazine* behind the scenes, is to give his talk 'Kites and Kite Aerials,' at the Scout Hut, Wilson Street, Winchmore Hill Green on the second Monday, which makes it May 11.

The title of the Acton, Brentford & Chiswick talk on May 16 suggests that the members are about to be psychoanalysed—a "Discussion on Members' Problems"! As always at Chiswick Trades and Social Club, 66 High Road, Chiswick, London W4. Joking apart, we feel that a subject such as this is a worthwhile activity for any club, allowing the less able to pick up help from others, and doubtless giving *everyone* present a new slant on something or other.

Gunnels Wood Road, Stevenage, is where Hawker Siddeley Dynamics have their factory, and in the canteen on the first and third Thursdays there is a reservation for the Stevenage group. Formally, the start is at 8 p.m., but for the previous thirty minutes G4DDX will be giving slow Morse tuition. A far cry indeed back to the days when your scribe and G3FAU used to do the slow Morse session on Top Band—G3FAU had a garden shack and on a cold winter's night you could almost detect the shivering on the key and definitely hear it on the readback!

Forty years ago—even further into history!—the Edgware gang were first formed, and to mark the

occasion they will be holding a dinner at the Railway Hotel, Station Road, Edgware on May 20. All members, and in particular ex-members, are invited—past members who would like to attend to please pass the word to G3MNO at the address in the Hon. Sec.'s Panel, either by writing or telephone.

Although the name is different, the place is the same; thus Chichester in their *Newsletter*. It is now at the Lancastrian Wing of the Chichester High School for Boys, Basin Road, Chichester. On May 2 they have an RSGB tape-and-slide lecture, while on May 18 there is to be a problem-solving evening, to which everyone is invited to bring along a bit of gear with gremlins in occupation.

Sutton & Cheam will be at Sutton College of Liberal Arts on May 18, for an inter-club quiz against unspecified opponents; in addition they have a special-event station which will be set up at Nonsuch High School, on Saturday May 13.

It seems to be a case of second and fourth Wednesdays at Crawley, the first date being an informal in members' homes, and the later one the "proper" session at the United Reformed Church Hall, Ifield. The informal is May 10, *chez* G3GRO, and the latter (May 24) is set up for a lecture by *Lowe Electronics*.

We have a change of arrangements to record for Chiltern, where at the AGM it was decided to alter to the last Wednesday in each month; the address will be

Names and addresses of Club Secretaries reporting in this issue:

- ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London W4 8LB. (01-992 7778.)
- BISHOPS STORTFORD: H. Allison, G3XSE, 89 Birchanger Lane, Birchanger, Bishop Stortford, Herts.
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- BLACKWOOD: S. R. Cole, GW4BLE, 10 Llanthewy Road, Newport, Gwent NPT 4JR.
- BOURNEMOUTH (Wessex A.R.G.): G. D. Cole, G4EMN, 6 St. Anthony's Road, Bournemouth (20027) BH2 6PD.
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- EXMOUTH: D. R. Hanson, 67 Carter Avenue, Exmouth (75482), Devon EX8 3EF.
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- HEREFORD: S. Jesson, G4CNY, 181 Kings Acre Road, Hereford. (3237.)
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- ORMSKIRK: P. J. Kay G4GCB, 24 Laurel Avenue, Burscough (892416), Ormskirk, Lancs.
- REIGATE: F. H. Mundy, G3XSZ, Westview, rear of Manor Farm, off Reigate Road, Hookwood, Surrey. (Horley 73878.)
- ROYAL SIGNALS: Major R. A. Webb, G3EKL, 3 Hillcrest, Scotton, Catterick Garrison, N. Yorks. DL9 3NJ. (Catterick camp 2809.)
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- STEVENAGE: T. Tugwell, G8KMW, 11 The Dell, Stevenage, Herts. SG1 1PH.
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- SURREY: S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon CR2 8PB. (01-657 3258.)
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- WEST KENT: B. P. Castle, G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent TN14 5AF.
- WINCHESTER: C. Jackson, 69 Buriton Road, Havestock, Winchester (880152.)
- WIRRAL (West Kirby): M. McIntosh, G8NMG, 8 Bancote Gardens, Bromborough, Wirral, Merseyside. (051-334 1027.)
- WOLVERHAMPTON: J. Cook, G8EDG, 75 Windmill Lane, Castlecroft, Wolverhampton WV3 8HN.
- YEOVIL: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil, Somerset.
- YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

as before, namely the Conference Room, 42 Castle Street, High Wycombe. Thus we have May 31, for G3KLI, Ivan Eamus, to give a talk on LF CW contest operating.

At Cray Valley the place to look for is called Christchurch Centre, and it lies in Eltham High Street; we have it that they book the first and third Thursdays, but at the moment of writing we do not have more detail to offer.

Something happened at Surrey while the *Newsletter* was being run, in that the back page came out upside-down; curiosity resulted and when we had sorted ourselves out we read that they have bought a beam rotator and been lent a three-element beam by a member as well—which seems to indicate that the people in charge of Hq. (*T.S. Terra Nova*, 34 The Waldrons, South Croydon) are quite amenable to the sight of big beams. Perhaps it has an effect on their membership, through youngsters trying to find out what it does! Anyway, it does mean that a club "night-on-the-air" should show some reasonable DX, always of course assuming that conditions are right on the first or third Wednesdays of each month.

The Reigate group have had, since they moved, the odd situation where none of their regular dates are in Reigate! Formals are at the Constitutional Centre, Warwick Road, Redhill, and the informals at the Marquis of Granby in Redhill. On May 2 its an informal, while the evening of May 16 will be devoted to a members Evening on Microwaves, with D. Hayter.

Perhaps a factor in the success of the **Bournemouth (Wessex)** group is the amount of space in the *Newsletter* allocated to "selling" the various activities to the members, and so getting them to turn up. From this we see one of the rare G6CJ appearances, which is on May 19, and will cover the gentle art of extracting CW signals from noise; not just a lecture, but as always with Dud a demonstration. The other half of the double act will be by Ken Alford, G2DX, who was first licensed in 1912, reminiscing about those early days of cats-whiskers and bright emitters. Earlier, on May 5, there will be some lectures and discussions, aimed very specifically at the chaps who are doing R.A.E., and in particular *Part I* covering Licence Conditions and Interference. In both cases, the place will be the usual one at the Dolphin Hotel, Holdenhurst Road; 7.30 for 8 p.m. In between, on Sunday May 14, there are noises about a possible mobile meet—details on this from the Hon. Sec.—see Panel.

Off we go now to **Verulam**, where they are based on the Market Hall, St. Albans; on May 25 G3RPA will be talking about "Electronic Aids in Gliding." During the summer months the informals on the second Thursday of each month are transferred from the R.A.F.A. to Salisbury Hall, London Colney—a place in which there is much relatively recent history, in that it was there where the *Mosquito* aircraft was designed during W.W.II, and where Sir Nigel Gresley lived during the period when his steam engines were being developed to their peak.

The **UK FM Group (London)** *Newsletter* has been remarked on before, and there is no doubt at all that this month they have excelled themselves—lots of technical

articles including a series for potential "fox-hunters" on Two, giving a rundown on the equipment and its use, plus a supplement by G3OSS which has some interesting things to say about receiver front-ends at VHF and HF.

It is May 12 and 26 for the **West Kent** lads, at the Adult Education Centre, Monson Road, Tunbridge Wells. For the earlier date they have Ron Ham, discussing the 'Hissing Phenomena' on our bands, leaving the later date free for HF and VHF NFD arrangements.

QRT

You will already have sent in your material for June, so your next task is to write to us with July information. The Hon. Sec's. post code and STD code should be checked against the last entry sent off, and corrected as needs be (in many cases we haven't got the STD code on file yet), and the whole lot to be addressed to "Club Secretary," **SHORT WAVE MAGAZINE**, 34 High Street, Welwyn, Herts. AL6 9EQ.

MOBILE RALLY SEASON — 1978

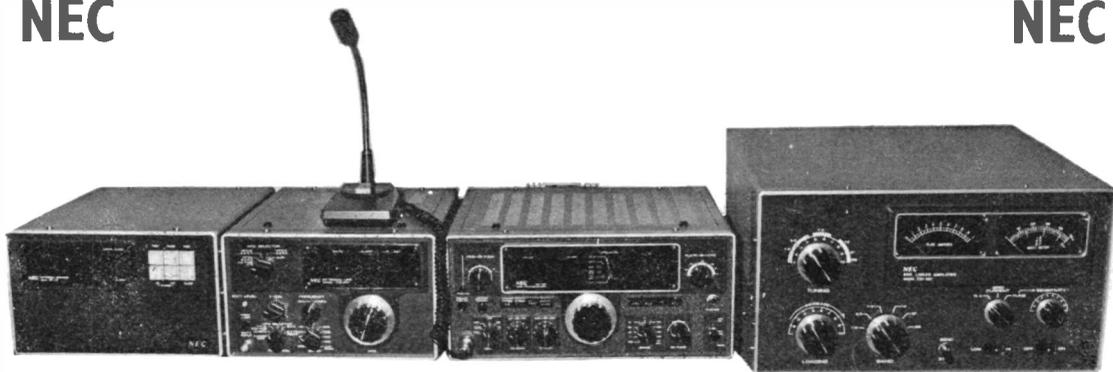
The following list updates the information published in the March issue. **May 14**, East Suffolk Wireless Revival, Iacssa Sportsground, Foxhall, Ipswich. Details from C. Ranson, G8LBS, QTHR. **May 21**, Welsh Amateur Mobile Rally, Barry Rugby Football Club, Cemetery Lane, Barry, Glam. Contact GW3WBU, Penarth 712887. **May 28**, Hull Mobile Rally, University of Hull, Cottingham Road. Details from G3WYW. **June 11**, Elvaston Castle Mobile Rally, Elvaston Castle Country Park (5 miles S.E. of Derby on B5010). Talk-in by G3EEO/P on 160m., G3ZBI/P on 2m. FM S22, G8KGC/P on 70 cm. FM SU8 and SU20. Details from I. Cage, G4CTZ, QTHR. Tel: Derby 71875. **June 18**, Plymouth Radio Club Mobile Rally, at Club Hq., details from R. Hooper, G3SCW, Tavistock 2876. **July 16**, Hornsea Mobile Rally, Hornsea School, Hornsea, North Humberside. Contact P. Loten, G8KFK, QTHR. **July 23**, Anglian Mobile Rally, Stanway School, Stanway, Colchester. Contact G. Caswell, G4DKI, QTHR, Colchester 67512. **July 30**, Scarborough ARS Mobile Rally, Scarborough Technical College, Scalby Road, Scarborough. Talk-in on 2m. FM. Details from D. Warwick, G4EEV, QTHR. **September 10**, Telford Amateur Radio Rally, Town Centre Malls, Telford, Salop, full attractions, family entertainments. Details from G8DIR, G8FSV or G3UKV, all QTHR. **September 17**, Peterborough Radio and Electronic Society Mobile Rally, Walton School, Mountstevens Avenue, Peterborough. Contact G3EEL, QTHR. Tel: Peterborough 65423/62881. **Special event stations: May 30-June 3**, GB2BWS at the Royal Bath and West Show, Shepton Mallet, Somerset; operation on all bands 3.5-28 MHz, A1, A3J; 144 MHz, A1, A3J, F3. Talk-in on S21 if required. Special QSL cards will be issued, QSL to G4GHI. Station located at Stand 508, Road 'J'. **June 3**: Talk-in station operated by the R.A.F. ARS for R.A.F. 'Cosford' Open-Day (8 miles N.E. of Wolverhampton); G4CES near 3.710 MHz, G3PWI on 145.625 MHz FM. Full 'aeronautical' attractions, including aerospace museum.

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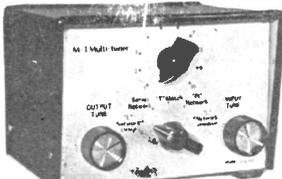
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See Test Report in February "Short Wave Magazine".



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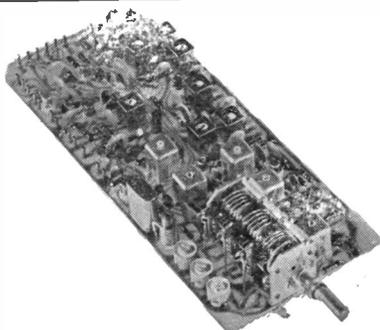
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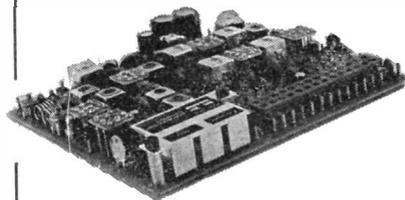
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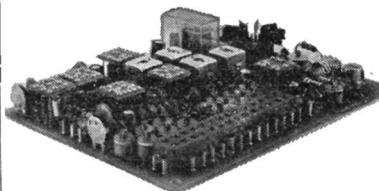
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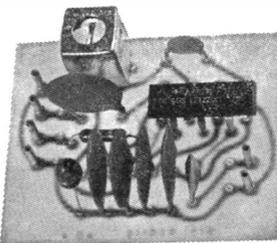
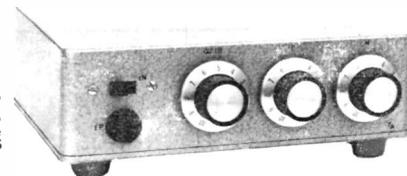
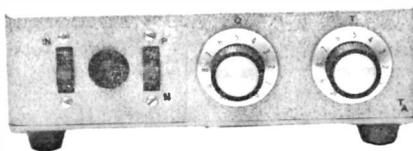
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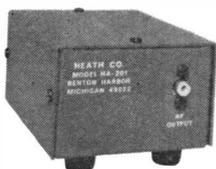
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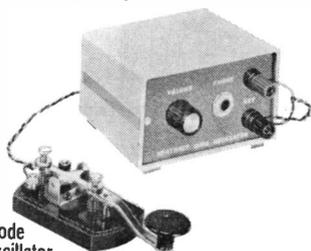


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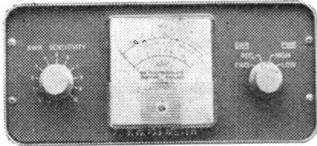
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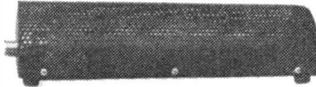
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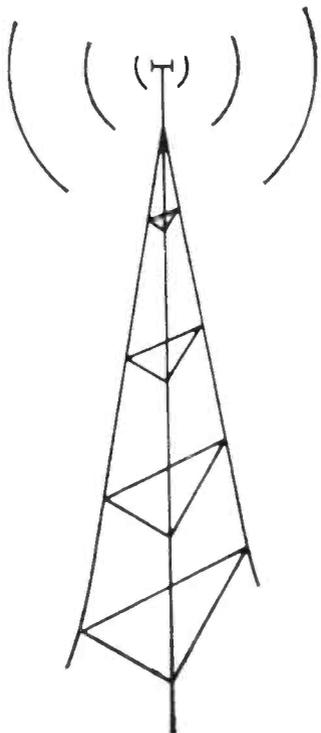
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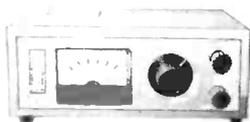
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144-41433-2 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
144-480 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
144-800 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
144-850 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-000/SO ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-050/R2T ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-075/R3T ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-100/R4T ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-125/R5T ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-150/R6T ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-175/R7T ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-200/R8T ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-300/S12 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-350/S14 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-400/S16 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-500/S20 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-525/S21 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-550/S22 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-575/S23 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-600/S24 ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-650/R2R ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-675/R3R ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-700/R4R ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-725/R5R ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-750/R6R ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-775/R7R ...	a	b	b	b	b	b	b	b	b	b	b	b	b
145-800/R8R ...	a	b	b	b	b	b	b	b	b	b	b	b	b
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OUTDOOR TELEPHONES. An external intercom telephone unit (waterproofed for outdoor use). Has external handset and internal mike and speaker. 10 push buttons for dial code + 4 push buttons for select handset, speaker, etc., + pilot lights. Brand new and boxed, few only. Only £6 each.

MAINS TRANSFORMERS, TYPE 15/300. 240V input, 15V at 300mA output, £1-50 each.
MAINS TRANSFORMERS, TYPE 45/100. 240, 220, 110, 20, 0V output, 45V at 100mA output, £1-50 each.

MECHANICAL COUNTERS. 4-digit Resettable, 60p each.

LARGE ELECTROLYTIC PACKS, contain range of large electrolytic capacitors, low and high voltage types, over 40 pieces, £3-00 per pack (plus 12½% VAT).

A RANGE OF DRAPER TOOLS FOR THE ELECTRONICS ENTHUSIAST.

MAINS TESTER SCREWDRIVERS. 100 to 500V Standard size, 50p. Large, 70p.

RADIO PLIERS. 6" £1-80, 6½" £2-00.

DIAGONAL SIDE CUTTERS. 6½" £2-20.

SMALL SIDE CUTTERS L12. Standard, £4-00.

L17 (with wire holding device), £4-50.

MIDGET OPEN ENDED SPANNER SETS. 0+1, 2+2, 3+5, 4+6, 6+8BA sizes, £3-20 set of 5, +4-5, +5-5, +4-6, 6+7, 8+9

10-11mm. sizes, £4-00 set of 6.

MINIATURE FILE SETS. Set of 6, £2-20.

Set of 10, £3-60 (Round, flat, etc.).

TAP AND DIE SETS (18 piece) contain 1 each of 0, 2, 4, 6, 8, BA sizes in Dies, Plug Taps, Taper Taps + American type tap wrench, T type tap wrench, Die Holder, £12-50.

A NEW RANGE OF QUALITY BOXES AND INSTRUMENT CASES

Aluminium Boxes with Lids

AB10 5 x 4 x 1½ 75p

AB13 6 x 4 x 2 £1-00

AB14 7 x 5 x 2½ £1-25

AB15 8 x 6 x 3 £1-50

AB16 10 x 7 x 3 £1-75

A-17 10 x 4½ x 3 £1-50

AB25 6 x 4 x 3 £1-25

Vynal Coated Instrument Cases

Light Blue Tops and Plain lower sections. Very smart finish.

WB1 5 x 2½ x 2½ 75p

WB2 6 x 4½ x 1½ £1-35

WB3 8 x 5 x 2 £1-80

WB4 9 x 5½ x 2½ £2-00

WB5 11 x 6½ x 3 £2-25

WB6 11 x 7½ x 3½ £2-50

WB7 12 x 6½ x 3½ £2-85

WB853 8 x 5½ x 3½ £2-25

PLUGS & SOCKETS

PL259 PLUGS (PTFE). Brand new, Packed with reducers, 75p each.

SO239 SOCKETS (PTFE). Brand new (4 hole fixing type), 60p each.

N-TYPE PLUGS, 50 ohm, 60p each.

GREENPAR (GE30015). Chassis Lead Terminations. (These are the units which bolt on to the chassis, the lead is secured by screw cap, and the inner of the coax passes through the chassis), 30p each, 4 for £1-00.

MULTICORE SOLDER. ¼ Kg. (1-1 lb.) 60/40, 20 SWG on plastic reel, £3-00.

UR41 ATTENUATOR CABLE. Nominal 72 ohm, overall dia. approx. ¼". Att. per 100ft. 100MHz 218dB, 200 MHz 316dB, 600 MHz 449dB, 3000 MHz 625dB. Ideal for Rx or Low power Tx fixed attenuators. Supplied with attenuation graph. 4 metres for £1-00.

FULL RANGE OF BERNARDS/BABANI ELECTRONICS BOOKS IN STOCK. S.A.E. FOR LIST

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A NEW RANGE OF SPEAKERS AND CABINETS. BRAND NEW AND BOXED AT BARGAIN PRICES

TELEFUNKEN HIGH QUALITY SPEAKERS. 3 ohm, 8 watt RMS, 9½" dia. Full range type, £6-00 each (or 2 for £11-00) + 12½% VAT.

TYPE L2 TRIANGULAR CORNER CABINETS. Smart woodgrain Formica type finish with nylon grille. Overall height 23" x 12" wide.

Contains Three 15 ohm 6½" x 4". Full range speakers in parallel + 100V line transformer (easily disconnected for 5 ohm operation), £7-50 each (or 2 for £14-00) + 12½% VAT.

TYPE M704 CEILING SPEAKERS. White plastic fascia 10" square, for recess mounting into ceiling, with 8" dia. 15 ohm full range speaker, £4-00 each + 12½% VAT.

TYPE L4 PORTABLE SPEAKER CABINET. Smart woodgrain Formica type finish with nylon grille, 15" high x 14" wide x 7" deep (tapering). Containing 10" round, 15 ohm full range speaker + 100V line transformer £7-00 each + 12½% VAT.

TYPE HT4 HOTEL SPEAKER CABINET. Wood veneered, 12½" wide x 5½" high x 3½" deep, with aluminium grille + volume control and 4 way + off switch panels on front. Very smart. Contains 3 ohm 5" x 3" elliptical speaker + 100V line transformer, £5-00 + 12½% VAT.

AND SPIRALUX. Tools for the Electronics enthusiast. S.A.E. for list.

AE CS10BR MICROWAVE MIXER DIODES, up to X-Band, max. noise figure 8-5dB at 9-375 GHz, 80p each.

SUB-MINIATURE ROTARY SWITCHES, 4 x 5 way make contacts, Size approx. ½" dia. 1" deep, 3/16" spindle, 50p each.

DIE-CAST BOXES Size approx.:

4-3" x 2-3" x 1-2" (111 x 60 x 30mm.) £1-10

4-8" x 2-3" x 1-5" (121 x 60 x 38mm.) £1-65

4-3" x 3-8" x 1-1" (121 x 95 x 25mm.) £1-40

4-8" x 3-8" x 2" (121 x 95 x 51mm.) £2-20

6-8" x 4-8" x 2" (171 x 121 x 51mm.) £2-75

4-8" x 3-8" x 3" (121 x 95 x 76mm.) £3-00

6-8" x 4-8" x 4" (171 x 121 x 101mm.) £4-20

8-6" x 5-8" x 2" (222 x 146 x 51mm.) £3-75

10-6" x 6-8" x 2" (273 x 171 x 51mm.) £4-85

SOLDER SUCKERS (Plunger type). Standard model, £5-50, Skirted model, £6-00. Spare nozzles, 60p each.

PLASTIC PROJECT BOXES with screw on lids (in Black ABS) with brass inserts.

TYPE NB1 approx. 3" x 2½" x 1½" 45p each.

TYPE NB2 approx. 3½" x 2½" x 1½" 55p each.

TYPE NB3 approx. 4½" x 3½" x 1½" 65p each.

SMITH'S CLOCK MOTORS. 200—250V 50 Hz 2 watts, 1 Rev. every 2 mins., 3 hole fixing, ¼" spindle, £1-00 each.

SLOW MOTION MOTORS. 120V 50 Hz 1 RPM. Size approx. 2" dia. 1½" deep, with ¼" spindle, 60p each or 2 for £1-00.

NEW PCBs FOR PYE LYNX TV-CAMERA STABILISER PANEL (AT26352), £3-00.

VIDEO PC B (AG58314), £5-00.

LIMITED SUPPLY ONLY. . . ORDER NOW!

CERAMIC TAG STRIPS (4 on 1 mount), 10 mounts for 50p.

TUNED COILS, 2 section coils, around 1 MHz, with a black smart tuning knob, which moves an internal core to vary the inductance, many uses, easily rewound, 3 for 50p.

2-6p, 10mm. circular, ceramic trimmers (for VHF/UHF work), 3 pin mounting, 5 for 50p.

ON/OFF/RX STANDBY SWITCHES for AM10B Cambridge and Vanguard control boxes, 40p each, 3 for £1.

OSMOR REED RELAY COILS (for reed relays up to ½" dia., not supplied), 12v., 500 ohm coil, 2 for 50p.

THIS MONTH'S SCOOP PURCHASE, PYE CAMBRIDGE AM AUDIO PCB. Brand new, 60p each, or 4 for £2-00.

VIDICON SCAN COILS (Transistor type, but no data) complete with vidicon base, £6-50 each. Brand New.

ALL BELOW — ADD 8% VAT

WELLER TCP2 and PU2D PSU. Temperature controlled soldering iron with matching Power Supply Unit, containing sponge and spring stand, £30-00.

CHARGER PCBs for ITT Starphone batteries (12v.), with battery compartment. Requires 28v. DC at 50mA. Contains transistorised circuit for constant current limiting, £2-75.

RED LEDs (Min. type), 5 for 70p.

TRANSISTORS

TO3 TRANSISTOR INSULATOR SETS, 10 sets for 50p.

BSX20 transistors (VHF OSC/MULT), 3 for 50p.

BC107 (metal can), 4 for 50p.

BC108 (metal can), 4 for 50p.

PBC108 (plastic BC108), 5 for 50p.

PNP AUDIO TYPE TO5 TRANSISTORS, 12 for 25p.

BFY51 TRANSISTORS, 4 for 60p.

BF152 (UHf AMP/MIXER), 3 for 50p.

2N3819 Fet. 3 for 60p.

BC148 NPN SILICON, 4 for 50p.

BC158 PNP SILICON, 4 for 50p.

BAY31 Signal Diodes, 10 for 35p.

BYX 38/300 Stud Rectifiers, 300v. at 2-5A, 4 for 60p.

SCRs 400v. at 3A, stud type, 2 for £1-00.

TIP2955 Silicon PNP power transistor, 60v. at 15A, 90 Watts, Flat pack type, 2 for £1-50.

GERMANIUM DIODES, approx. 30 for 30p.

1N4148 (1N914) DIODES, 10 for 25p.

741CG RCA OP AMPS. 4 for £1-00.

VALVES

QQV03/20A (ex equipment), £3-00.

QQV03/10 (ex equipment), 75p or 2 for £1-20.

6BH6 (ex equipment), 2 for 50p.

All the above valves are untested, except for heaters, and no guarantee of percentage of emission is given. Sorry, no returns.

6BW6 VALVES (BRAND NEW), 85p each or 2 for £1-50.

MULLARD 85A2 85v. STABILISER VALVES (Brand New), 70p each or 2 for £1-20.

ALL BELOW — ADD 12½% VAT

BARGAIN PACK OF LOW VOLTAGE ELECTROLYTIC CAPACITORS. Up to 50v. working. Seatronic manufacture. Approx. 100, £1-50 per pack.

A large range of capacitors available at bargain prices, S.A.E. for list.

TV PLUGS (metal type), 4 or 50p.

DIN 3-pin LINE SOCKETS, 15p each.

3 PIN DIN PLUGS, 15p each.

ELECTROLYTICS

ELECTROLYTICS, 50µF, 450v., 2 for 50p.

ELECTROLYTICS, 100µF, 275v., 2 for 50p.

ELECTROLYTICS, 470µF 63v., 3 for 50p.

ELECTROLYTICS, 1,000µF 30v., 3 for 60p.

ELECTROLYTICS 5,000 mfd. at 35v., 50p each.

ELECTROLYTICS, 5,000µF 50v., 60p each.

ITT ELECTROLYTICS, 6,800 mfd at 25v., high grade, screw terminals, with mounting clip, 50p each.

MULLARD ELC1043/05 VARICAP TV TUNERS. Brand New. £5-00 each.