OCTOBER 1969

RADIO COMMUNICATION

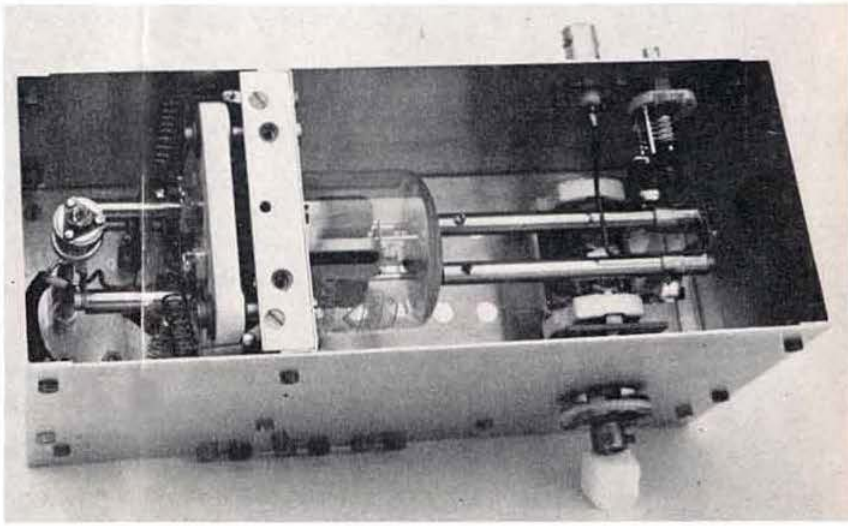
C U at the rsgb show

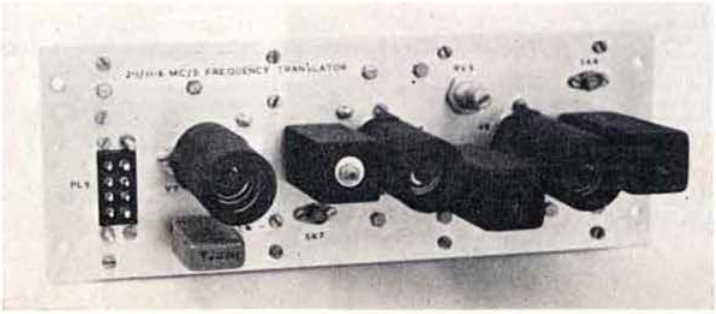
1-4 OCTOBER

Journal of the Radio Society of Great Britain

AN SSB TRANSMITTER FOR 70 and 432 MHz

page 676





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CLOSING DATES
(except where otherwise stated)

NOVEMBER
9 OCTOBER

DECEMBER
6 NOVEMBER

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OCTOBER 1969
VOLUME 45 No. 10

J. B. LOWE

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100 kc or 25 kc crystal/multivibrator marker.

SPECIFICATIONS:

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		Selectivity:	2·3 kc/s at —6dB, 3·7 kc/s at —55dB.
Stability:	100 cps after warm up.	Image rejection:	50dB.
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73, de Bill, G3UBO/VE8DP

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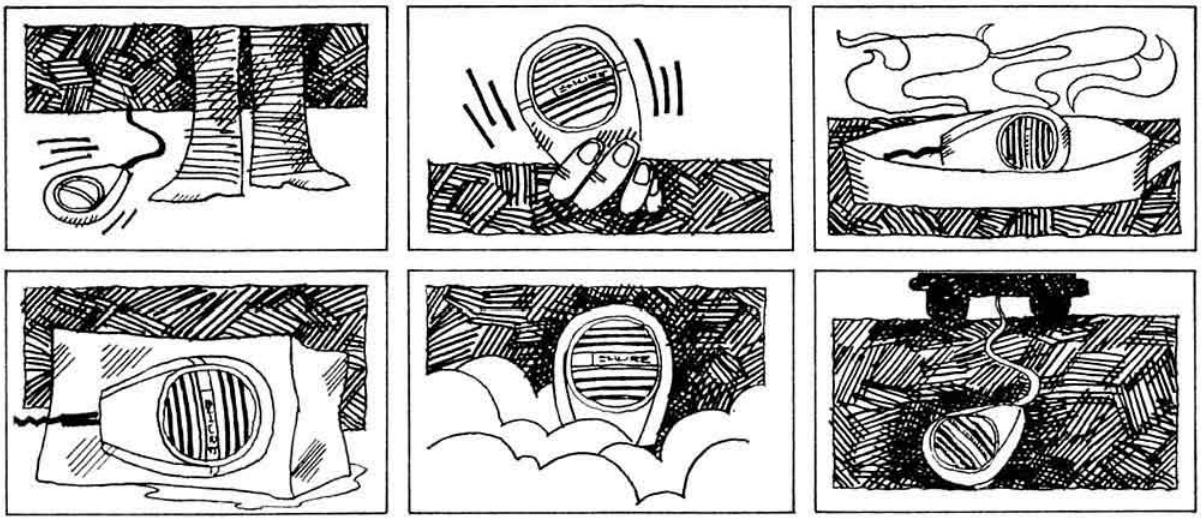

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QTC

AMATEUR RADIO NEWS

RSGB Membership

The September issue of *Short Wave Magazine* (page 417) contained a contribution headed "U.K. Licence Statistics" which purported to analyse RSGB membership figures. Unfortunately however the assumption made by the writer is incorrect and therefore the conclusion reached is also erroneous.

A figure supplied to the IARU prior to the Region 1 Conference in May 1969 gave the number of UK Licensed Members as 7,836. We are glad to report that the number is now in excess of 8,000. This figure refers to UK Members only and does not include overseas Members.

In case this should give the impression that the Society is complacent concerning these figures let it be said that our target for UK Licensed Members is 100 per cent. **Your** help in attaining this figure is not only desirable but essential.

Aerial Planning

The Council has accepted, with appreciation, an offer by Mr G. S. Bracewell, G3EGK, to collate information regarding applications for planning permission for aerial installations and also the circumstances of appeals against refusal of planning permission. In many instances the success or otherwise of a planning submission or appeal could depend on the nature of the background material presented and the documentation available regarding similar cases. It is felt therefore that the availability of this information from a single source would be a valuable service to members.

However the value of the service depends directly on the information that is provided by members. This should be as comprehensive as possible including, if available, copies of any Ministry documents. If a member does not have copying facilities then documents can be copied and returned without delay. Information should be sent directly to G3EGK at Chevington Chase, Huncote Road, Croft, Leics.

BATC Convention in 1970

The British Amateur Television Club is coming up to its 21st Anniversary and to celebrate a special convention will be held in Cambridge. This will be a two-day event, over the weekend 25/26 July, and so arrangements have been made to provide accommodation in Churchill College on request. Further details of the programme, the cost of rooms and how to reserve them will be publicised later this year.

ZD7WR Beacon Station

Following the article in the December 1968 issue of *Radio Communication* by W. R. Whiting, G3UYO, information on the operation of the beacon station was given to the CCIR at Geneva. This data has been incorporated in an ESSA (Environmental Science Services Administration) Technical Report entitled Predicting Long-Term Operational Parameters of High Frequency Sky Wave Telecommunication Systems which was published in May of this year. The report, which runs to 283 pages is available from the US Government Printing Office, Washington, DC 20402, at a cost of $2.25.

The G3HBW MOSFET Converter Kit

A kit offered by A. C. Mansell, 46 Headley Road, Woodley, Reading, was mentioned in a footnote to the article which appeared in the June issue of *Radio Communication*. There has been some delay in meeting orders due to the supply of one or two small components. It is pointed out that the price of £4 5s. mentioned in *Radio Communication* excludes the crystal which however can be supplied for an additional 10/6d., if bought with the kit.

Tape Library

The RSGB Tape Library now has a new Tape and Colour Slide lecture entitled "A conducted tour of ARRL Headquarters," kindly donated by the General Manager, WILVQ. This lecture is now available and bookings for the Autumn season should be sent to the Librarian, RSGB Tape Library, G2MI, Bromley, Kent.

Amateur Radio and Scouting

Booklet No. 28 in the Scout Badge Series entitled *Communicator* has recently been published and is obtainable from any Scout Shop or bookseller handling this series of publications at a cost of 2/6d. The prime purpose of the booklet is to enable a Scout to obtain his Communicator badge but the information will be of value to any person having a recently acquired interest in amateur radio.

RAE Courses

A comprehensive list of Courses for the Radio Amateur's Examination was published on pages 637 and 638 of the September issue. Details of three courses were received after our closing date, however, and these will be held at:

Durham. Durham Technical College, Framwellgate Moor, Durham. Fridays, 6.30 pm (commenced 26 September). Lecturer G3PDM.

Liverpool. Riversdale Technical College, Riversdale Road, Liverpool, L19 3QR. Dept. of Electronic and Radio Engineering. Detals from A. G. Brown, Head of Dept.

London. GLC De Beauvoir Evening Institute, Tottenham Road, Balls Pond Road, London, N1. Every weekday, except Tuesdays, 7.30 pm. Instructor F. J. Barns, G3AGP. This course is for candidates who have previously failed the examination, and wish to brush up their knowledge for a further attempt.

75th Anniversary of Radio?

A past president of the RSGB—Sir Oliver Lodge (1851–1940, President RSGB 1925 and Honorary Member) is thought to have transmitted genuine radio-telegraph signals during his historic demonstrations to the British Association at Oxford on 13 August 1894—a year before the earliest Marconi achievements of a comparable nature.

The circumstances surrounding the pioneer demonstration by Lodge—and evidence that there is a much stronger and more direct link between Lodge's work and the ultimate use of Hertzian waves for telegraphy by Marconi than is commonly appreciated—are described in detail by Rowland Pocock in the September issue of the IEE's *Electronics and Power*.

The fact that Oliver Lodge demonstrated radio signalling in 1894 over distances variously estimated as between about 60 and 150 yards is to be found recorded in many texts. An interesting feature of the present investigation is that this seems to confirm that the great scientist did specifically show that his apparatus could be used for Morse signalling.

Pocock suggests that " if Lodge had been a Russian he would now be known as the ' inventor of radio' in the Soviet Union." He points out, however, that in Great Britain, the first public demonstration is not usually accepted as sufficient in itself to indicate priority of invention unless accompanied by evidence of subsequent development to a practical system of commercial value. Unlike Marconi, Lodge did not immediately appreciate the significance of what he had achieved so that the Oxford demonstration " does not upset the pre-eminence usually accorded to Marconi."

An account of the links between the Society and Lodge and Marconi (who was also an Honorary Member) can be found in the Society's publication *World at their Fingertips*.

Affiliated Societies

The following societies are now affiliated to the RSGB:

Rank Xerox National Workshops Radio and Electronics Club. *Secretary:* L. F. Heller, c/o Rank Xerox Limited, 88 High Street, Uxbridge, Middlesex.

Wessex Amateur Radio Group. *Secretary:* A. Emery, G8AVE, " Windrush," 7 Brunel Drive, Preston, Weymouth, Dorset.

RSGB QRA Locator Map

A completely new map is now available and will be on sale at the Exhibition. The coverage includes Scotland northwards beyond the Faeroe Islands and eastwards taking in Norway and Sweden. This map is printed on a single sheet 30 in by 40 in. The cost of the new map is 7/-, or post paid in a tube 9/-. For those who prefer the larger maps the price of the four sheets of the HB9RG map has been reduced to 22/6d. post paid.

Special Event Stations

GB3BES will be on the air over the weekend 18/19 October for the Scout Jamboree-on-the-Air. Operation will be on 80m–10m using ssb. A special QSL card will be issued and QSLs should be sent via G3XUE. Any scout stations wishing to arrange skeds with GB3BES should contact K. Beesley, G3XUE, 70 Fagley Lane, Eccleshill, Bradford 2.

* * *

Arranged by the Carlisle Radio Amateurs for the 12th Jamboree-on-the-Air and the 18th Carlisle (Upperby) Scouts, a station with the call **GB3CUS** will be on the air from 0001 on 18 October until 2359 on the 19th. Operation will be on all bands from 1·8 to 30 MHz and requests for skeds can be sent to D. Spooner, G3WDS/A, " Lady Wath," Park Road, Scotby, Carlisle. It is hoped to issue a special QSL card.

RSGB Dinner Club

The next meeting will take place on Friday October 10 at 7.30 for 8.00 pm at the Kingsley Hotel, Bloomsbury Way, London, WC1. Members and overseas visitors will be most welcome. In order to assist the catering arrangements reservations should be made in advance to Mrs M. Jardine at RSGB HQ. The cost remains at 25/- and it would be appreciated if reservations could be accompanied by the appropriate remittances.

Silent Keys

It is with sorrow that we record the passing of the following amateurs:

Ernest G. Houldsworth, G6NM, of Wilmslow, Cheshire.

Philip Jefferies, G8BNF, of Downend, Bristol.

J. J. Sowerby, BRS23140, of Stafford, Staffs.

R. E. Sedgwick, G2BSN.

Henry Jakeman, ZLICA, of Oneroa, Waiheke Island.

Beacon Booklet

The Region 1 Division of the IARU has produced a booklet which provides details of nearly 50 beacon stations operating in Europe and Africa. This booklet will be available at the RSGB Exhibition at a non profit price of 2s 6d.

Pirates Caught

As a result of Post Office enquiries into the suspected unlicensed use of wireless telegraphy transmitting equipment, the following convictions have been obtained on using wireless transmitting apparatus without the appropriate licence, contrary to the provisions of Section 1 of the Wireless Telegraphy Act, 1949.

Mr A. K. White, 32 Barnsland, West End, Southampton, at East Leigh, Southampton Magistrates Court on 2 April, 1969. He was given a conditional discharge for one year and ordered to pay £10 costs.

Mr C. S. Wright, 22 Greenfield Street, Lenton, Nottingham, at Nottingham Guildhall Magistrates Court on 23 April, 1969. He was fined £3 and ordered to pay £5 costs with forfeiture of equipment.

Mr R. J. Moon, " Rosedale," St. Germans, Cornwall, at Saltash Magistrates Court on 29 April, 1969. He was fined £5 and ordered to pay £7 7s. costs.

Mr A. D. Frazer, 16 Moorland Close, Forest Lane, Sturbeck, Harrogate, Yorkshire, at Harrogate Magistrates Court on 29 April, 1969. He was fined £15 on each of two charges and ordered to pay £20 costs.

Mr D. J. Stockley, 47 Nixon Avenue, Ramsgate, Kent, at Ramsgate New Law Court on 11 May, 1969. He was fined £12 10s. on each of two charges and ordered to pay £25 costs with forfeiture of equipment.

Mr M. Fennemore, 3 Landscape Gardens, Leicester, at Leicester Court (10 Bishop Court), on 24 July, 1969. He was fined £50 on each of two charges and ordered to pay £5 5s costs with forfeiture of equipment.

Licence Figures

The numbers on 31 July 1969 were:

Amateur Sound (A)	13,221
Amateur Sound (B)	1,595
Amateur Sound Mobile (A)	2,622
Amateur Sound Mobile (B)	213
Amateur Television	182
Model Control	16,416

PART 1

A 432 MHz Single Sideband Transmitter

By N. G. HYDE, CEng, AFRAeS, MIERE, FBIS, G2AIH*

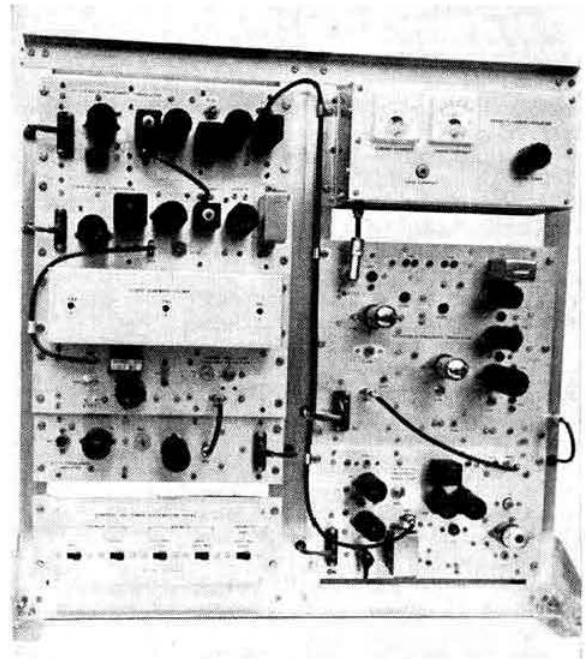


Fig 1. The complete transmitter, with all the sub-assemblies bolted on to a single vertical frame.

THE transmitter described (Fig 1.) is intended primarily as a driver for a high-power 432 MHz linear amplifier. It is however, eminently suitable for use as a transmitter in its own right, in which role it delivers an rf output of approximately 35 watts pep at 432 MHz. Ssb output of approximately one watt is also available at 70 MHz for driving an external 4 metre linear amplifier.

A block diagram of the transmitter is shown in Fig. 2. Amplified audio frequencies from the microphone are applied to a double-diode balanced modulator together with the rf output of a 498·6 kHz carrier oscillator. The resultant output from the balanced modulator thus consists of the upper and lower sidebands of the (suppressed) carrier frequency. These two sidebands are then applied to a two-section half-lattice crystal filter, which rejects the upper sideband and passes the lower sideband only via a 498·6 kHz amplifier to a second balanced modulator in the first frequency translator. Here the lower sideband signal is heterodyned with an rf voltage at approximately 2·65 MHz to give an output frequency of 2·15 MHz, and at the same time the lsb signal is converted to usb, to conform with standard ssb practice for vhf and uhf transmission.

In the next frequency translator stage the 2·15 MHz is heterodyned with 9·47 MHz in a balanced modulator to give a resultant output frequency of 11·6 MHz usb. This 11·6 MHz signal is then amplified and applied to a third frequency translator which converts the output frequency to 70 MHz. The oscillator—multiplier chain in this translator generates a frequency of approximately 58·5 MHz, the actual frequency being determined by selection of any one of three crystals, which results in three spot frequencies being available for transmission in the 70 and 432 MHz bands.

The 70 MHz output from the balanced modulator in the third translator is amplified by a Class A amplifier, and can be applied either to an external 70 MHz power amplifier for 4m operation, or to the final frequency translator when 432 MHz operation is required.

For 432 MHz operation, the 70 MHz ssb signal is heterodyned with a frequency of 362 MHz in the final frequency translator, to give an output at any one of three frequencies in the 70cm band according to the crystal selected in the 11·6–70 MHz translator. The final stage is a 432 MHz Class B linear amplifier, employing a uhf double-tetrode valve operating in a push-pull circuit.

Provision is made in the transmitter for injecting a voltage from the carrier oscillator (carrier re-supply) into the first mixer. This by-passes the first balanced modulator and crystal filter and enables a single sideband plus carrier transmission (A3H) to be made if desired. Wiring in the transmitter is incorporated for the application of automatic level control (alc) voltage from a high power final amplifier back to the 11·6 MHz amplifier; alc is not used, however, in the present application.

All oscillators, namely the carrier oscillator and those associated with frequency translation processes are crystal controlled. To assist in obtaining good frequency stability, which is of paramount importance for ssb transmissions, oscillator output is derived via buffer stages in most instances. The exception is the carrier oscillator, and the crystal in the 70–432 MHz translator, which employs a high multiplication factor, and is mounted in a temperature-controlled oven. Ht supplies to oscillators, balanced modulators and signal frequency amplifiers are regulated.

* 114 Tattenham Grove, Epsom Downs, Surrey.

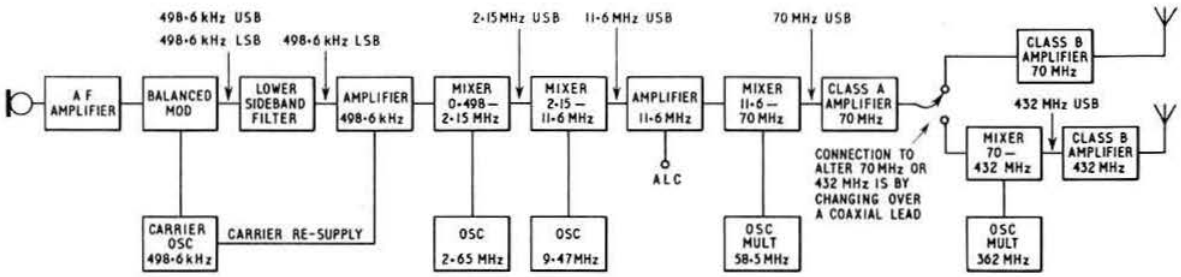


Fig 2. The block diagram for the 70 and 432 MHz transmitter.

To ensure isolation between stages and to permit ease of any subsequent modifications (eg introduction of a vfo) the transmitter is constructed in the form of nine sub-assemblies, as follows:

(1) Audio frequency amplifier.
(2) Carrier oscillator and balanced modulator.
(3) Lower sideband filter.
(4) 0·498/2·15 MHz frequency translator.
(5) 2·15/11·6 MHz frequency translator.
(6) 11·6/70 MHz frequency translator.
(7) 70/432 MHz frequency translator.
(8) 432 MHz linear amplifier.
(9) Control and power distribution panel.

The location of individual sub-assemblies, which are mounted in a double rack constructed of aluminium alloy angle may be seen in Fig. 1. Sub-assemblies (2), (3) and (4) are mounted together to form a sideband generator assembly. Connections to sub-assemblies are made by plugs and sockets; all signal-frequency connections are at low impedance and are made by coaxial cable—75 ohms up to 70 MHz and 50 ohms at 432 MHz. The control and power distribution panel, to which external power supplies are connected is permanently wired to the rack; power supplies are distributed from the control panel to each sub-assembly through permanent rack wiring. The panel also provides switching facilities for local control of the transmitter.

A regulated ht power supply of 250V at 260 mA is required for the af amplifier, sideband generator and frequency translation stages. Regulated supplies of 150V and 180V for oscillator and certain valves in the final frequency translator are derived from the 250V supply. Lt consumption is 6·3V ac at 6·2A total. The 432 MHz amplifier requires an ht anode voltage of 300V at 120 mA, which should be obtained through a choke-input filter, and a 255V regulated screen supply, derived from the 300V line; the lt requirement for the amplifier is 6·3V ac at 1·3A. Negative grid bias of approximately 28V derived from a regulated variable voltage supply is also required; grid bias voltage for the 70–432 MHz balanced modulator may also be obtained from this supply.

Circuit Description

The circuit diagrams of the nine sub-assemblies are shown in Fig. 3.

Audio frequency amplifier

The circuitry of the af amplifier is conventional, consisting of a low-noise pentode microphone amplifier V1, followed by a double-triode V2; V2a is a voltage amplifier and V2b is a cathode-follower providing a low-impedance output to the balanced modulator. The microphone is connected to the grid circuit of V1 through an rf filter consisting of RFC1, R1, and the shunt capacitors C1 and C1a. Interstage coupling capacitors C5 and C8 are of low value to restrict the amplifier response at low audio frequencies.

Carrier Oscillator and Balanced Modulator

The carrier oscillator V3a uses an FT241 type crystal in a Colpitts circuit, feedback being determined by the ratio of C16 and C17. Rf from the oscillator is applied via the variable dust-core transformer TC to the balanced modulator and also to a cathode-follower buffer, the output of which provides carrier re-supply to the first frequency translator via RV2, which forms the carrier level adjustment, and SK4.

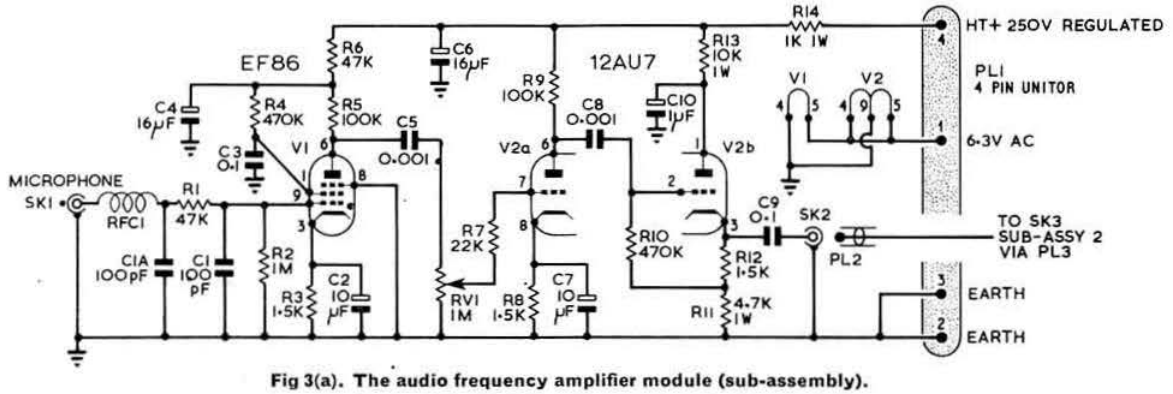


Fig 3(a). The audio frequency amplifier module (sub-assembly).

C

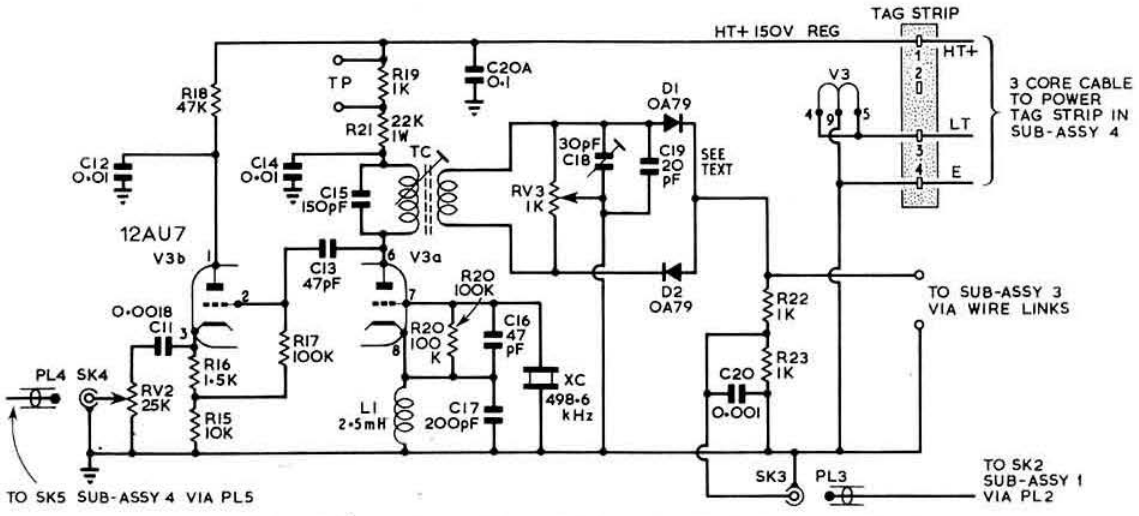


Fig 3(b). The carrier oscillator and balanced modulator (sub-assembly 2).

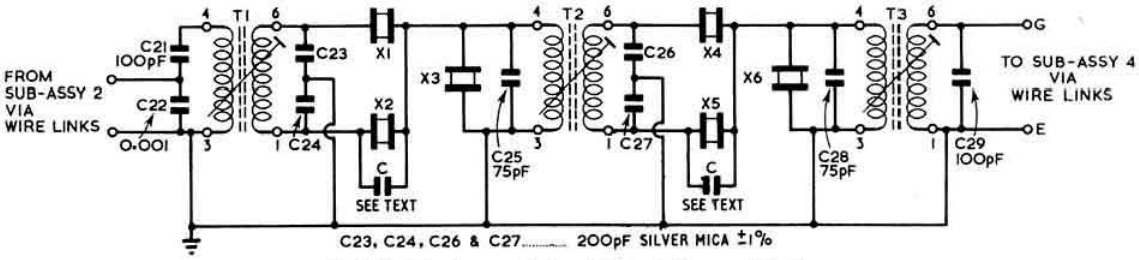


Fig 3(c). The lower sideband filter (sub-assembly 3).

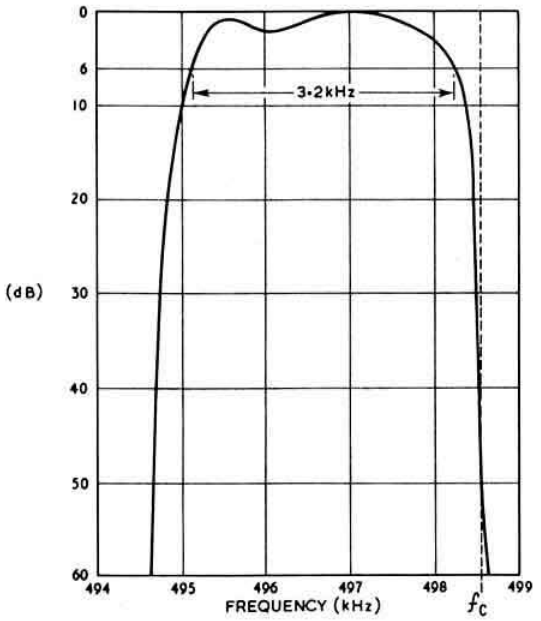


Fig 4. The response curve for the filter in Fig 3(c).

The primary of TC is tuned to the carrier frequency, and the secondary is of low impedance to match into the double diode modulator, consisting of the matched diodes D1 and D2. RV3 is the resistive balance control and C18, C19 in parallel provide for capacitance balance of the modulator, enabling a carrier suppression of some 25dB to be obtained. It is essential that RV2 and RV3 are potentiometers of the carbon track type, as these two components are required to operate at radio frequency.

Audio-frequencies are applied from SK2, via a single-core screened lead terminated in PL2, and PL3 to SK3. R22, R23 and C20 form a filter and impedance matching network, across which is developed the output of the balanced modulator, namely, double-sideband with carrier suppressed.

Lower sideband filter

Selection of the lower sideband output of the balanced modulator is achieved by a two-section half-lattice crystal filter, formed by T1, T2, T3, and the FT 241 crystals X1 to X6. Theory of operation of crystal filters is covered elsewhere (eg *RSGB Radio Communication Handbook*, 4th Edition, Chapter 10), and will not be repeated here. Suitable crystal frequencies are also listed in this Reference. Frequencies of the filter crystals used in the particular application described are however listed in Table 1.

The balanced modulator output is connected across C22 to match the low impedance of the modulator to the input

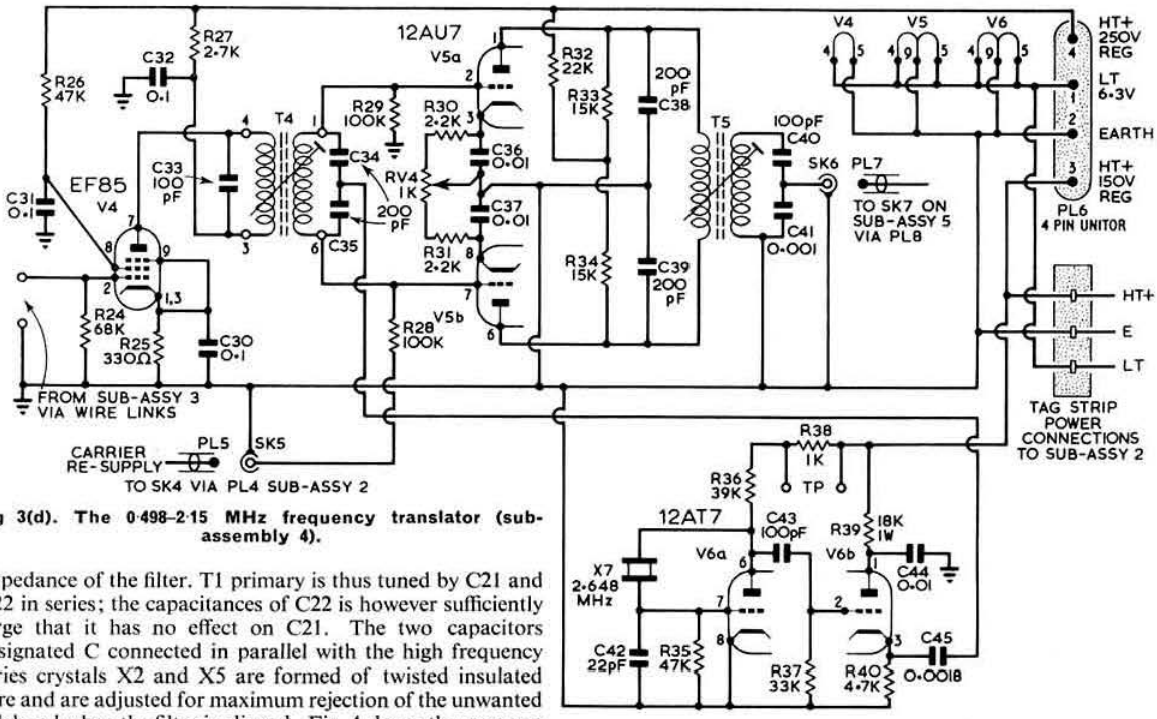


Fig 3(d). The 0·498–2·15 MHz frequency translator (sub-assembly 4).

impedance of the filter. T1 primary is thus tuned by C21 and C22 in series; the capacitances of C22 is however sufficiently large that it has no effect on C21. The two capacitors designated C connected in parallel with the high frequency series crystals X2 and X5 are formed of twisted insulated wire and are adjusted for maximum rejection of the unwanted sideband when the filter is aligned. Fig. 4 shows the response of the sideband filter. The af bandwidth between 6dB points is approximately 3·2 kHz, and carrier attentuation is of the order of 45 to 50dB. Spurious responses are greater than 60dB down.

0.498-2.15 MHz Frequency Translator

Lower sideband with suppressed carrier from the output of the filter is applied to the grid of V4, which operates as a voltage amplifier at 498·6 kHz. The amplified signal from this valve is fed in push-pull via T4 to the control grids of the balanced mixer V5a and V5b. V6a and V6b are a heterodyne oscillator, operating in a Pierce circuit at 2·648 MHz, and a cathode-follower respectively; the function of the cathode-follower is to isolate the oscillator from the mixer circuit. This sub-assembly converts the signal from lsb to usb, the difference between signal and heterodyne frequencies, namely, 2·15 MHz, being selected by T5, the secondary of which is tuned by C40 in series with C41. The output to SK6 is thus at low impedance for connection via coaxial line to the second translator.

V5a and V5b are balanced by RV4 connected in the cathode circuit of each triode. Carrier re-supply is taken from the carrier oscillator sub-assembly via coaxial cable to SK5, and thence through an isolating resistor R28 to the grid of V5b.

2.15-11.6 MHz Frequency Translator

Upper sideband from sub-assembly 4 is fed from SK6 through coaxial cable terminated by PL7 and PL8 to SK7 on the second translator. V7 operates as a self-balancing type of mixer; the single-sideband signal is applied via T6 to the control grid of V7a and heterodyne voltage is applied

TABLE 1

CRYSTAL, HETERODYNE AND OUTPUT FREQUENCIES

Filter	X1, X4 495.833 kHz (Channel 357) Fosc (MHz)	X2, X5 498.148 kHz (Channel 69) Fin (MHz)	Fhet (MHz)	X3, X6 498.611 kHz (Channel 359) Fout (MHz)
Carrier oscillator XC	0·496			
0·496–2·15 translator X7	2·648	0·496	2·648	2·152
2·15–11·6 translator X8	9·474	2·152	9·474	11·626
11·6–70 translator X9, X10 or X11	6·500	11·626	58·5	70·125
	6·506	11·626	58·554	70·179
	6·525	11·626	58·725	70·350
	6·540	11·626	58·86	70·485
	6·550	11·626	58·95	70·575
	40·2222	70·125	361·9998	432·1248
	40·2222	70·179	361·9998	432·1788
	40·2222	70·350	361·9998	432·3498
	40·2222	70·485	361·9998	432·4848
	40·2222	70·575	361·9998	432·5748
70/432 translator X12– 3rd overtone operating on fundamental — 3 alternative crystal frequencies shown.	40·2593	70·125	362·3337	432·4587
	40·2593	70·179	362·3337	432·5127
	40·2593	70·350	362·3337	432·6837
	40·2593	70·485	362·3337	432·8187
	40·2593	70·575	362·3337	432·9087
	40·2963	70·125	362·6847	432·8097
	40·2963	70·179	362·6847	432·8637
	40·2963	70·350	362·6847	432·0347
	40·2963	70·485	362·6847	432·1687
	40·2963	70·575	362·6847	432·2597

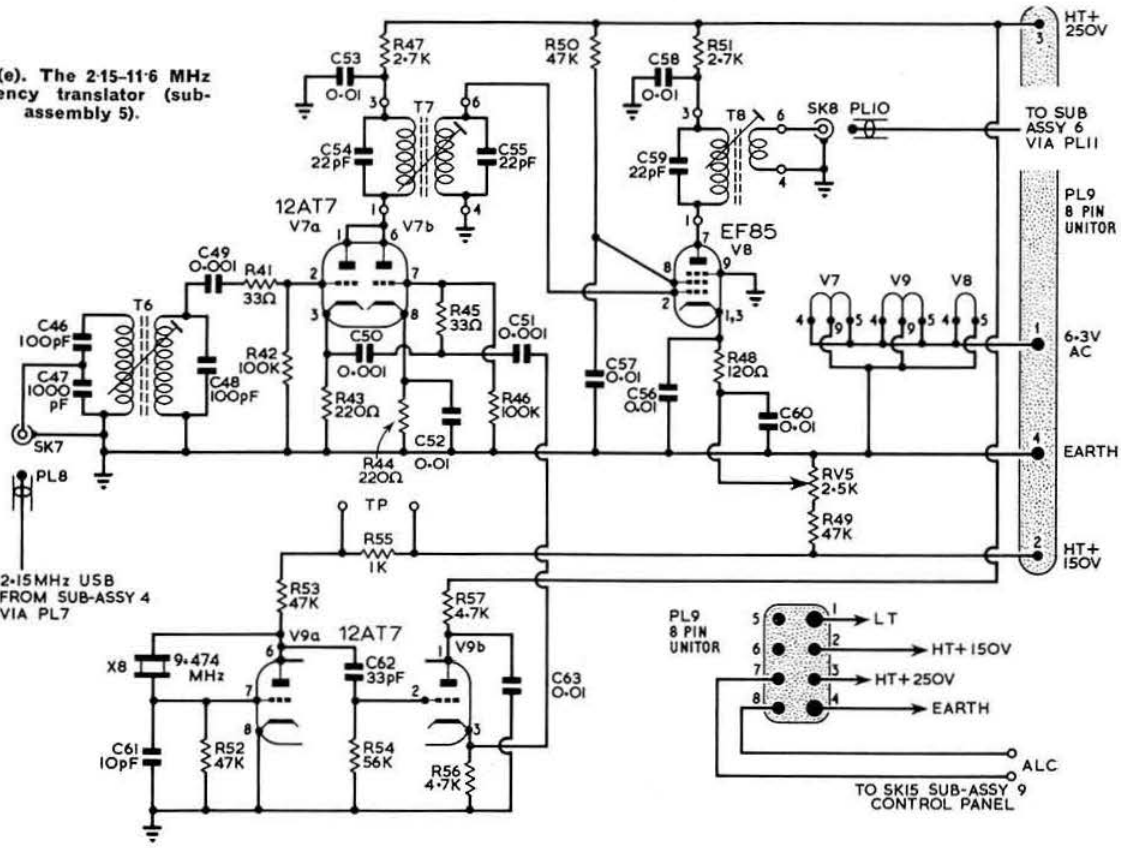


Fig 3(e). The 2·15–11·6 MHz frequency translator (sub-assembly 5).

in phase to the control grid of V7b and the cathode of V7a. The heterodyne frequency is 9·474 MHz and T7 in the anode circuit of V7 is tuned to the sum of signal and heterodyne frequencies, that is, 11·6 MHz.

V8 is a voltage amplifier at 11·6 MHz, the output of which is applied via T8 to SK8. This stage employs a variable-mu valve the gain of which may be adjusted by RV5, which determines the grid bias voltage applied to the valve. Provision is made in the rack wiring of the transmitter for applying alc to V8 from the final amplifier through coaxial cable terminated at pins 7 and 8 of the power supply plug, but this facility has not been incorporated in the transmitter as described.

11·6-70 MHz Frequency Translator

The upper sideband signal at 11·6 MHz is routed via PL10 and PL11 to SK9 on the third translator, which converts 11·6 MHz usb to 70 MHz usb. V12 and V13 form a balanced mixer, the ssb signal being applied in push-pull to the control grids of each valve. The mixer is balanced by adjustment of RV6.

V10 is a crystal-controlled oscillator-tripler operating in a Colpitts circuit. FT243 series crystals are employed and any one of three crystals, X9, X10, or X11 in the 6·5 MHz range may be selected by S1 to give a choice of operating frequency. The rf output from V10 at approximately 19·5 MHz is applied to V11 which functions as a tripler and gives an output at approximately 58·5 MHz. The tripler output is applied in phase to the screen grids of the mixer valves, and the sum of the signal and heterodyned frequencies, in this instance 70·35 MHz, 70·485 MHz or 70·575 MHz, dependent on the setting of S1 is selected by the tuned anode circuit C68 and L2 of the balanced mixer.

The 70 MHz signal is amplified by V14 which operates in Class A. The output socket SK10 may be connected via PL13 and a coaxial cable to the final (70/432 MHz) translator. Alternatively if operation on the 4 metre band is desired output may be routed through PL22 and SK16 (which is mounted at the rear of the transmitter rack) to an external 4 metre linear amplifier.

70-432 MHz Frequency Translator

When operating on 432 MHz, 70 MHz usb is applied via PL13 and PL14 to SK11 on the final translator. V15 to V18 form an oscillator-multiplier chain. The heterodyne frequency is derived initially from a 40 MHz third-overtone type HC6U crystal (X12) operating on the fundamental mode (V15). The crystal is enclosed in a temperature-controlled oven to assist in obtaining good frequency stability. V16, V17 and V18 are frequency triplers which raise the final injection frequency to 362 MHz. V18 is a single-ended uhf double-tetrode operating in push-pull with a quarter-wave linear tuned anode circuit L19, C100.

The 70 MHz ssb signal is applied in push-pull to the con-

trol grids of V19. 362 MHz heterodyne voltage is applied in phase to the screen grids of this valve, via L20, L25 and a tuned circuit L26, C110. The sum of the two frequencies, namely 432 MHz is then selected by the mixer anode circuit L27, C111 and coupled to the output socket SK12 through L28 and C113. Using a 40·2222 MHz crystal at X12, the final output frequencies are 432·35 MHz, 432·49 MHz or 432·575 MHz, determined by the position of S1 in the 11·6 –70 MHz translator.

Negative bias at 18V regulated by the zener diode D3 is applied to the control grids of V19 to set the operating point of the valve. No provision is made for balancing this stage. Fixed grid bias is not applied to V18 as the high value of screen resistor, R87 plus R87a, effectively limits the maximum anode current drawn by this valve.

Power Amplifier

The final amplifier stage employs a uhf double-tetrode operating in Class B (V20). 432 MHz ssb output from the final translator is coupled via 50 ohm coaxial plugs PL16 and PL17 to SK13 and L30. The push-pull grid circuit L31, C115 forms a half-wave line. Variable-voltage regulated bias is applied to the control grids of V20 through a break jack J1 (*Grid current*) and rf chokes L32 and L33; the two chokes are connected to the voltage antinode on L31.

L35, C118 form a quarter-wave linear anode circuit which is coupled to the 50 ohm output socket SK14 through L36 and C120. Heater decoupling is by rf chokes L38 to L40 and the capacitor C123. Anode and screen currents are continuously monitored; meters are necessary in these circuits to align and load the stage by observation of screen current, and to ensure that the anode dissipation of the valve is not exceeded.

Control and power distribution panel

The function of the control panel is to distribute power supplies to the different sub-assemblies and provide local control of the transmitter for alignment and test purposes. All supplies, viz, ht, lt and gb are connected to the panel through three rear-mounted plugs, PL19 (ht), PL20 (lt and gb) and PL21 (ht, lt and gb supplies to the amplifier stage).

The 150V and 250V regulated ht supplies to sub-assemblies

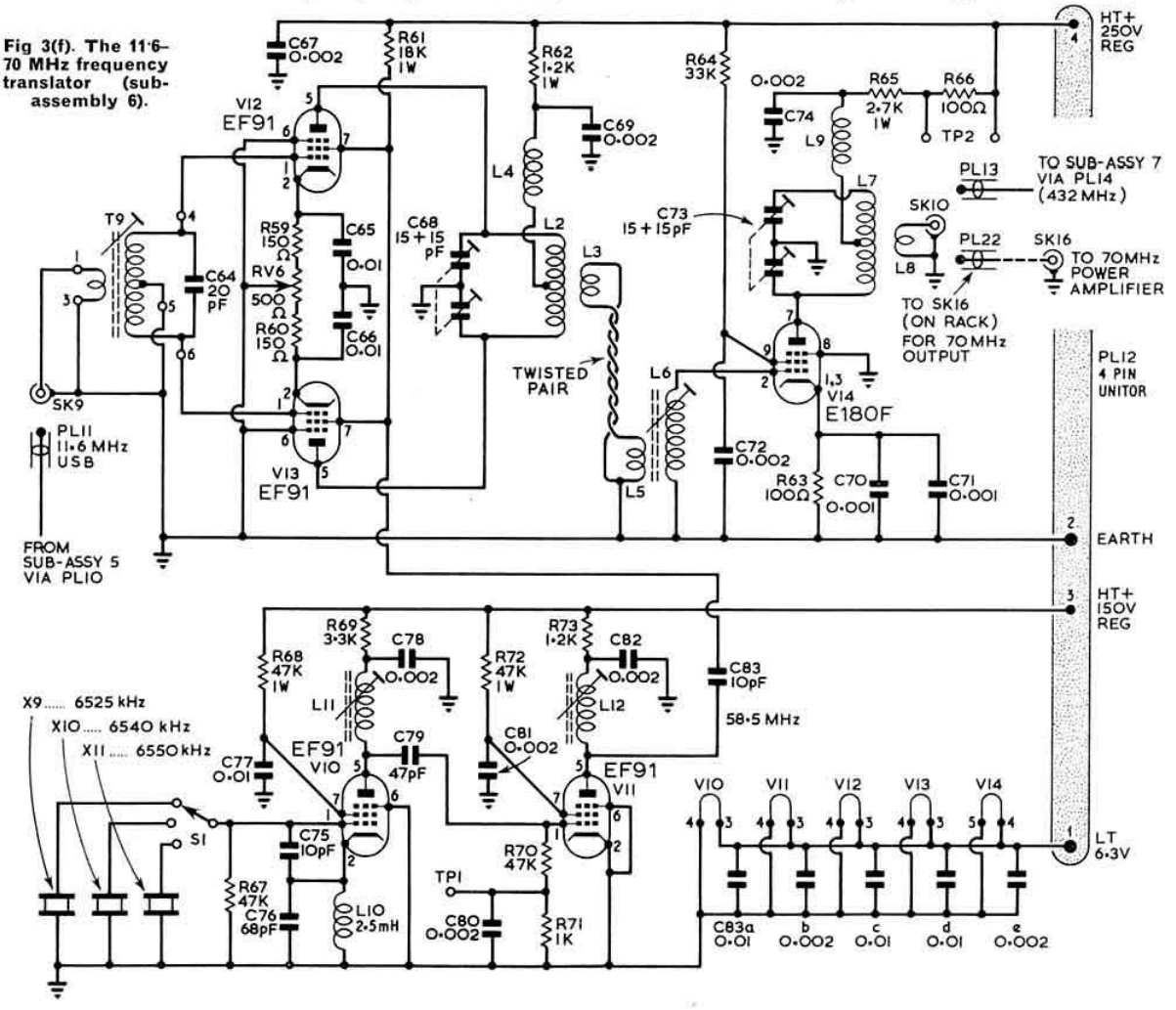


Fig 3(f). The 11·6–70 MHz frequency translator (sub-assembly 6).

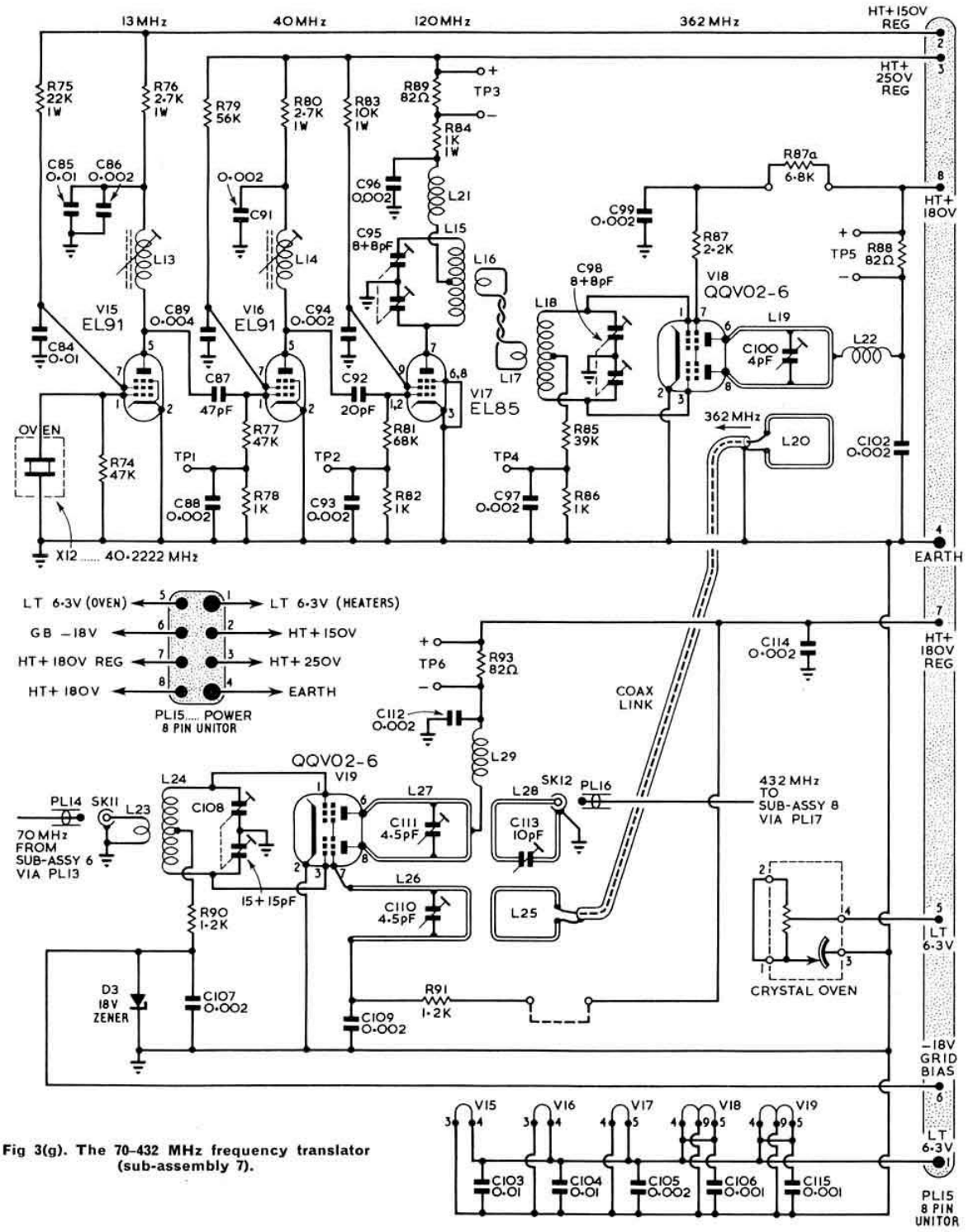


Fig 3(g). The 70–432 MHz frequency translator (sub-assembly 7).

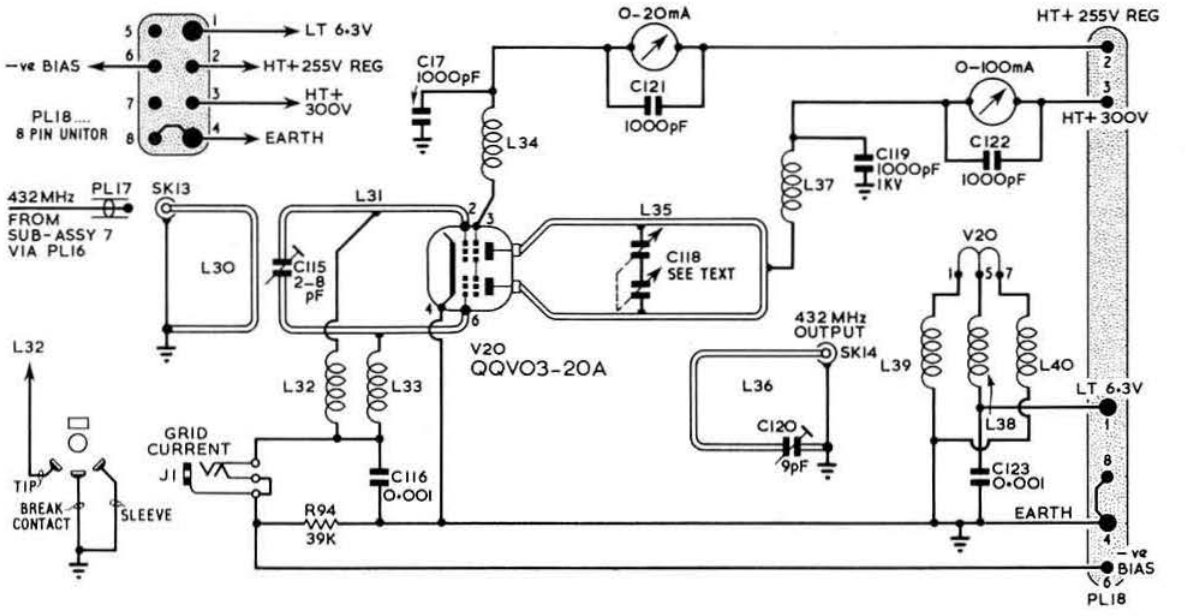


Fig 3(h). The 432 MHz power amplifier (sub-assembly 8).

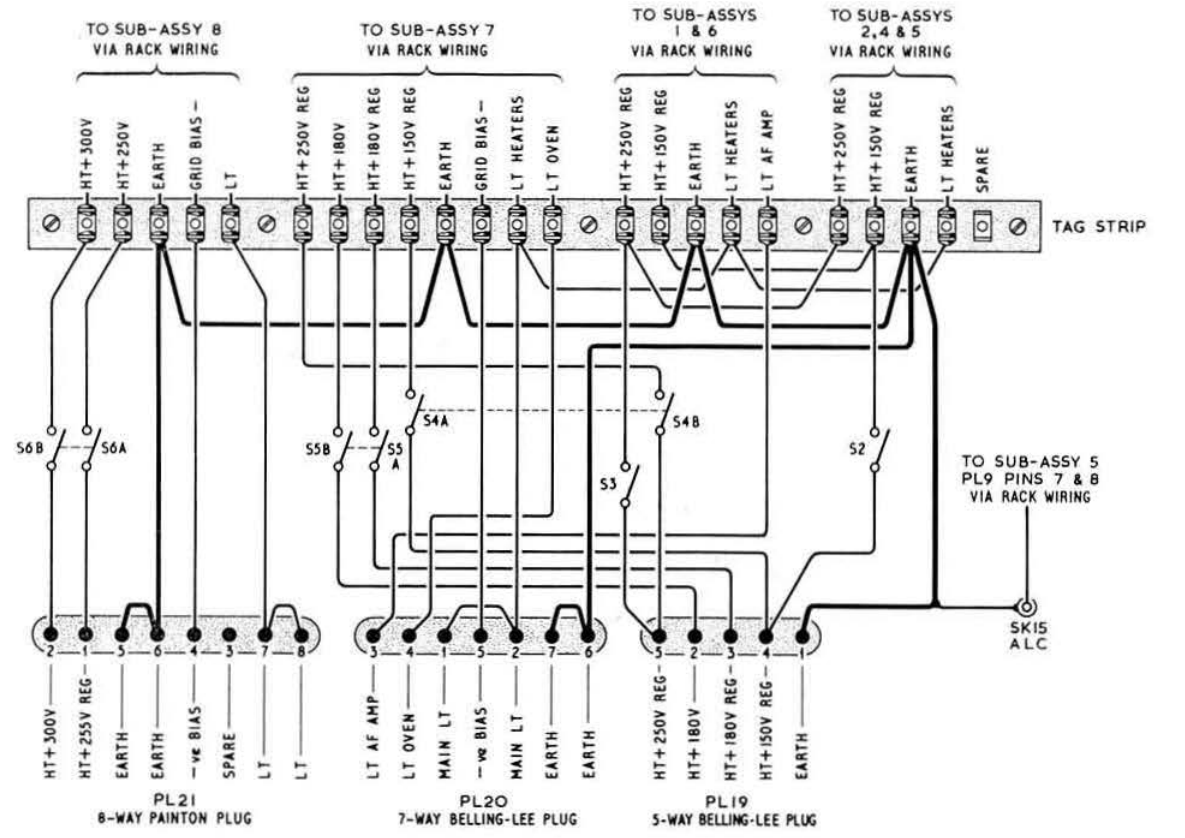


Fig 3(i). The control and power distribution panel (sub-assembly 9).

TABLE 2

LT Current consumption at 6·3V AC

Sub-assembly	Valve	Heater current (amps)	Total (amps)	Remarks
af amplifier	EF 86	0·2		
	12AU7	0·3	0·5	Separate supply
Carrier oscillator/balanced modulator	12AU7	0·3	0·3	
0·498–2·15 translator	EF 85	0·3		
	12AU7	0·3		
	12AT7	0·3	0·9	
2·15–11·6 translator	12AT7	0·3		
	12AT7	0·3		
	EF 85	0·3	0·9	
11·6–70 translator	EF 91	0·3		Common supply
	EF 91	0·3		
	EF 91	0·3		
	EF 91	0·3		
	E 180 F	0·6	1·8	
70–432 translator	EL 91	0·2		
	EL 91	0·2		
	EL 85	0·2		
	QQV 02–6	0·6		
	QQV 02–6	0·6	1·8	
	crystal oven	0·78	0·78	Separate supply
Class B amplifier	QQV 03–20A	1·3	1·3	Separate supply

1, 2, 4, 5 and 6 are switched by S2 and S3 respectively. S4a and S4b control the 150V and 250V regulated supplies to sub-assembly 7; the 180V regulated and unregulated supplies to this unit are switched by S5a and S5b respectively. Ht anode and screen voltage to the amplifier (sub-assembly 8) is controlled by S6. A common lt supply is used for sub-assemblies 2, 4, 5, 6 and 7. To avoid any possibility of rf feedback into the audio amplifier, this sub-assembly has a separate lt supply. The crystal oven in sub-assembly 7 also has a separate lt supply.

Power supplies

Ht supplies to all sub-assemblies except the 432 MHz amplifier (sub-assembly 8) are derived initially from a 250V 260mA regulated supply. 150V regulated for the crystal oscillators and 180V regulated for the 70–432 MHz mixer (sub-assembly 7) are obtained from the 250V supply through individual gas stabilizer valves. The unregulated 180V to the final multiplier in sub-assembly 7 is obtained via a series dropping resistor; this supply could with advantage be taken from the 180V regulated line but in the present instance this line, using the two gas stabilizers in series, had insufficient current capacity to permit this. The 150V and 150V ht supply circuit is shown in Fig. 5. Lt voltages are obtained from four separate 6·3V supplies; details of lt loading are shown in Table 2.

300V ht at 120mA for the amplifier stage is derived from a choke input filter power supply. The 250V regulated screen supply is obtained from two gas stabilizers, VR150/30 and VR105/30 connected in series across the 300V line.

Variable negative grid voltage for the amplifier is obtained from a separate power supply, a suitable circuit for which is shown in Fig. 6. A fixed negative voltage is also drawn from this supply to provide bias for the 70–432 MHz mixer; this supply is applied via PL20 Pin 5 on the control unit and PL15 Pin 6 on sub-assembly 7 to the zener diode D3 in this unit.

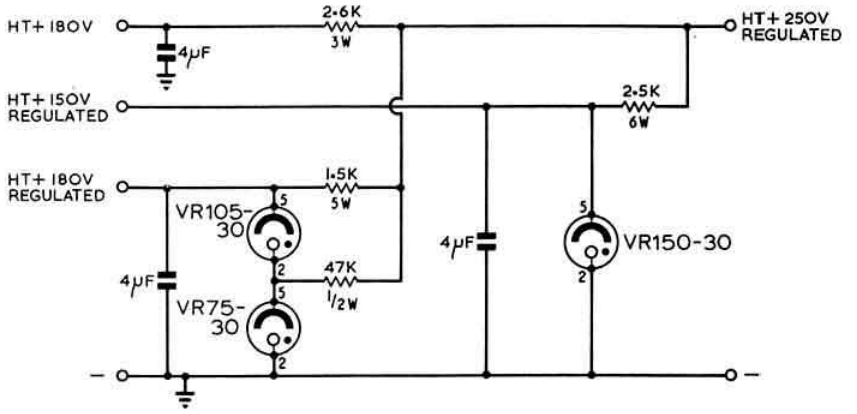


Fig 5. The power supply circuit providing 150V and 180V rails.

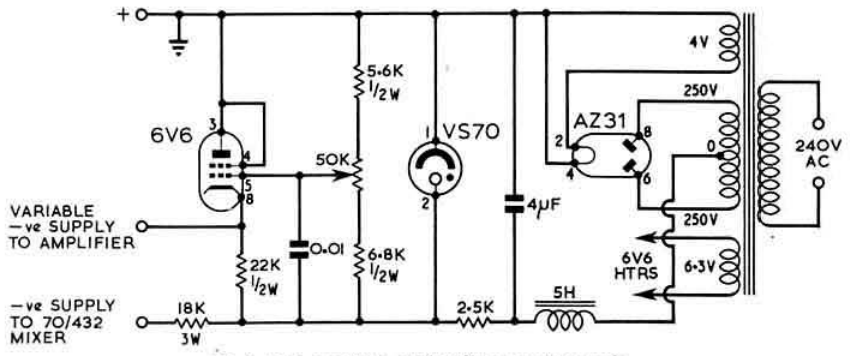


Fig 6. The negative grid voltage power pack.

To be concluded

the rsgb show

INTERNATIONAL RADIO ENGINEERING AND COMMUNICATIONS EXHIBITION

WEDNESDAY 1 OCTOBER
TO
SATURDAY 4 OCTOBER
10 am TO 9 pm

The 1969 Exhibition will be formally opened at 12 noon on Wednesday, 1 October, by Mr R. J. Halsey, CMG, of Cable & Wireless Ltd. RSGB President, John Swinnerton, TD, BSc(Econ), G2YS, will accompany Mr Halsey on a tour of the Exhibition. Many prominent personalities in the Government Service, Industry, and the world of Amateur Radio will be present at the opening ceremony. The special exhibit on the stage of the Hall will be provided by Cable & Wireless Ltd.

Once again the Society will be taking the largest stand in the Exhibition.

The **Enquiry and Reception Area** will be in the charge of M. J. Wallace, G8AXA and Mrs Eileen Vaughan, BRS26612, who will be assisted by Council Members and members of the various RSGB Committees. Orders will be taken for US magazines, call-sign and car badges; in addition subscriptions may be renewed, and full information on the Society's activities will be available to prospective members.

Overseas visitors are particularly asked to call at the Reception Area so that arrangements may be made for them to attend the Reception for Overseas Visitors to be held on Friday 3 October.

The **RSGB Bookshop** will be in the charge of Stand Manager Ron Broadbent, G3AAJ. A full range of RSGB publications will be on sale, including the 1970 edition of the "*Amateur Radio Callbook*" and the *VHF/UHF Manual*.

The **Display of Home Constructed Equipment** is being organized by M. R. Elliott, G3VWS, of 23 Filbert Crescent, Gossops Green, Crawley, Sussex, to whom enquiries reference display of equipment should be directed. See page 656 of the September 1969 issue of *Radio Communication* for full information.

GB3RS and **GB2VHF** will be operational from the Hall under the direction of Station Manager, Ron Vaughan, G3FRV. **GB3RS** will operate direct from the Hall on 80m ssb. **GB3RS** will operate on 20, 15 & 10m from the Imperial College Radio Society Club Station at South Kensington, and will be linked to the Hall by a duplex link in the 440–450 MHz band. **GB2VHF** will operate from the Hall on 4 and 2m.

TVI? will be the nameboard over a stand devoted to various aspects of tvi. Barry, G3JGO, and Kay, G3XIW Priestley, aided by other members of the Society's TVI/BCI Committee aim to help members with practical information on causes and cures.

The **British Amateur Radio Teleprinter Group** stand, managed by Peter Balestrini, G3BPT, will have access to the Society's transmitters and operation will take place on 20, 15 and 10m using the call-sign GB3RS. Speed will be 45·5 bauds fsk and both 850 and 170 Hz shifts can be used.

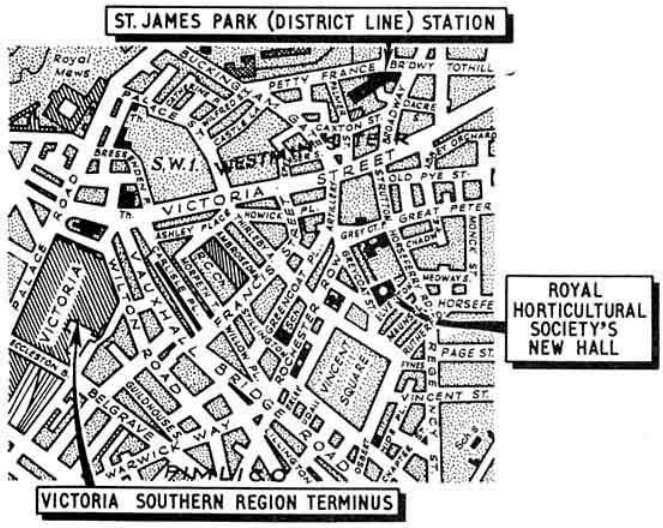
On 4 and 2m, GB2VHF will be pleased to have contacts at 50 bauds using 850 Hz afsk.

Reception for Overseas Amateurs—The Society is organizing an informal Reception for overseas visitors, on the lines of that held in previous years, for Friday, 3 October at 7.30 pm. Between 7.30 and 8.30 pm entry will be restricted to overseas visitors and invited guests, but Society Members may obtain tickets for this period at a cost of 7s. 6d. The Society hopes that all visiting amateurs will make themselves known at the Reception Area, when arrangements will be made for them to attend the reception.

A new multi-storey car park has been opened in Rochester Row, at the junction with Greycoat Street. If this is full, another car park can be found in Abingdon Street/Great College Street (opposite the Houses of Parliament).

ROYAL HORTICULTURAL SOCIETY'S NEW HALL

GREYCOAT STREET,
WESTMINSTER,
LONDON, SW1.



TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

THE widespread belief among amateurs that, of late, television interference problems, despite the improved tv coverage from extra BBC and ITA transmitters, have been getting more (rather than less) intractable receives powerful support from the harsh statistics of Post Office interference investigations. It is understood that the number of complaints ascribed to " amateur transmitters " has climbed from about 400 in 1964 to over 1100 in 1968.

Transistorised Tuners and TVI

While such statistics are affected by many variables (for example, greater skill in identifying this form of interference, different patterns of band usage either by viewers or by amateurs) it would appear likely that there must be some solid reasons for such a steep rise. My own feeling—and in this I appear to be supported by opinion within the tv receiver industry—is that a significant factor may be the greater liability of transistorized tuners on tv sets to run into cross-modulation and other non-linearity troubles in the presence of very strong signals from local transmitters, even when the output of the transmitter is well removed from the tv channel in use. For a period, British tv sets used transistors only in the uhf (Bands IV and V) tuner; but many " hybrid " sets now fit either one fully-integrated tuner (that is a combined vhf/uhf tuner using transistors), or else separate transistorized vhf and uhf tuners; often followed by a succession of bipolar transistors in the intermediate frequency strip. Furthermore with many uhf tuners, agc is often omitted in one or more stages.

It was indicated in *TT* (August) that portable Band II vhf/fm radio receivers had been found to be commonly driven into non-linearity by signals of the order of 50 mV at the input of the receiver, even when these were many MHz away from the desired signal; there seems little reason to suppose that the performance of tv front-ends is very different.

If this supposition that modern tv sets are appreciably more susceptible to strong local signals than the designs of a few years ago is correct, this might well account for some of the increase in tvi, and the process may continue to build up as more and more of the older sets are replaced. Admittedly, it is still possible to hope for considerable improvement with the spread of all-uhf tv viewing, but perhaps not as much as would otherwise be the case. A possibility offered by all-uhf viewing is that in most cases the local co-sited transmitters (it should not be forgotten that all ITA and BBC uhf signals will eventually be received from transmitters located at the same sites) will be grouped in channels within an 88 MHz spread, and this should facilitate the design of low-cost add-on band-pass filters. For example, printed-circuit " comb " filters would offer distinct possibilities. One hopes that set-makers will be prepared to supply suitable filters to viewers suffering from interference that results from what is, after all, a deficiency in receiver performance (though it is extremely difficult to determine what is a reasonable characteristic for domestic sets). On the other hand, this co-siting policy may actually tempt set-makers to pay even less attention, than in the past, to achieving good dynamic range: it would be easy to pre-set a tuner to suit tv signals coming from a single location even with a very limited dynamic range. There is little sign of any move to fit dual-gate IGFETS in tv sets, though such a change would certainly improve dynamic range when compared with that being achieved with bipolar transistors—perhaps makers are waiting for better uhf performance or for the prices to come down to bipolar levels.

Receiver " Immunity "

There is another tv receiver characteristic which should not be forgotten: this is what is sometimes referred to as the " immunity " of the set—the degree to which the receiver responds only to signals arriving via the aerial feeder (in its correct " coax " mode). As anybody who has ever used a tv set in a high-signal area soon discovers, the " immunity " of many receivers is pretty low: what with direct pick-up on the chassis, and/or response to signals coming via the mains lead or as " common mode " signals on the feeder cable. The absence of good " immunity " may mean that any filter in the aerial lead can prove only partly effective. A mains filter (such as that suggested by G3SYC in the March *TT*) can often help; but in extreme cases direct pick-up on the chassis can be an important factor. It seems unfortunate that some tv receiver characteristics, far from improving, often tend to get worse over the years. We know that some set-makers are well aware of the problem of operating sets in close proximity to transmitters of the mobile and amateur services, but this is a highly competitive field in which cost-cutting practices tend to spread. There seems to be real need for the best possible liaison between the Society, representing the amateurs, and the tv receiver industry. It may be too much to hope that set-makers will ever be greatly influenced by the amateur viewpoint, but we should at least do our utmost to ensure that they are kept informed of that viewpoint.

Stable AGC Controlled Oscillators

It is now widely appreciated that to obtain maximum stability from an oscillator, some form of agc loop is required. A high-stability crystal oscillator, with a temperature characteristic of about two parts in 10^7 per degree Centigrade, and with a similar figure per volt change in supply potential, has been described by two Italian engineers (Colla and Tomassetti) in *Electronic Design* (19 July, 1969).

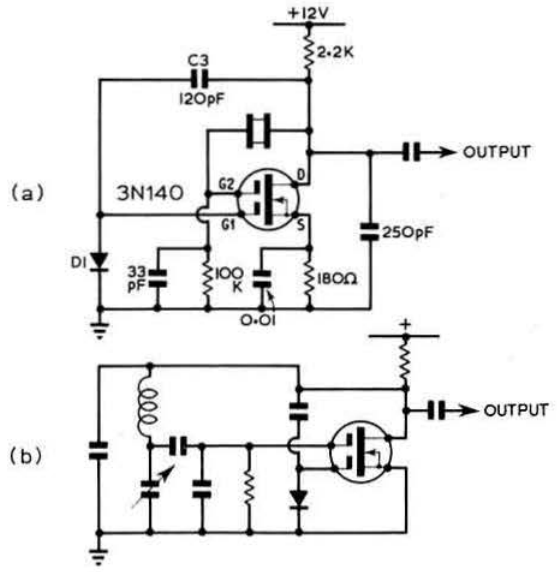


Fig 1(a). High stability crystal oscillator incorporating agc loop. (b) A possible use of this technique is conjunction with a Vackar oscillator. D1 any good quality rf silicon diode.

This comprises a modified Pierce oscillator circuit with the crystal between gate 2 and drain of a dual-gate MOSFET, leaving gate 1 free to provide very effective agc. This circuit is shown in Fig. 1(*a*), though two leads which appear in the original circuit have been omitted since it is felt these must have been included in error.

An rf voltage is taken from the drain, via C3, and fed back to gate 1. Any good silicon rf diode is connected between gate 1 and chassis as a clamp. The system thus provides both dc feedback, proportional to the output rf amplitude, in addition to the ac feedback. The Italians suggest that while the former keeps the output rf level constant for dc supply variations from 5 to 15 volts, the latter keeps the output waveform sinusoidal, with negligible harmonic content, in spite of the square-law transfer characteristic of the MOSFET. No indication is given of the output voltage, but we suspect that this is fairly low.

The component values are optimized for a 10-MHz crystal but it is claimed that the circuit works well without any modification at around 455 kHz. At lower frequencies, because of increased crystal activity, it is suggested that the output may not be perfectly sinusoidal; however, this can be remedied by increasing the value of C3.

While there is perhaps still only limited demand (although an increasing one) for crystal oscillator circuits in which there is only negligible contribution to drift by the circuit (i.e. the limitation is virtually that of the crystal itself), it would seem to me completely feasible to incorporate this agc system in a low-output dual-gate MOSFET Vackar oscillator. Such a technique might well produce the most stable simple variable oscillator yet proposed: an outline suggestion of how this might be done is shown in Fig 1(*b*), though component values would have to be optimised.

Ferrite Bead Attenuation

Way back in 1961 (*TT*, August 1961, or *ART* page 28), G3HWR indicated how ferrite beads could be incorporated in co-ax sockets to keep rf out of af circuits. Since then, the use of ferrite sleeving beads to provide hf insertion loss has become fairly common practice; for instance, many domestic receivers use beads to improve the decoupling of heater circuits. Beads are small, introduce no dc losses and can be installed by just slipping them on the component leads or wiring, and cost only a few coppers each. There are, however, relatively few articles giving detailed information on their use for such applications, so that many amateurs tend to use hit and miss methods.

For those who would like to dig deeper into the subject, an article by R. B. Cowdell in *Electronic Design* (7 June) provides a good deal of design data, from which the following brief points have been extracted.

Typical ferrite beads can provide up to 10dB of insertion loss over the range 1 MHz to 1 GHz; adding extra beads increases this insertion loss but makes the system more frequency conscious. Line current through the bead has to be kept reasonably low to avoid saturation, though some beads do not saturate under about 5-amp; generally it is better to keep well under saturation values. The writer indicates how insertion loss ratio rise with increasing frequency and then (for a given type of bead) fall off fairly rapidly, but may then have a sharp second peak (this can be utilized in suppressing parasitic oscillation). Putting more beads on a line increases the insertion loss but tends to be more effective at lower frequencies than at higher frequencies; in other words it shifts the insertion peaks lower in frequency. A long string of beads tends to become very frequency conscious, and because of this there will be a practical limit to the number of beads that can be strung on a lead.

There is also some useful information on the use of F8 and F14 beads in the *Electroniques* catalogue; this mentions their use to prevent leakage, along dc or heater leads, from screened boxes, and to prevent parasitic oscillation, as well as for the suppression of interference. *Electroniques* note that when higher impedance values are required, longer beads or several beads can be used, or else several turns of wire can be wound through the bead to make a more conventional form of inductance.

It might well be possible to increase the "immunity" of a tv receiver, as discussed earlier, by fitting beads over the main leads, to avoid the need to fit a complete mains filter. We wonder if anyone has any information on this form of filter?

PIN Diodes on HF

A preoccupation in preparing material for *TT* is that the costs of the devices should be "reasonable", in terms of amateur budgets. This means that quite a number of useful-looking linear integrated circuit (LIC) applications are deliberately being held over, and similarly there is usually not much point in referring in detail to microwave devices such as Gunn and Impatt diodes (though we feel that eventually these could have considerable importance to Amateur Radio). There are however always some fringe situations in which although, at the time of writing, the cost of the components may be fairly high, either these could come down, or alternatively the information is sufficiently interesting to justify its inclusion as a signpost to the future.

A letter from Frank Dorey, BRS16468, (who in *TT* November 1967 reported his work on FET hf front-ends) provides some new information on an extension to the use of PIN diodes. Previously in *TT* (e.g. *TT*, March 1967 or *ART* page 31), it has been indicated how these devices can be used as gain-controlled attenuators for vhf and microwave receivers.

BRS16468 reminds us that due to its intrinsic layer such a diode has a high storage time, usually denoted by τ (tau). At low frequencies the device behaves as an ordinary diode; but above a frequency $1/(2\pi\tau)$, the rectifying action of the diode drops off at 6dB per octave, because the diode is too sluggish to respond (the opposite of the Schottky diode with its low storage time). The mean slope of the diode characteristic however continues to be governed by the dc bias current, allowing the PIN diode to be used as an electronically variable resistive attenuator on signal frequencies high compared with $1/(2\pi\tau)$.

Most PIN diodes have storage times of the order of 100 nanoseconds (nS—one nanosecond being one-thousandth of a microsecond), so that they are suitable only for signals in the higher hf, vhf, uhf, and microwave bands.

However—BRS16468 points out—the AEI type DC1020A has a storage time of 10 microseconds, which means that $1/(2\pi\tau)$ has a value of about 15 kHz, thus making the device suitable for use throughout the mf and hf range. He has recently been testing the diode as an attenuator between a 75-ohm signal generator, and a load consisting of an 82-ohm resistor, with a signal frequency of about 0·5 MHz. He has produced attenuation curves under these conditions both with the diode connected as a series current-controlled attenuator, and also as a shunt attenuator.

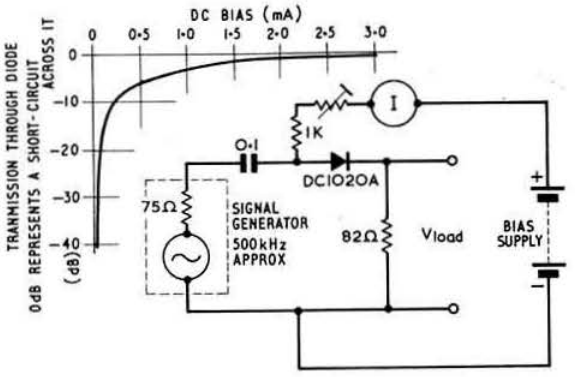


Fig 2. Results achieved by BRS16468 using a DC1020A PIN diode as an MF attenuator.

His conclusion is that the series circuit (see Fig 2) gives quite encouraging results (attenuation with the shunt circuit varies from roughly no attenuation with no bias current to about 20dB attenuation with 30mA dc bias).

He stresses that the price of these diodes is currently of the order of £5 even though this DC 1020A is the "cheap" (epoxy encapsulated) form of the device, which in other forms is much more expensive.

Multiband Stub Dipole

To judge by the popularity of the W3DZZ-type of trapped dipole, there is a continuing demand for fairly simple aerials that can work effectively on a number of hf bands. One should not, of course, forget the attractions of such "old-fashioned" aerials as the so-called "centre-fed Zepp" (more correctly a centre-fed dipole with resonant line feeders), despite the current disdain for resonant feeder systems.

In *CQ* (July, 1969), Cortland Richmond, W1CEJ, describes a multiband "portable dipole" for 7, 14, 21 and 28 MHz, although the system would seem to have advantages over the trapped dipole for fixed operation; maybe the Americans no longer dare to suggest anything less than a beam as suitable for home use! The W1CEJ aerial makes use of two techniques which have been previously described in *TT*, but the combination seems to be a novel one. These techniques are the well-known paralleled dipoles using 300 ohm line (*Amateur Radio Techniques*, page 121) and the use of 300 ohm stub sections as originally patented by W4JRW (*ART*, page 126).

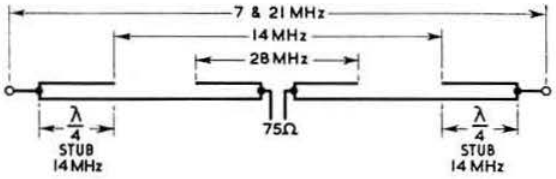


Fig 3. The W1CEJ multiband (7, 14, 21 and 28 MHz) "portable dipole."

The W1CEJ aerial (Fig 3) has an overall length of 67 ft which, when fed with 75-ohm line, results in a $\frac{1}{2}\lambda$ dipole for 7 MHz and a $\frac{3}{2}\lambda$ arrangement for 21 MHz. A 28 MHz paralleled dipole is formed from 300 ohm ribbon. To allow 14 MHz operation, a 14 MHz $\frac{1}{4}\lambda$ stub section is incorporated (we have made a slight modification on the original diagram to underline that the length of this stub section depends on the velocity factor of the 300-ohm ribbon) as in the W4JRW manner. Because of the interaction and the effect of the stub, the dimensions need to be adjusted by means of a grid dip oscillator for optimum performance on the various bands (there will be some compromise on either 7 or 21 MHz).

In practice, the whole top element can most conveniently be fashioned from 300-ohm twin feeder or 450-ohm open wire line; the lower velocity factor of the 300 ohm feeder might be found useful, since the inclusion of the stub section tends to shorten the overall length on the lower frequency band. It may be found worth looking up the earlier material on this use of stubs in this manner, either in *ART* or in the original *QST* article (December, 1960) which covered a 14 and 28 MHz arrangement. With some care in adjustment, the result should be a multiband system with appreciable advantages over the trap dipole.

Multivibrator "Pulser"

Recently, (*TT*, May 1969), G3HCT appealed for a simple "pulser" keying device to assist in checking for tvi. And although G2IS subsequently showed how a kitchen timer could be used as an automatic signal source for phone rigs, a

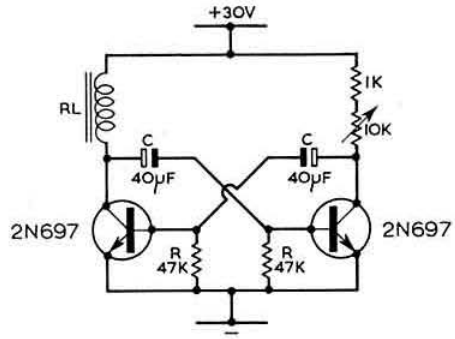


Fig 4. Repetitive switching device using a stable multivibrator. Original relay type given as P8 B (LM11) but typically 24-volt relays could be used.

pulser could still be useful for cw rigs—and also for some other totally unrelated applications. For this reason, a circuit suggested by S. A. Ritterman in *Electronic Design* (21 June, 1969) might well fit the bill. This provides repetitive switching by substituting a relay for one of the collector resistors in an astable multivibrator: see Fig 4. This gives successive switch closures of the order of the time-constant $R \times C$. The component values given are said to provide a variable cycle between about 1 and 3 seconds, although a larger-value potentiometer would permit longer intervals (or a smaller series resistor would decrease the minimum time).

Capacitance Meter

A simple capacitance meter suitable for checking the value of mica or ceramic capacitors in ranges of 0–100 pF and 100–2000 pF is described by ON5GP in *CQ-QSO* (July/August, 1969). This instrument is intended to overcome the common problem of capacitors whose colour coding or other value identification is no longer readable. It should prove sufficiently accurate to allow the recovery of many components which would otherwise have to remain unused in the junk box. An OC171 or equivalent transistor crystal oscillator (ON5JI suggests Channel 66, FT241 crystal) plus OC171 amplifier feeds a 492·59 kHz signal through the unknown capacitor to an integrator-detector circuit and 1 mA fsd output meter.

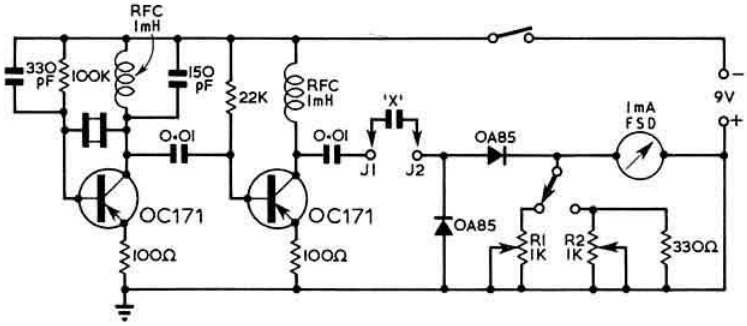


Fig 5. The ON5GP version of the simple crystal-oscillator capacitance meter.

To calibrate the instrument, a known 100 pF capacitor is inserted and R2 adjusted for full-scale deflection of the meter. Then with the switch in the other range, R1 is similarly adjusted with a 2000 pF capacitor plugged in. The two ranges can then be approximately calibrated using a handful of capacitors of known value. The scale is non-linear, and some improvement can be achieved by inserting a third crystal diode in series with the meter.

ON5GF states that his unit was derived from an article in *QST*. However, the circle can be completed since I feel certain that the original source was in fact the full-length article on this type of capacitance meter by T. H. Holbert, GM3DXJ (*RSGB Bulletin*, March 1964). Apart from the use of a 2 MHz crystal, and some variations in component values, the GM3DXJ unit was almost identical. It is worth while again drawing attention to the value of this type of handy instrument, but main credit should go to GM3DXJ, and those readers with 1964 issues of the Bull available will find therein a good deal of additional information.

Here and There

An improvement on the usual " back-to-back " connection of electrolytic capacitors to form a non-polarized unit can be easily effected by using two diodes to short-out automatically the " reversed " capacitor: see Fig 6. The capacitors no longer have reverse voltage across them as happens in the conventional arrangement, and also each provides its full capacitance (instead of only one half of this) to the circuit. The idea comes from *Electronic Design* (24 May, 1969).

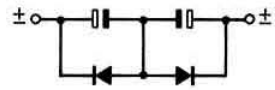


Fig 6. Use of two diodes to provide improved "non-polarized" electrolytic capacitance.

John Haydon, G3BLP, has been prompted by the account of the GM3SAN FET voltmeter (*TT*, June) to mention the performance of the Mullard transistorized DC voltmeter (a sophisticated version of which was described by G3LOK in the *RSGB Bulletin* a few years ago). A modified unit was completed in mid-1963, runs off a PP9 battery, still has the original battery and has never needed any re-calibration. The current drain is only about 0·7 mA. This would seem to put the bipolar one up on the FET! G3BLP is moved to ask whether this is a record?

Workshop Practice for the Radio Amateur

By T. KIRK, G3OMK*

HOME construction requires many skills, all of which make this facet of amateur radio a very interesting one. Most amateurs deciding to build some piece of equipment start collecting information on circuits, source of components, and other technical data, but often forget to enquire about the manufacturing techniques.

The choice of the right material for the job, the tools and how best to use them, combine to confuse or disappoint many a home constructor, and may permanently deter him from attempting to make even the simplest of equipment.

The first essential is an elementary knowledge of the types of materials available and useful to the amateur.

METALS

Aluminium and its Alloys

Good electrical conductor. Medium to high cost. Available in sheet, rod, tube and other forms. Usually bends and machines easily, but does not readily solder. With the unknown quality of this metal that most amateurs use, soldering is best left alone. Adhesive bonding is very good, when the adhesive instructions are meticulously followed, but such joints are not good electrically, so do not go sticking wires onto the chassis.

It is non-corroding in normal use, but try to avoid the use of brass or copper in direct contact with the metal as these react and encourage corrosion with its attendant troubles of poor or non-existent electrical contact. Cadmium or other plated screws, nuts and washers should be used, particularly where the finished job is intended for long term usage.

If sheets of unknown properties are used, it is advisable to test its bending ability on a small strip (4 in $\times$ $\frac{1}{2}$ in). For reliable bending of sheet up to 0·048 in thick, it should be possible to bend the sample strip back on itself, and hammer the fold flat, without breakage.

A metal that looks like aluminium, and may come into the hands of the unwitting, is magnesium alloy. Filings and chippings from this metal are highly inflammable. They can burst into a glaring flame with the heat generated by filing or drilling. Trying to put out such a fire with water only makes matters worse. (Factories where this alloy is machined use a chemical fire extinguisher, one type of which goes under the title of DX powder).

Copper

Very good electrical conductor. Very expensive. Available in sheet, rod, tube and other forms. Before work of a forming or bending nature is attempted, the metal should be annealed by heating as uniformly as possible to a bright red heat, and air or water cooled. If considerable bending is required, especially on tube or thick sheet, this annealing should be repeated as soon as the metal begins to resist the bending action. In the annealed state copper bends very easily indeed.

Soldering is easy, but adhesive bonding can be troublesome. Non-corroding, but reacts with aluminium and zinc.

Brass

Good electrical conductor. Very expensive. Available in sheet, rod, tube and other forms. Soldering is easy, but like copper adhesive bonding is difficult.

For work involving bending or forming, the most suitable grade is Ductile Brass.

For panels and non-formed parts, the Half-Hard and Engraving Brasses are adequate.

Can be annealed like copper, though some care is necessary as brass is nearing its melting point if heated to bright red.

Non-corroding, but reacts with aluminium and zinc.

Tin Plate

Good electrical conductor. Cheap, and available in sheet form around 0·020 in thick. Soldering, adhesive bonding bending and machining are easy.

Non corroding under normal conditions. Cut edges should be re-tinned with solder if the full benefits of non-corroding properties are required.

Steel

An electrical conductor. Cheap, and available in numerous forms, and qualities. Most sheet forms commonly available will bend, solder and machine easily. Unless plated or well painted, corrosion is a problem. For outdoor use galvanizing is perhaps the best form of protection.

* * *

All the above metals work-harden. That is, if repeatedly bent and straightened at the same point they will break. In the case of copper, brass and steel, annealing removes the effects of work hardening. Aluminium and alloys can be annealed, but this is a specialised process, normally outside the range of the home workshop.

Where copper and brass have to come into good electrical contact with aluminium, they can be tinned with solder, along the contacting face of the copper or brass.

So much for metals. If further information on these or other types is required, a useful book is *Metals* published by Product Journals Limited.

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PLASTICS

Laminates

Various base metals such as paper, cotton, glass, asbestos and others are bonded together by selected resins. The combination of the resin and the base fabrics produce laminates for many applications. Readily available forms are sheet, rod and tube. They cannot be formed, though certain shapes can be laminated to order, when the quantities etc. warrant. Normal machining is possible, particularly if attention is paid to the lay of the base material. Drilled and/or tapped holes should be arranged so that they go through at right angles to, and not in the same plane as the laminations.

Most laminates are water absorbent to some varying degree. Where components made from this material are exposed to wet conditions and are expected to insulate, the glass or nylon fabric based laminates should be preferred. Similarly for applications where the dielectric properties are important (vhf converters, etc). The normal heat generated by valves will not harm these laminates. Where higher temperatures are encountered (150–300°C), the glass or asbestos fabric bases should be used.

Costs range from cheap for the paper and cotton bases, to expensive for the nylon and glass base. (The Nylon based laminates are not readily available in this country to date.)

Acrylics (Perspex)

Commonly available in clear or coloured sheet, rod or tube and may be encountered as injection or vacuum mouldings.

May be formed by heating, but not with a flame as this plastic is combustible and gives off toxic fumes if burnt. If placed in a pan of water and simmered, or in the oven—XYL permitting—at around 200°F, the plastic softens and can be formed easily. Stop forming and reheat the moment hardening is felt.

Bonding can be done with ease and success. A suitable glue can be made by mixing acrylic filings or small chippings with trichlorethylene, to the required consistence. This form of glue is also useful for securing coils or waterproofing aerials, traps, etc. *Warning*—trichlorethylene fumes are highly toxic. Use only in the open air. Do *NOT* inhale the fumes, nor smoke whilst using this chemical, or the glue made with it.

The polishing of cut edges, or scratch marks can be done by sequentially filing, emerying (using first the medium grade and working down to the Crocus paper grade) and finishing off with a mixture of metal polish and Vim, the proportions of which are reduced until the final polish is achieved with metal polish alone. Commercial polishing compounds are available.

When drilling, sawing or filing, ensure that the work is adequately supported, as these plastics are not flexible and can shatter or crack very easily. It is important also to use a slow speed drill, perhaps with paraffin lubricant, to avoid heating and melting the Perspex. Where holes are used in such a manner as to put the plastic under a tensile or pulling load, it is advisable to chamfer or radius the edges of the holes on both sides. Most sheet forms are supplied covered with protective paper and it should be cut, drilled and filed with this left in place.

Do not use in direct contact with valves and lamps.

Cost medium to expensive.

Epoxides

This covers a group of medium to expensively priced heat setting resins, which can be used for bonding, surface coating, laminating or encapsulation. Whatever the application the makers' instructions should be meticulously followed, or failure is certain. Encapsulation can be carried out very easily, at home, by using what is termed the cold setting or working types of resins. The biggest hazard in home encapsulation is air bubbles (the professionals do their encapsulating under vacuum), but this hazard can be minimized by warming the work and the resin to around 100°F and providing a generous shrinkage allowance, with a large pouring area, which can be cut off from the dried encapsulation.

Surface coatings can be applied by dipping, spraying or brushing. The resins for this type of work want to be flexibilized and in this state they are ideal for protecting beams, traps, etc.

Laminating kits are available, and do not really warrant detailed description. The same goes for bonding resins with the exception of three general rules.

1. Thoroughly degrease, for even finger marks impair bonding.
2. Roughen the joint faces with a file or scratch card.
3. No joints under a peeling type of load.

Most of the disappointed users of epoxy adhesives can usually attribute failure to the non-observance of the above rules.

General

All the above mentioned plastics are electrical and thermal insulators. The degree of insulation can be considered as very good for most amateur purposes. PVC, PTFE and other plastics may be encountered, but only those so far commonly available and easily worked have been listed here.

For further information a useful book is *Plastics*, published by Product Journals Limited.

Tools required by the Radio Amateur

Any tool purchased with reliable use in mind should be the best that the XYL and the bank manager can afford. Bazaar type tools, especially those used for measurement, are a last resort.

Most amateurs have a shack, room or some place with a bench and a vice of one type or another. Accepting these, the range and type of useful tools available is virtually limitless, unlike most pockets. Basic tools and a few useful extras will therefore be listed here.

Soldering Irons—15 watt Instrument
50 watt Electricians and a
200 watt Heavy Duty

Electrician's pliers, side cutters, watchmaker's shears, long nosed pliers with and without grooved ends, *4 oz ball pein hammer, 4 oz or 8 oz soft faced hammer. Twist drills* in high speed steel (*not carbon steel*) in at least fractional sizes from $\frac{1}{16}$ in to $\frac{3}{8}$ in diameter. *Hand or electric drill*—a drilling stand of the DIY drill kits is a valuable addition. The drill chuck capacity should at least match the range of drills on hand. *Large and small hacksaw* with blades (24 or 32 teeth per inch hand blades preferred)—a recent hacksawing addition is the type known as the "automatic or endless hacksaw." This is a combination of a pad and jig saw; the saw can be used for sawing large sheets as it has no frame to interfere. *Screw-*

drivers—4 in insulated plus *6 in* or *8 in electricians*. An instrument maker's set is also very useful.

Spanners—box and open ended types—in at least the BA sizes.

Hexagon socket screw wrenches—at least BA range.

Files and handles—6 in second cut. Hand, half-round, round and *three square*, also the same shapes in *round handle needle files*.

Surform or similar type of file or plane.

Repairman's reamer.

Next a few extras, which for the serious or struggling constructor can help considerably to reduce the time spent "chassis bashing" and improve the quality of the work.

Bending bars with or without radius bending attachment—Fig. 1. These will have to be a home-made item, and the things to check when acquiring the steel angle are its straightness and squareness. If either of these are not up to much the corrective actions will require skills which may be beyond those so far acquired. A milling or surface grinding machinist is a good friend to have in these circumstances. Surprisingly enough, old bed frame angle, provided it hasn't rusted too badly, usually makes very good bending bars. The length and the distance between the clamping bolts of the bars governs two things. First is the maximum width of metal or other material bought. Anyone who has tried cutting a 6 ft × 4 ft sheet of aluminium will know the difficulties. The answer here is, if buying materials in these sort of quantities, have them guillotined or sawn to a width which will fit in between the bending bar clamp bolts. The length of sheet won't matter. Second is the maximum size of chassis or cabinet which can be produced.

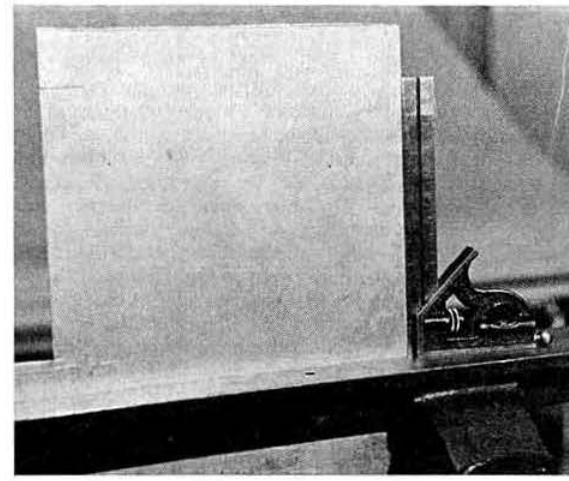


Fig 2. Combination square used for squaring-up prior to bending or cutting.

difficult to classify tools in order of usefulness, but these will, or should, be the most used.

Engineer's combination square—Fig 2.

Various types and sizes are available. The type with the 12 in rule and square head only is preferred from the usefulness to cost viewpoint. Ensure that the combination square purchased is *not* of the Pattern Makers' type, otherwise measure-

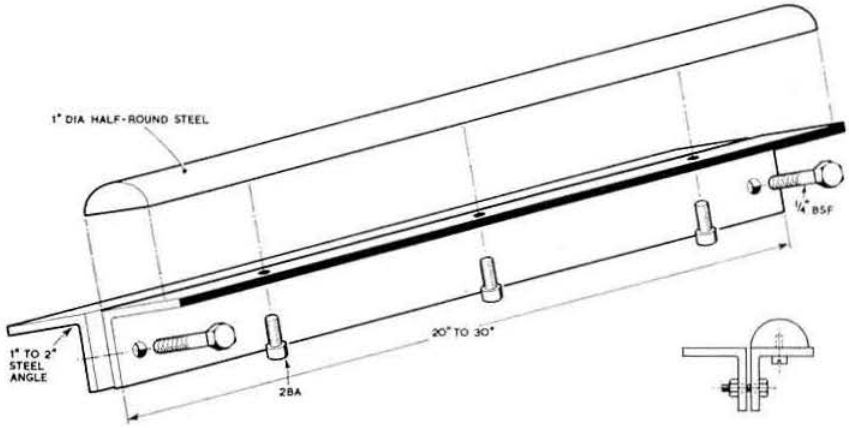


Fig 1. Bending bars with a radius bend attachment.

Tool-maker's clamps. These are available in several sizes. Two 3 in clamps are preferable for most amateur purposes. These clamps should not be confused with the Joiners' "C" or "G" types.

Chassis screw-up punches or hole saws—$\frac{1}{2}$ in to $1\frac{1}{4}$ in diam in $\frac{1}{4}$ in steps. These can now be replaced by a stepped drill which is made especially for drilling sheet up to $\frac{1}{4}$ in thick. These drills cover a range of sizes—one type will drill holes in $\frac{1}{16}$ in steps from $\frac{1}{4}$ in to $1\frac{1}{4}$ in diam on one drill. They are expensive—around £8—but good value when compared with cost of the same range of Punches or Saws.

Lastly, the measuring and marking out tools. It is very

ments will become very confusing indeed. To check, place a known standard 1 in graduated rule alongside the combination square rule 1 in graduations. If they match over the full 12 in all is well. Most combination squares are supplied with a scriber which fits into a hole on the square head, so it really is 4 tools in one. (Fig 4).

4 in or 6 *in spring dividers*.

4 in or 6 *in Jenny calipers*—the type with the positive register shoulder is preferred.

Automatic centre punch.

This is a formidable list of tools, and if buying from scratch will be very costly. A retiring fitter or toolmaker often sells

off his tool kit, and many good but used tools can be obtained at a reasonable price. Some tool shops run a " tool club " primarily intended for the young impecunious apprentices. Whichever way they are acquired, these tools are a must, if pleasurable and successful " chassis bashing " is the aim.

How to use these tools!

Hole drilling is straightforward, but often on thin sheet the holes produced are anything but round. In these circumstances drill the hole undersize and ream. This will produce a round hole, and provided the reamer has been allowed to cut without being forced, the edges of the hole will be burr free. The use of a large drill for hole deburring is not recommended on the softer metals, unless the " touch " for this method has been acquired. A countersink or rose-bit is more suitable as they have more cutting edges than a drill and do not " dig in."

Always centre-pop the hole position before drilling.

Filing is an art which can only be acquired by practice. General rules are:

(i) Always use a handle with the file. This eliminates the possibility of running a file tang into the wrist, and enables the file to be properly guided.

(ii) Use a sharp file. (Use new files first on only the softer metals such as brass and aluminium and as their sharpness wears off use them for filing steel and harder metals).

(iii) Do not force the file to cut. Only a light and relaxed pressure is required which also aids the accuracy of filing.

(iv) Keep the file clean by brushing with a file card or by rubbing a piece of soft brass or copper along the teeth grooves.

When bending or forming sheet metal never use the hammer directly on the metal. Either use a soft faced hammer or a block of wood to act as a buffer for the hammer blows. This will stop all those humps and hollows along the bends. (Fig 3).

When three sides are formed by bending, the point of intersection of the bend lines should be drilled, before bending, with a hole diameter of between two and four times the thickness of the metal. This prevents corner bulge. (Fig 4).

Tube bending for beams, tuned lines, etc. need not be difficult, and flattening or kinking can be avoided by observing the following:

(i). Ensure the tube is suitable for bending. In the case of copper and brass this means annealing as previously mentioned. For aluminium/alloy carry out a sample bend on an unwanted piece of the tube.

(ii). Unless skilled or equipped with specialized tooling, do not attempt to bend to a radius of less than three times the tube outside diameter, e.g. $\frac{1}{2}$ in o.d. tube—$1\frac{1}{2}$ in minimum bend radius.

(iii). Always bend round a former shaped to the required radius.

(iv). Pack the tube with fine sand and cork both ends. This will minimize the risk of kinking during bending. The sand can be washed out afterwards.

Cutting long strips of metal with tin snips or shears is an expert's job. The cut edges usually produced by non-experts are anything but straight and they require flattening

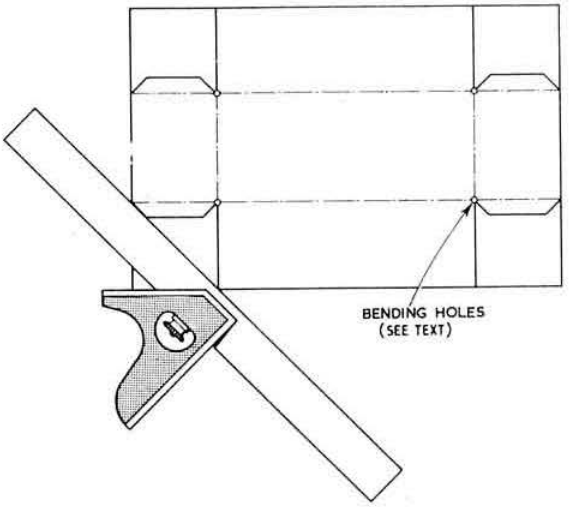


Fig 4. Marking out a box on sheet metal using a combination square.

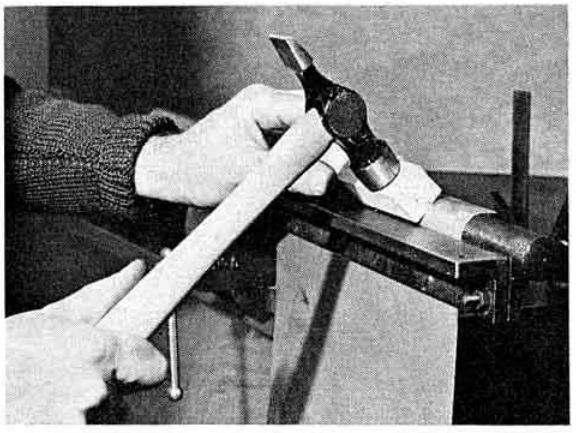


Fig 3. Buffer for hammering the bends.

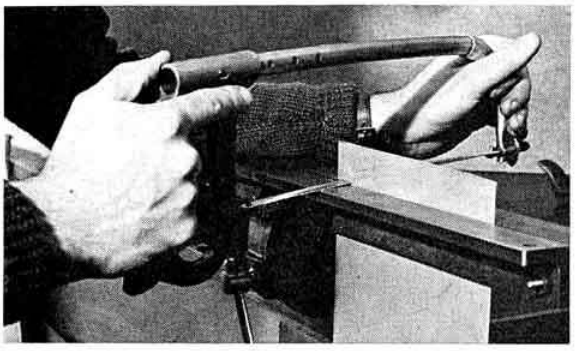


Fig 5. Bending bars used as a guide for sawing.

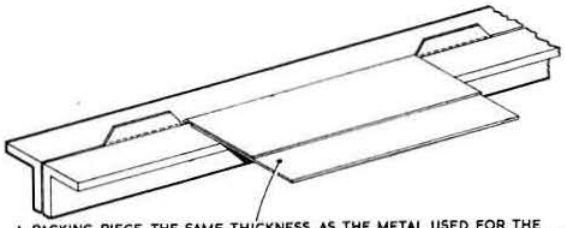


Fig 6. A packing piece the same thickness as the metal used for the box ensures that lugs, when bent, will fit into box ends.

to remove the cutting curl. Tin snips are best used where a one-snip cut will remove the required amount of metal, such as 45° corners, or the trimming to length of narrow strips. Laminates and plastics should always be sawn. The use of bending bars as a guide for cutting and filing are shown in Figs 5 and 9.

Large cut-outs for dials etc can be made in at least two ways, both simple and well within the range of the home workshop technician.

(i). Drill contiguous holes of around $\frac{1}{4}$ in diam. on the waste side of the hole and about $\frac{1}{16}$ in to $\frac{1}{8}$ in away from the finished size markings. Knock out the waste and file to size, using the bending bars as a guide for the straight portions. This method can be used for the large round meter holes, but the filing of round holes though not difficult requires patience, and a half-round file,

(ii). Drill holes at the corners and using a saw file (Abrafile) saw out the waste, leaving about $\frac{1}{32}$ in all round for trimming by filing. Again the bending bars can be used as a guide, but care should be taken to ensure that the saw file does not cut them.

Large round holes can also be made using a tank or washer cutter. The biggest snag with this method is obtaining an even cut around the full circle. With hand drilling this is almost impossible, but by clamping the work onto a block of wood and drilling through the work into the wood with the centre pilot drill of the cutter, a guide is provided which improves things a little. Machine drilling requires the slowest speed possible (no more than 500 rpm).

The de-burring of large holes can be awkward, particularly on existing panels where the finish wants to be left as intact as possible. The small half-round needle file enables this to be done easily. The file is used in the " draw " fashion. That is both ends of the file are held and the file is drawn round the edges to be de-burred, in a similar manner to a spokeshave, so producing a small chamfer.

Before any drilling, filing or bending can be attempted, the

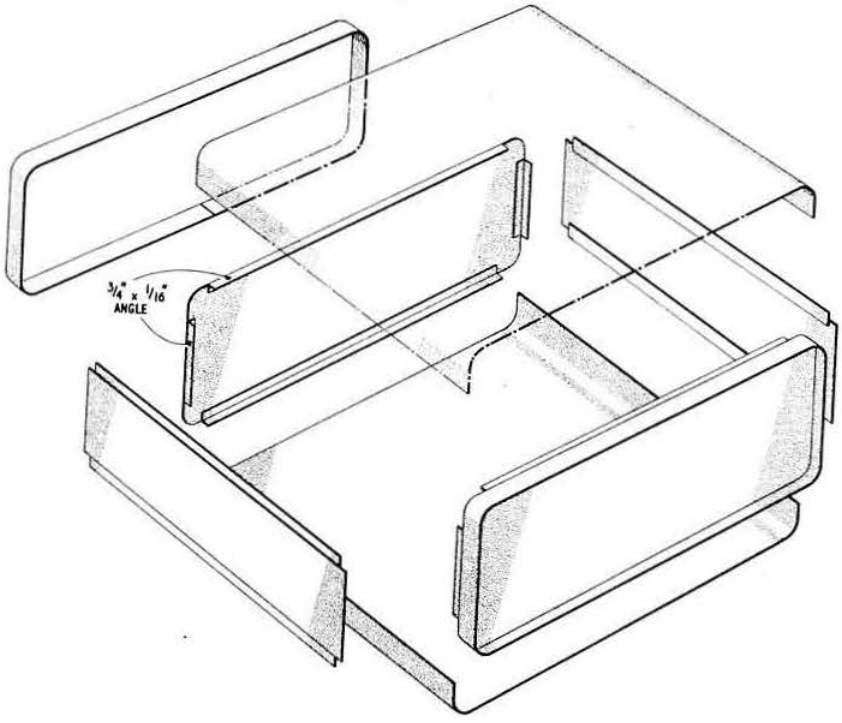


Fig 7. Cabinet design suitable for home construction.

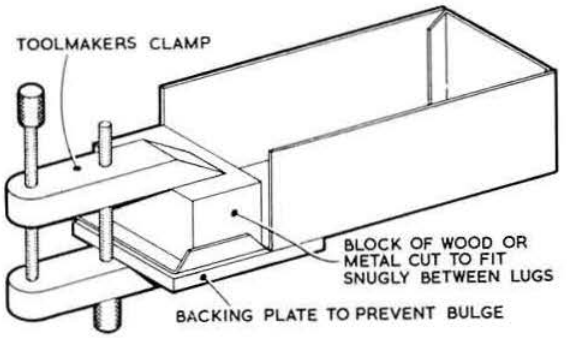


Fig 8. Using a toolmaker's clamp to position the bending block when forming the last side of a box.

work must be marked out. The accuracy with which this is done governs the future results, so great care is necessary and worthwhile. Measurements and squareness checks should be made from one or two datum edges. Consider marking out the sheet for the box shown in Fig 4. The first operation is to obtain two edges straight and at right angles to each other. The method of doing this should be clear from the illustrations. These two edges are now the datum edges for vertical and horizontal measurements. The overall size of the sheet is marked out and cut to size. This results in a sheet with all corners square and all edges straight. In this case the box sides are to be the same depth; therefore adjust the Jenny calipers to the required measurement and locating from each edge in turn scribe round the sheet. Check with the combination square from the datum edges, that these lines are parallel to their respective edges. If no Jenny calipers, the combination square can be used by setting the rule to the required measurement and scribing round the sheet with a scriber held against the end of the rule. If the box is now bent to these lines the sides will all be the same depth, and if the squareness of the sheet was originally right the bottom or width of the box will be true, with sides parallel and ends square. The illustrations for the remainder of the box marking out and bending are self-explanatory.

Existing chassis or panels should be similarly marked out using the datum edges. If a truly square corner is not available, then use only the longest and straightest side as a datum, and the end of the Combination Square rule to mark out the right angle lines. A line at right angles to this single datum edge can be used to mark off the measurements in this plane.

Hole centres should be scribed in and it is worthwhile to scribe each hole diameter around its centre. This helps in ensuring that the right size hole is drilled, and in checking that holes do not foul. When screw-up chassis punches are used these scribed diameters can be used to accurately locate the punch.

When a gleaming polished chassis is purchased, marking out directly on to it will spoil the finish, so obtain a piece of draughting film and mark out on this in pencil. Using draughting tape, stick the film on to the chassis and centre pop through the hole positions and around the outline of any cut outs. After removing the film scribe in the hole diameters and join up the cut out outline dots.

Fixing holes for meters, IFT's, etc should be carefully measured and these measurements transferred to the work. In these cases, where holes or cut-outs are related to each other and not to some other edge of the chassis or panel, a vertical and horizontal datum for these holes alone should be used. In the event of repeat sets of holes occurring it is often worthwhile to make up a metal drilling template on to which is clearly marked the location datum lines (eg The centre of the slug adjusting hole for ift's, or the relay clamp screw for GPO type relays). These lines can then be matched up with those marked out on the chassis and the template clamped in place ready for drilling. Clearly mark the viewed side of the template. This will minimize the risk of using it the wrong way round. The centres of holes of the same diameter can be found by simply measuring from the inside edge of one hole to the outside edge of the other.

The adage " cut once measure twice " when applied saves a lot of cussing.

The cabinet construction shown in Fig 7 is very simple to make, and looks very professional. The front and rear panels are made as a pair, and similarly for the sides. It is advisable to screw these panels to the angle pieces, which allows easy removal should a change of layout be required. Cadmium-plated self-tapping screws of the Pan-head type can be used with very satisfactory results. The bending bars with radius attachment are essential for the making of the top and bottom covers, which will usually be made from perforated metal.

The edging strips are best made from $\frac{3}{32}$ in or $\frac{1}{8}$ in thick metal, and the radius corners also require the radius attachment of the bending bars. The joint of each edging strip can be made simply by overlapping, marking off and sawing to give a butt joint. If this is too difficult the edging strips can be left off along the bottom edges.

Chassis panels are mounted on angle fastened to the front, back or side panels, of the cabinet. All the angle pieces can be extruded section, or made from strip bent to suit. From the appearance viewpoint with this form of cabinet the front profile requires that the height be about half the width (6 in height—12 in or 13 in width). The top or bottom profile looks good in perforated metal with a depth to width ratio of one to one. One other feature is that of matching appearance. Mother receiver and Father transmitter look radiant when surrounded with obviously their family of SWR Meter, Keyer, PSU, etc.

FINISHING

Having built the equipment the urge to use it may be so great that there is no time to finish it off. This is a shame, because the finish affects the appearance, which in turn adds or subtracts from the pleasure of home-made equipment. The time spent on construction may be considerable but that spent on finishing is undoubtedly the most rewarding.

Painting is probably the most common form of finish used. The combination of two or more colours can enhance the equipment. The choice is limitless and most amateurs try to adopt some standard colour scheme. Brush painting very rarely gives a good surface and a considerable amount of elbow grease is required to burnish this form of painting into anything like a smooth finish. Brush applied hammer or crinkle finish paints are pleasing, but this type of finish is unsuitable for the larger front panels of, say, receivers or transmitters where a monotone finish looks far superior.

Spray painting is now within the realms of the home constructor, particularly with the aerosol paints. These are expensive in themselves but the cost of paint per square inch is reasonable. A few practice runs on an unwanted piece of metal, enable the technique of spray painting to be quickly acquired. The spraying of corners sometimes gives trouble, and the paint may splodge. The technique here is to spray each corner face in turn, masking off the other faces, which may or may not be freshly painted, by holding a piece of cardboard in the path of the unwanted spray.

For the painting of panels another useful and easily applied method is spin-coating. The panel is spun at about 50 to 100 rpm and the paint is poured onto the centre. This immediately flows outwards and a very thin and even film of paint is deposited on the panel. Paint flies off so ensure that this operation is carried out somewhere that cannot be spoilt by blobs of paint.

The face plate of the DIY drill kits can be held in the chuck of a hand drill, which in turn is held upright in a vice, and the panel can be stuck to this plate with double-sided adhesive tape, to provide one method of obtaining the spin. Another method is to use an old gramophone turntable and motor. The top speed of these is about right for good coating.

When cellulose lacquers are applied by this method the coating is usually dry by the time the spinning has stopped.

This spin method of coating is also very good for the application of Photo Resists, when making printed circuits.

Before any painting can be done, the surfaces should be suitably prepared. The resultant ease of obtaining a smooth finish depends on the quality of the unpainted surface and the methods of preparation.

The first essential is to ensure the surface is burr free and smooth. Any scratch marks should be smoothed out or after priming filled in with one of the proprietary fillers, and this should be thoroughly blended in to leave a smooth flat surface. It is essential to degrease thoroughly the surface prior to painting. A very effective surface peparation is to wash and scrub the panels etc. with hot water, cleaning powder and wire wool. This results in a very smooth surface which is also grease free.

Surfaces can also be prepared and sometimes finished by etching. As most of the substances used for this technique are dangerous to handle this method is not recommended, particularly in the home workshop over-run with young harmonics. For copper, brass, steel and aluminium, a solution of ferric chloride will etch to produce a reasonable surface. The previously mentioned surface degreasing and scrubbing should be carried out prior to etching. The juice from stewed rhubarb cleans aluminium a treat and, apart from the No 9's effect, is not harmful.

The next step in the painting of metals is priming. For steels use the oxide primers, to suit the type of paint that will be used for the finish. For aluminium-alloys the etch type primers should be used, particularly on parts subject to flexing. It is sacrilege to paint brass or copper, but if unavoidable the priming can be done using the undercoat paints: do not use any of the zinc or aluminium based primers.

After priming and when the work has thoroughly dried, a light rub down with very fine wet and dry paper or pummice powder and water will smooth off ready for the under or finishing coats.

With modern paints the use of undercoats is not really necessary, as their function is primarily to ensure the colour coverage and most top or finishing paints will cover and colour anyway.

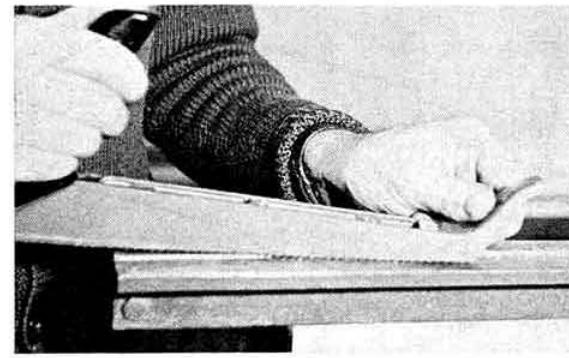


Fig 9. Bending bars used as a guide for filing. The Surform type file is ideal for most materials, as it will cut these and not the bending bars.

There are so many types of paints to choose from that a little personal experimenting is advisable. Most paint manufacturers will supply literature on their products on request. A few types are listed below.

Acrylic and alkyd paints—good gloss; flexible; durable; suitable for metal protection and decoration; reasonably priced.

Bituminous paints—useful and cheap; suitable for protection of masts and other outdoor metalwork; usually black semi-gloss finish.

Cellulose lacquers—reasonably priced; quick drying with high gloss which can be improved by polishing; available in aerosol cans. Preferred because of its general ease of use and quality of finish. The fast drying properties considerably reduce the risk of dust marred work.

Polyurethane paints—high gloss hard abrasion resistant finish; reasonably priced; sometimes difficult to apply.

Stoving paints—usually of the acrylic or alkyd types which rely on stoving to complete the chemical changes of drying. The resultant finishes are hard, durable and can be very glossy.

The number of coats of paint and method of application is entirely a matter of choice, but all painting should be carried out in a warm, dry and as dust free as possible, atmosphere. If the painted work can be popped in an oven at around 180°F drying will be greatly assisted. Don't put the work in with the weekend joint, as the fat from this ruins the finish and the meat doesn't taste too good either.

Decorative laminates and thin self adhesive plastic sheets (i.e. Fablon, Contact, etc) can be used to good effect for the front panels of receivers and transmitters. They should all be backed with a metal panel to give adequate support and good rf screening or electrical contact. The laminates can be glued or screwed to the metal backing panel. On some designs it is possible to utilize the dial, potentiometer or switch fasteners to secure the laminate facing. If subsequent modifications are likely this last method of fixing is probably the best.

The self adhesive plastic sheets are relatively cheap and easy to use. Their one drawback is that of shrinkage with age.

This can be minimized by heating the panel to which the plastic is to be applied to a temperature of around 140°F (just too hot to hold with comfort) and then in this condition apply the plastic sheet. A generous overlap should be left, $\frac{1}{2}$ in to $\frac{3}{4}$ in all round, and the now faced panel should be clamped between two sheets of blockboard or similar and allowed to cool before trimming the facing to size. The trimming is easily done using a sharp modelling knife and experience suggests that the folding over of the plastic sheet, in an attempt to cover the panel edges, is inadvisable.

Self adhesive coloured and chrome tapes can be used to line in features of the panel or cabinet. There is a strong tendency, due to the ease of application, to overdo this and finish up with something that looks like a cross between a juke box and an " auto " radiator grill.

Lettering panel work used to be a problem. Machine engraving is undoubtedly the best way of doing this, but at today's prices it is prohibitive. The stamping or the hand held vibro engraving techniques, usually leave much to be desired. Engraving by hand is fascinating to watch but the men who can do this today are very few.

The wet slide-on transfers are effective but are fast being replaced by the self-adhesive, rub on type of lettering, such as Letraset, Letterpress and others. These are so easy to use and completely effective that the initial expense of buying the lettering sheets is not worth considering. The type faces available are extensive and it is advisable to choose one style and stick to this. Variations of signal importance can be made by using upper and lower case and different point size of the same style characters. Most of the type styles are available in black or white and this should cover most requirements.

Unfortunately these letters can be easily rubbed off, therefore a protective covering of some kind is required. The completely lettered panel can be coated with a clear lacquer. This lacquer may react with the surface of application, so a little test beforehand will save a lot of trouble.

Another method is to cover the panel with a self adhesive plastic sheet. This has the same drawback as previously mentioned, shrinkage, and one other: being self adhesive it must be applied right first time as any attempt to peel off and start again will remove all the lettering.

The easiest protection is obtained by facing up with a thin ($\frac{1}{32}$ in to $\frac{1}{16}$ in thick) sheet of transparent perspex, held to the front panel by screws or the existing component fasteners.

Etch engraving is very effective but requires techniques which are not within the scope of this article. Those familiar with the production of printed circuits can utilize the experience gained from this for the making of etch engraved panels.

Self adhesive labels made on the hand operated lettering machines are a very useful way of marking controls, etc. but do not add much to the appearance of the equipment.

Dial calibrating is often a problem and can be tackled in many ways depending on the requirements and the dial used. Probably the best dial available today is the Eddystone 898. It is so expensive that good clear calibration is a must, and many a trembling hand has drawn back from attempting to mark the dial.

All preliminary marking should be made lightly in B or HB pencil, which for line work should be sharpened to a chisel point. The squareness of the lines can be obtained by using the combination square as a guide. When all is satisfactory inking-in can proceed. The now pencil marked surface should be thoroughly cleaned using " Pounce " or french chalk applied lightly with a soft duster. This will not rub off the pencil marks, but will allow splodge free inking. Using a draughtsman's lining pen, set to the correct width of line, and the combination square rule as a guide, ink in any horizontal lines. Allow this to dry thoroughly. Next proceed to ink in all vertical lines working from one side and doing every line as it occurs whether on different levels or not. To minimize the risk of line thickening at the finishing ends, work such that the line and the pen finish on one of the horizontal lines. If a mistake is made, dab the area dry with blotting paper and wipe off with a wet cloth; any slight smudges can be removed later with a rubber.

The ink for lining in should be good quality Indian suitable for paper. Colour inks can be used but greater care is necessary as these inks tend to run very easily. All figures and letters should be of the rub-on type, and applied as the manufacturer recommends. There is no need to protect these letters in this instance, as there is little likelihood of abrasion once the dial is in place.

Some dials are made of plastic and these are calibrated in the same manner, but using an ink of the acid etching type. This ink etches into the plastic and any errors should be wiped off immediately.

The lining pen should be filled very sparingly and a column of ink about $\frac{1}{8}$ in long from the tip is about the maximum amount, if blots are to be avoided. The pen should be wiped clean before each refill as any whiskers or dried ink will cause uneven line thickness or splodging.

Dials for GDO, Field Strength meters, etc. can be made by sticking white smooth surface paper on to a metal or plastic supporting plate (tobacco tin lids are ideal). Calibrate and letter as required, spray with a clear lacquer and a lasting job is produced.

Other finishes, such as chrome plating, colouring, anodizing, etc, which have to be carried out by an appropriate firm are well worthwhile but a few words of advice may be helpful.

Most finishing firms do not pre-polish or dress the work prior to finishing. With plating, the article will be plated as received, scratch marks and all. This is very disconcerting so ensure that all work for plating is highly polished and scratch free. A hard felt pad on the electric drill together with buffing compound cuts out the hard work. Fingers get a bit dirty but the work shines nicely.

Brass, copper and steel all polish easily. Aluminium is slightly more difficult as the metal tends to pick up on the polishing head and produce deep scratch marks. The risk of this happening is reduced by using oil with the buffing compound and ensuring that the metal being polished and the polishing wheel are kept cool. Aluminium is usually anodized and coloured, which does not necessitate a highly polished surface. To improve the finish on this material the contractor can be asked to carry out some form of etch treatment to improve the surface finish prior to anodizing or colouring.

All these finishes are expensive, but do provide corrosion protection as well as enhancing appearance.

DESIGN THOUGHTS

Initial planning of the home constructed project involves time, observation and experience. The more of each that can be devoted at this stage, the better the results are likely to be.

Truly experimental work will not by its very nature require a pretty pretty looking cabinet, and versatility of chassis or panel work are probably the most important hardware requirements. Modular type of construction is rapidly gaining favour and with it the chassis becomes nothing more than strip supports for boxes and PC Boards. The cabinet illustrated in Fig 7 is an ideal box for much of this type of work. When the experimenting has proved satisfactory or when a proven circuit is being made, and a permanent job is the aim, some thought should be devoted to the outward appearance of the finished project.

A considerable amount of time has been and is being devoted to finding out how to think a design. It should be possible to glean a few ideas from this effort and utilize it for the amateur.

One piece of terminology already mentioned in the pages of this journal is " Value Engineering." Similar terms have been devised to describe systems and methods by which the design processes can be rationalized. All these systems and methods can be related to the use of common sense combined with personal and other people's experience.

Most amateurs employ some degree of value engineering or analysis: a field strength meter with an Eddystone 898 dial is very nice, but is a waste of money and a good dial. Alternatively a KWM2 with a crank-up and tilt over tower supporting a TH6, which is fed by 9d a yard type of coax, is equally stupid. With today's high cost of components the value side of designing is very important even for one-off amateur jobs.

Design Optimisation is another of these expressions. Is it possible, at the design stage, to ensure that the design chosen is the right one? Are better ways available? If this valve base goes with Pin 1 to the south what will happen to the resistor coming in from the ht line?

Obviously the experienced constructor works out much of this sort of thing subconsciously.

For the novice this is the point where observation can be applied to great advantage. A notebook can be used to jot down the way so-and-so does this or that, and why, if this is possible. Eventually a store of useful knowledge is collected and combined experience can be utilized. It is not suggested that this should be the sole duty, but in the same way that knowledge is gained on the radio and operating sides so it should with design, and the idea is to gain as much experience as possible in the shortest time.

At the design stage a list of fors and againsts could be made of various layouts. Eventually the finalised layout will in all probability look nothing like the first one, but will be a combination of the best points of each. Anyone who has tried to make a printed circuit board from a schematic circuit diagram of something involving six or more transistors and their associated bits and pieces will know this layout design technique.

The chance to study commercial equipment should never be passed by. It is amazing what the professionals seem to get away with, and the thinking out of how it's done adds greatly to the funds of knowledge.

Lastly is the artistic side of design. The professional types responsible for this are usually titled Industrial Designers, and they like to be in on the design at any stage but the last. One of their functions of design is to ensure that it has functional as well as aesthetic appeal.

The functional side can be evaluated very easily for home-made gear. Consider a receiver design and list, in order of preference, what functions (knobs, switches, dials, etc) are required to appear on the front panels. The list may finish up like this:

(i) Dial (iv) S-Meter (vii) AF Gain
(ii) Tuning (v) RF Gain (viii) Selectivity Control/s
(iii) Bandset (vi) Phone's Socket (iv) AGC On Off
and so on.

This forms the basis for the panel layout. In this instance if the design has fulfilled its intent, when looking at the receiver the first thing noticed should be the dial, the next thing the tuning, and so on. A rough sketch, to size if possible, can be made of this before work commences, and tried on a few friends (the XYL is usually a biased judge of these matters) to see if the desired effect has been achieved.

Most commercial firms producing amateur equipment employ such techniques and their " styling " can be scrutinized to decide what each considered important.

KW Electronics, if they will permit a mention, produce some very interesting examples of styling. A look at their earlier products through to the latest " Atlanta " will more than illustrate this point.

Many insignificant features of a front panel can be brought into prominence, if required, by the use of colour or by the size of lettering used to indicate its function. The techniques of doing this are very difficult to apply and great care has to be exercised if the " juke box " effect is to be avoided. For a trial run of this technique, limit the colour or tone changes to a maximum of 3, and leave the letter size changes out altogether. Areas of functions can be outlined in chrome or coloured self adhesive strip.

The dial is usually the significant feature and the use of multi-colours on this should be treated with very great care indeed, or avoided completely.

Wherever possible stick to one style of knob and switch. The functional importance of these can be brought out by using various sizes of the same general pattern. Communication equipment ought to have business-like controls, and the use of the domestic radio type knobs just doesn't look right.

Electronic equipment styles change very much like dress fashions. This leaves plenty of scope for the amateur to try some " way out " designs, the results of which would be interesting to see. Maybe, like past dress fashions, the old polished mahogany box with lift up lid and a $\frac{3}{8}$ in thick ebonite panel concealing a wonderful bread board layout, will return. Perhaps someone will then write an article on Joinery and Wood Polishing for the Radio Amateur.

Some items and their manufacturers:

Epoxy Resins

C.I.B.A. (ARL) Ltd., Duxford, Cambridge.
Shell Chemicals U.K. Ltd., Shell Centre, Downstream Building, SE1.

Laminates

Tufnol Ltd., Perry Barr, Birmingham, 22B.
Bakelite Xylonite Ltd., 12–18 Grosvenor Gardens, SW1.

Draughting Film, inks and pounce

G.A.F. (G.B.) Ltd., Stourton House, Dacre St., SW1.
Admel International Ltd., Dacre Works, Brooklands Road, Weybridge, Surrey.

President on the Move

★ ★ ★

ONE of the major tasks of the Society's President in his year of office involves a "time and motion" problem—finding the time to visit clubs and functions and getting there by the best available means. This year's President John Swinnerton is finding such demands on his time are pleasant—if exacting—and reckons that by the end of the year his travels will total not less than thirteen thousand miles!

The longest trip was to meet ARRL officials in the USA and Canada to discuss problems of mutual interest—at no cost to the Society, since it was combined with a vacation trip, and transport was provided by RSGB member K2UYG. The welcome accorded the President and his wife left no doubt that our Society is held in high esteem by our friends over there.

An account of the Region 14 ORM has already appeared in these columns: this involved a round trip by train of over 800 miles. Back to the car again for two more "up country" trips—the first to the Chester and District Club's Annual Dinner and a meeting with Region 1 Representative Basil O'Brien, G2AMV. The second journey involved a unique occasion—few places can manage to celebrate a 700th Anniversary. Yet Stratford-upon-Avon did just this—the establishment of the Guild of the Holy Cross in 1269; one of the earliest bodies for local government in the country. Here the President opened the local Club's Exhibition Station GB3SUA in the presence of the Mayor and local dignitaries of the borough. A highly organised event in brilliant weather.

For his next trip John left his car at home and went by air to the Channel Islands; the first time that a President has visited the Islands during his year of office. First stop Guernsey, where the local club was visited and the hospitality enjoyed of Bert Crousaz, GC3ODE, the Affiliated Society Representative. Here was a publicity "build-up" in the local press that many societies would envy, and an evening with club members dealing with local problems and RSGB affairs. On to Jersey by the inter-island "diddy plane"—a highly efficient nine-seater "Islander" similar to those which do such good work in the Western Isles of Scotland. Not to be outdone publicity-wise, Jersey PRO Bert Chater, GC2LU had *Channel TV* in waiting as well as the battery of press cameras: the arrival was duly screened and fully covered in the local press. There must be few people in the Channel Isles who have not heard of RSGB, thanks to the excellent publicity efforts of both clubs. Each has a club-room that would be the envy of "mainlanders"—why not go and see for yourself? You can buy gin for as little as 16s. a bottle, and cultivate a smoker's cough with the best cigarettes at 2s. 1d. for 20. And if you want to operate /A there's the advantage of a rare prefix thrown in!

By the way, does anyone know what's happened to the President?

New Products

Remote Aerial Switching

The model *TS-4 Tenna Switch* is a remote switching system which allows up to four separate remotely positioned aerials to be fed from a transmitter through a single feeder. Both sides of the transmission line are switched ensuring complete isolation and current is drawn only during the switching cycle which allows the use of lightweight control cable. A five wire cable is required to switch four bands. The remote unit is of course completely weatherproof and is capable of handling the full legal input on ssb or am. The cost of this switch is £12 post paid, a large proportion of which could be immediately saved by the economy in feeder cable. Available from Western Electronics, 24 Hook St., Hook, Swindon, Wilts.

Aerial Rotators

Two rotators of German manufacture under the trade name of *Stolle* are marketed by *J. Beam Engineering Ltd.* of Rothersthorpe Crescent, Northampton. These are the types 2010 and 3001 suitable for 110V and 220V supplies. The drive units are similar in both models and the indicator unit in the type 2010 is of the transistorized automatic pattern whilst the type 3001 employs manual selection. The drive units embody the usual features of magnetic disc brake, overtravel stop and rotation speed of one revolution in 50 seconds. The carrying capacity of the unit is 25 kg and a support accessory is available as an optional extra. The price of the 3001 is £14 10s and of the 2010, £18 10s. Further details are given on a descriptive leaflet obtainable from J. Beam Engineering Ltd.

Mobile Aerial

Of particular interest to those mobile operators not wishing to drill fixing holes in their vehicles is the *Type MA VHF R|T Aerial* produced by R.C.C. Communication Equipment Ltd. of Crewkerne, Somerset. This is a ¼ wave stainless steel whip aerial intended for use on vehicles with metallic roofs. The unit is weatherproof and has been tested in excess of normal road speeds. The frequency range is 68 to 178 MHz and feedpoint impedance is 50 ohms. The power rating is 50 watts maximum and the aerial is supplied with twelve feet of UR76 coaxial feeder.

Is this a Record?

Robert Ellis, of Llandaff near Cardiff, recently passed the RAE and a month later the Morse test. At first sight there is nothing unusual in this, until it is realized that his age on passing the RAE was 13½ years. He cannot be issued with his own call-sign until November, when he reaches the age of 14. In the meantime he has been granted a certificate of competence by the Post Office which allows him to operate any licensed station under the supervision of the owner.

Although too young to be officially admitted to the RAE Class at Barry College of Further Education, it was arranged by the Regional Representative, through the kindness of Mr Dan Adams, GW3VBP, that he should attend the classes on an unofficial basis. The results speak adequately both for Robert and the quality of the course.

GW8NP

It Clangeth Again!

From Members' Wanted Ads, September issue. Quote: "HP 13 G31FU, QTHR. (*We like ads like this—Ed*)," You do? It'd help if he was listed in the Call Book!

G3MQI

The call-sign should read G61FV (W. P. Lewis, 57 Nicholls Lane, Winterbourne, Bristol)—Ed.

"Of course it's caused some sacrifices to buy this rig . . . "

An Add-on Product Detector for a Transistor Receiver

Transistor radios for " entertainment " use are now available so cheaply that they are an attractive starting point for an amateur band receiver. In building a 160/80m receiver as a companion to his Top Band transmitter, G3SBA used a surplus Perdio receiver printed circuit board with modified tuning coils and capacitor. To allow the reception of cw and ssb signals with the minimum of modification an unusual product detector was selected, and has proved entirely satisfactory.

By R. C. MARSHALL, MA, MIEE, G3SBA*

PRODUCT Detector is one of several names used for the same circuit function. Similar circuits appear in carrier telephony as " balanced modulators," in servosystems as " phase sensitive rectifiers," and in low-level dc amplifiers as " choppers " or " synchronous rectifiers." The half-wave chopper as used in dc amplifiers can be used to adapt for ssb the 455 kHz am detector circuit shown in Fig. 1, without

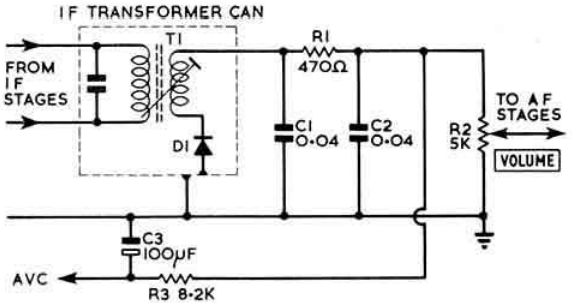


Fig 1. Detector circuit before modification.

major modification of the printed circuit. In this common am detector, where the diode goes between the if transformer secondary and common, the diode is simply replaced by an inverted transistor switched on and off by the bfo, as shown in Fig. 2. It connects the rf signal to the output during alternate half cycles of the local oscillator output. When reception of am is required the base-emitter junction of the transistor is used as a diode by earthing its base. An npn transistor is necessary to give the required agc polarity on am and germanium is preferred because of the low signal level. Lastly, good switching performance is required. The transistor was fitted inside the ift can, in place of the original diode, because fortunately there was a spare pin available to bring out its base connection. An additional rectifier circuit D2, C4 is required in the agc line, as on ssb the detector output goes both positive and negative. This completes the changes to the main printed circuit board; a piece of screened lead connects the detector base to the am/ssb switch and thence to the bfo, as shown in Fig. 3.

Continued on page 706

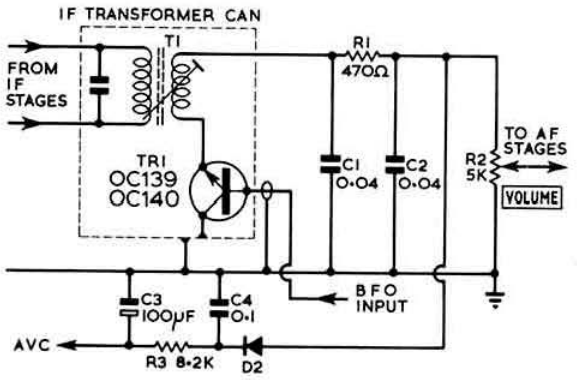


Fig 2. The new detector circuit.

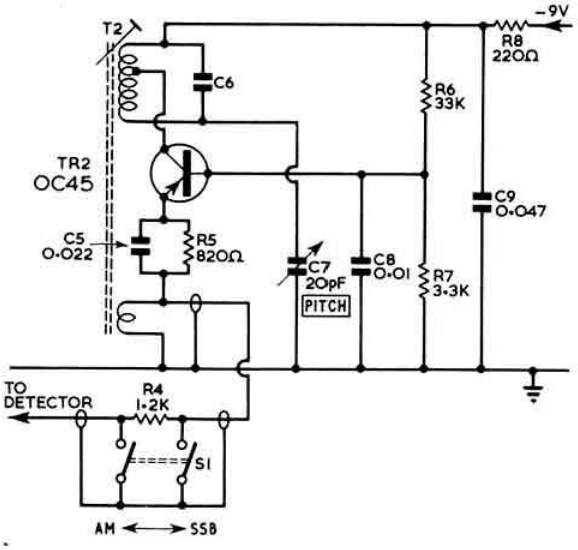


Fig 3. The bfo and am/ssb switch.

* 30 Ox Lane, Harpenden, Herts.

Dual-Gate FET Converters for Two and Four Metres

By C. W. WESTWOOD, G3VFD*

THIS article deals with the design and construction of a high performance vhf converter. The choice of devices for rf and mixer stages is discussed together with the selection of a suitable i.f. and local oscillator frequency. Full constructional details of converters for 2m and 4m are given, using RCA dual gate MOSFETs and with tunable i.fs in the 10m band. For use with tunable i.fs of poor performance a second conversion stage is described enabling a much lower i.fs to be used. The complete converter is simple to build and the cost of the basic unit should not exceed five pounds.

Choice of Devices for RF Amplifier and Mixer Stages

It has frequently been pointed out in the past that FETs offer advantages over valves and bipolar transistors for use at vhf. This is due to two main features; firstly the FET has a relatively high input impedance compared with other devices, which permits some step up of signal level between the aerial and the rf amplifier; secondly they have a superior performance in the presence of strong signals. This is due to the near perfect square law transfer characteristic (it being the cubic term which gives rise to cross modulation effects [1]). This latter point is of great value under contest conditions when any spurious signals generated by the receiver are intolerable.

The dual gate FET offers additional advantages over the single gate variety in both rf and mixer stages. In the rf amplifier the dual gate FET may be considered as a cascode stage with extremely low feedback capacitance [2]. This results in a very simple circuit configuration which does not require neutralization. As a mixer the second gate is used for oscillator injection, giving good isolation between the signal and oscillator. The dual gate FET also has a higher conversion gain than single gate types which is useful when the converter is used with an insensitive receiver. This high gain might prove an embarrassment with a high gain receiver due to overload and cross-modulation taking place in the main receiver. The solution to this problem is to reduce the input to the main receiver, either by use of an attenuator or by reducing the gain of the vhf front end mixer with adjustment of the second gate bias. This alteration of bias on the second gate may also be employed in the rf amplifier to facilitate agc [Ref. 2].

* 25 Knoll Road, Bexley, Kent.

† A useful discussion on spurious responses is given in [3]. Although directed towards ssb transmitters, this points out some of the unexpected spurious responses which can occur if very great care is not paid to choice of oscillator frequencies.

The devices chosen for the converters are the RCA types 3N140 and 3N141, these offering very good performance at a reasonable cost.

Choice of Intermediate Oscillators and Frequencies

The choice of the i.f. and the local oscillator frequency can have an important effect in determining the final performance of a vhf receiver front end. Four important points need to be considered, although the final results will necessarily be something of a compromise.

1. The first i.f. should be sufficiently high to give a good image rejection.
2. The tunable i.f. chosen should give the maximum amount of bandspread.
3. The band chosen should be clear of strong signals likely to give trouble from i.f. breakthrough.
4. Spurious responses and birdies should be reduced to a minimum.

For stations possessing an amateur bands only receiver, as was the author's case when these converters were first built, there is no choice, as the 10m band is the only one wide enough to cover the whole of 2m as a tunable i.f. Fortunately this is quite a satisfactory i.f. to use provided that the receiver is sufficiently stable on this band. On the older general coverage receivers in use in many stations, however, the stability and bandspread leave a lot to desire at this frequency and a lower i.f. would be much better. To achieve satisfactory image rejection using an i.f. of say 2–4 MHz with only one conversion stage would be difficult and when using an Eddystone EC10 the author built a second mixer stage to give a much lower i.f. using double conversion. This method has also been used with good results with an AR88D to get better bandspread and stability.

Having decided on an i.f. range suitable for the receiver in use the oscillator must be chosen to avoid any spurious responses†. In general the oscillator should operate at as high a frequency as possible, although there are some pitfalls for the unwary. For example consider a two metre converter with an i.f. of 28–30 MHz.

Required injection frequency = 144 − 28 = 116 MHz.

Therefore one could use either 38·66 MHz × 3 or 58 MHz × 2. The third harmonic of 58 MHz is however 174 MHz and thus if the third harmonic output of the oscillator were rather high then the band would be tuned backwards as well as forwards at the same time.

Another point worthy of consideration is the presence of any strong local broadcast stations in Band 2. When using

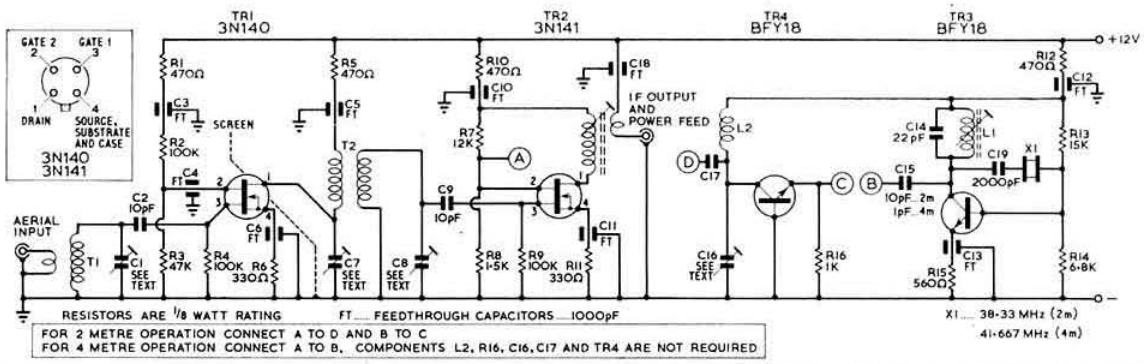


Fig 1. The 2 and 4m dual-gate FET converter circuit. The differences between the two versions are explained immediately above this caption. T3 is the i.f. output transformer.

say 27–29 MHz as the i.f., the image frequency falls in the middle of Band 2 and it might be difficult to avoid some trouble from image reception of the broadcast stations.

Circuit Description

The circuit diagram of the main two and four metre converters is given in Fig 1 and that of the second mixer stage in Fig 2. The rf amplifier, TR1, uses a 3N140 operated in common source. This is coupled to the mixer, TR2, a 3N141 by means of a double tuned transformer, T2. The local oscillator is coupled to gate 2 of the 3N141. The output at approximately 29 MHz is taken from a low impedance link winding coupled to the tuned circuit in the drain of the mixer. Extensive decoupling is provided to ensure freedom from any possible instability troubles. These stages are identical on both two and four metres with the exception of the tuned circuits, details of which are given in Table 1. The local oscillator uses an overtone crystal oscillator circuit, TR3, operating on 38·33 MHz for 2m and on 41·667 MHz for 4m. On two metres this is followed by a common base tripler, TR4, to provide the necessary 115 MHz injection frequency.

The second mixer stage uses a junction FET type 2N3819, TR5, as the mixer with the oscillator and input signals fed to the single gate. The drain load is provided by an rfc as a high gain is unnecessary in this stage and it is easier to get the required large percentage bandwidth this way. The oscillator for this conversion also uses a similar circuit to the main converter and TR6 provides an output on 26·35 MHz.

It will be noticed from the circuit diagram that the link coils coupling the first and second mixers are returned to the 12V +ve rail rather than to earth. This arrangement provides a power feed down the coaxial connecting cable between the two units thus obviating the need for a separate power lead. If the converter is to be used with a separate battery then these link coils should be returned to earth and power fed in, in the normal manner.

Components

All of the components used are reasonably easy to obtain and where necessary the supplier is indicated in the component list. The two types of transistors specified for the oscillator are the only two types which have been tried but almost any silicon n-p-n type with an f_T greater than 150 MHz should be perfectly satisfactory.

Since the original converters were built it has been noticed that supplies of the trimmers specified have dried up. A suitable alternative would be the small piston trimmers available from the same source.

The oscillator injection capacitors, C25, and C15/17, are formed by twisting together two pieces of insulated wire for about 1 in. *(Continued overleaf)*

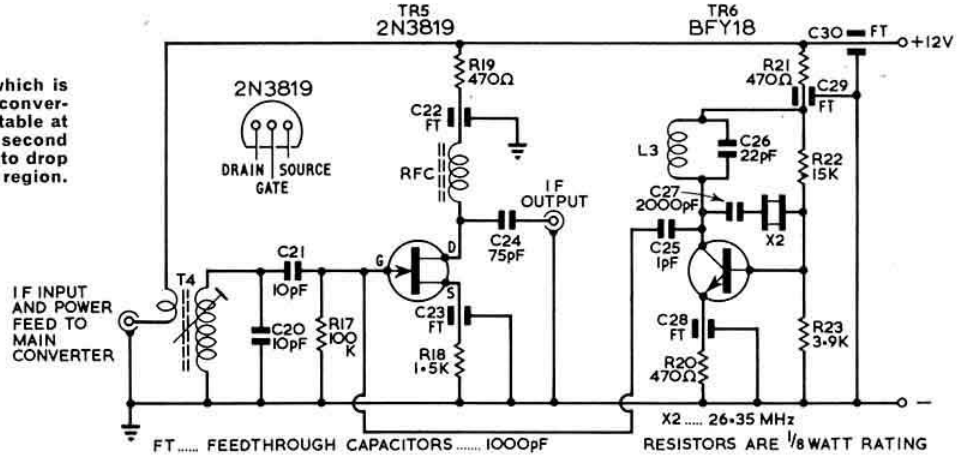


Fig 2. If the receiver which is intended to follow the converter is not sufficiently stable at high frequencies, this second converter can be used to drop the output to the 3 MHz region.

Table 1. Coil Details

Main converters

No of turns given refer to four metres. Figures in brackets to two metres.

T1 Primary: 2 turns of 20 swg en ½ in dia. Secondary: 8(4) turns 20 swg en ½ in dia tuned by C1.

T2 Primary: 8(4) turns of 20 swg en ½ in dia tuned by C7. Secondary: 8(4) turns of 20 swg en ½ in dia tuned by C8.

T3 Primary: 25 turns of 32 swg en on ¼ in Aladdin former tuned by dust core. Secondary: 2 turns of 20 swg en.

L1 10 turns of 22 swg en on ¼ in Aladdin former tuned by dust core.

L2 5 turns 22 swg ¼ in dia airspaced tuned by C16.

Second Conversion stage

T4 Primary: 3 turns of 20 swg en. Secondary: 20 turns of 32 swg en on ¼ in Aladdin former tuned by dust core.

L3 16 turns of 22 swg en on ¼ in Aladdin former tuned by dust core,

RFC 10 mH rf choke. Denco.

Table 2. Voltage measurements

All voltages were measured with a meter of resistance 10,000 ohms/volt. Supply + 12 volts.

Voltage	Source or emitter	Gate 2
Tr1	1·0	2·4
Tr2	0·7	1·2
Tr3	2·0	—
Tr4	—	—
Tr5	1·5	—
Tr6	2·0	—

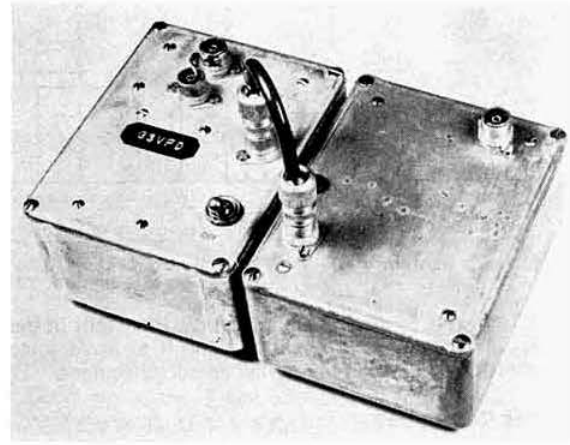
These voltages will vary considerably with transistor spreads but nevertheless give an idea of the order of result to be expected for those unfamiliar with these devices.

Component List

R1, 5, 10, 12, 19, 20, 21	470 ohms	⅛ watt
R2, 4, 9, 17	100 K	⅛ watt
R3	47k	⅛ watt
R6, 11	330 ohms	⅛ watt
R7	12 K	⅛ watt
R8, 18	1·5 K	⅛ watt
R13, 22	15 K	⅛ watt
R14	6·8 K	⅛ watt
R15	560 ohms	⅛ watt
R16	1 K	⅛ watt
R23	3·9 K	⅛ watt

C1, 7, 8, 16. 2–20 pF miniature airspaced trimmer, cut to ½ size on 2 metres (Smiths, Lisle Street).
C2, 9, 20, 21. 10 pF tubular ceramic.
C3, 4, 5, 6, 10, 11, 12, 13, 18, 22, 23, 28, 29, 30. 1000pF feed-through (Radiospares).
C14, 26. 22pF tubular ceramic.
C15. 10pF (2 metres) 1pF (4 metres).
C17, 25. 1pF.
C19, 27. 2000pF tubular ceramic.
C24, 75pF.
X1. 41·667 MHz (4 metres) or 38·33 MHz (2 metres).
X2. 26·35 MHz.
Some suitable crystals in HC6U style may be available from Henry's Radio.
TR1. RCA type 3N140.
TR2. RCA type 3N141.
TR3, 4, 6. STC type BFY18 or Texas Type 2N3826.
TR5. Texas type 2N3819.

As far as can be determined no suitable 12T battery is manufactured. A plastic case made by Eagle products is however made to hold 8 pencells, thus giving a small 12V battery.



A converter and its companion second mixer.

Construction

Both the main and second converters are built into standard Eddystone diecast boxes. The main converter is built up on a piece of copper clad paxolin board with screens formed from double sided copper clad board. These screens are essential to separate the oscillator and to screen the input and output terminals of the rf amplifier. Full details of the cutting and drilling requirements are given in Fig 4. This board is fixed to the lid of the box by means of 6BA screws and ½ in spacers. The drilling layout for the lid is given in Fig 4 also.

The components are mounted on the board by means of feed-through capacitors at the points requiring decoupling, and by standard Lektrokit pins type LK3011 at other points (see Fig 4, for fixing details). All resistors are mounted on the underside of the board, whilst the coils and capacitors, etc, are placed above the board. This results in a very neat layout making assembly very easy. Fig 3 will assist in the location of the various components.

Construction should be carried out in the following order for convenience:

1. Cut out and drill the copper laminate board and solder the screens in place.
2. Mount all the bolt-fixed items, trimmers, coils etc; solder in the feedthrough capacitors and fit the Lektrokit pins.
3. Solder all resistors to the underside of the board.
4. Fix the board to the underside of the lid of the box.
5. Fit the capacitors and remaining coils and transistors to the upper side of the board.
6. Test and align.

The construction of the second converter stage can follow the lines of the main converter if it is desired to build this. No constructional details are given, apart from the view in Fig 3, which shows the layout adopted by the author. The layout here is not critical and it is anticipated that readers would prefer to make use of available components rather than follow detailed layouts.

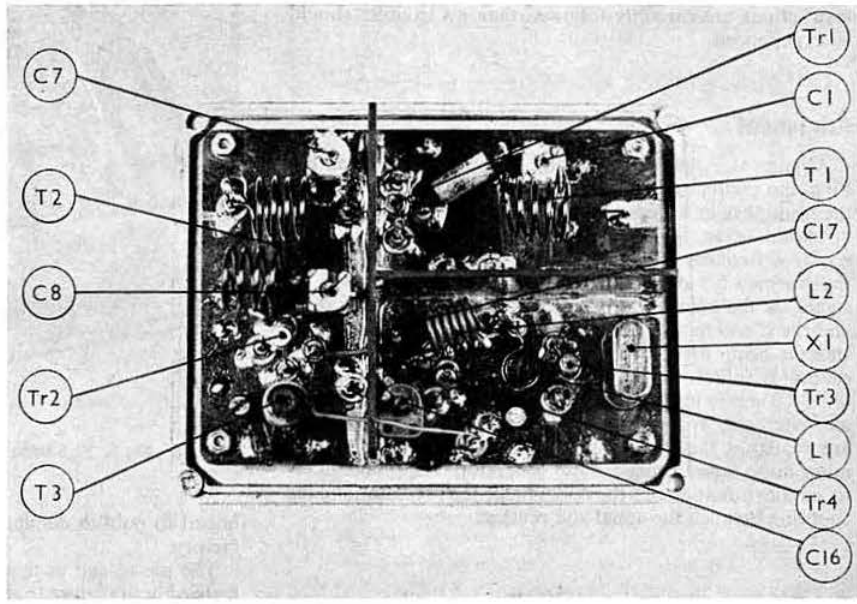


Fig 3. A photograph of the top of the board, the larger components being identified.

Handling of insulated gate FET's

The insulated gate FET has an input impedance at dc of the order of 10^{14} ohms. As a result of this and the small capacitance between the input gate terminal and the channel it is easily possible for a small charge, e.g., that carried on one's finger, to provide a sufficiently high voltage on the gate to cause breakdown and permanent damage. The gate terminals must always, therefore, be provided with a low impedance dc path to ground during handling. This is accomplished by wrapping a piece of thin tinned copper wire around the leads before removing the brass shorting sleeve provided for transit. This sleeve may then be removed and the device soldered into circuit. The shorting wire should not be removed until all other components are in place. If these

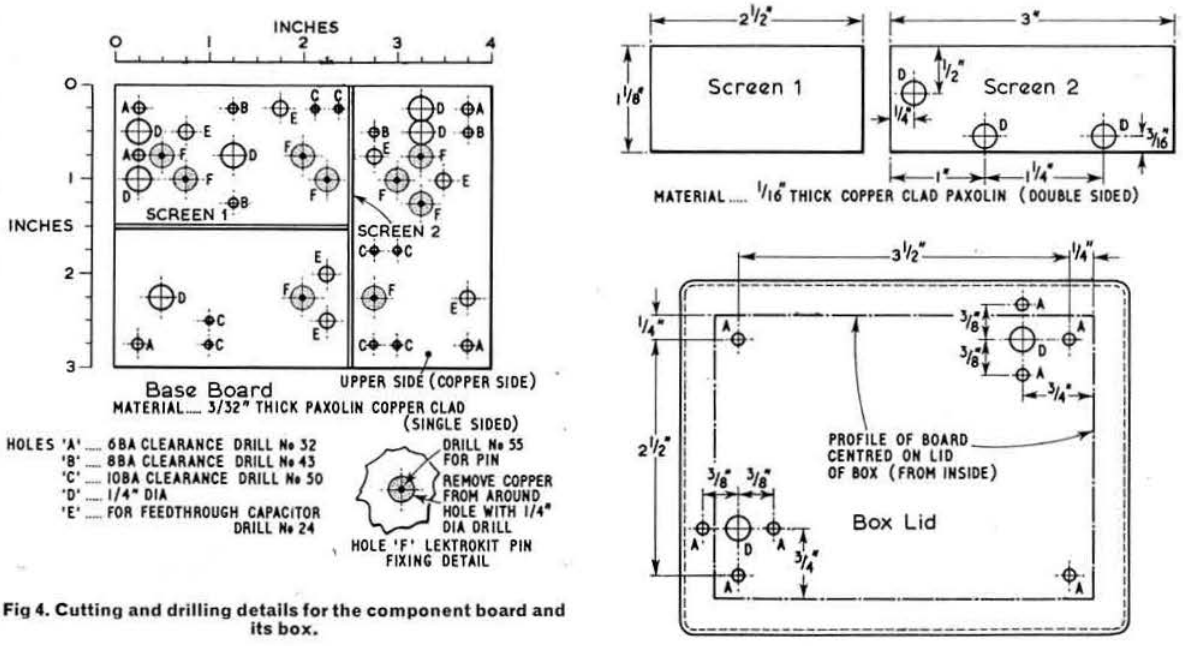


Fig 4. Cutting and drilling details for the component board and its box.

instructions are carefully followed then no troubles should be experienced.

Alignment

Alignment is quite simple and follows normal practice. First the oscillator is tuned for maximum output and then the multiplier in the case of the two metre version. This can be done using an absorption wavemeter tuned to the required frequency. The next step is to align the output i.f. transformer for maximum noise in the main receiver. A signal on the appropriate band is next fed into the rf stage and the rf and mixer circuits tuned. If the second conversion stage is being used then it is suggested that the same procedure is followed, treating this as a completely separate unit. To assist in checking operation some typical voltage measurements are given in Table 2. Finally, if the facilities are available, then the converters may be adjusted for optimum noise figure using a noise generator. The points likely to require attention are the coupling of the oscillator and the coupling between the aerial and rf stage.

Results and experiences with the converters

The converters described have proved very satisfactory in use, outperforming anything previously built by the author. No cross-modulation effects attributable to the converter have been noticed, in spite of operating very close to other stations on the same band on field days. Any trouble on this score has always occurred in later stages of the receiver (using bipolar transistors!).

The noise figure of the converter seems to be of the order of 2·5dB, although no precise measurements have been carried out. At most locations the noise coming in from the aerial seems to override the converter noise on 4m, whilst on two the writer's present QTH in central London precludes this test being made.

Several other converters of similar design, using the same FETs, have been built by other stations in the area and seem to give similar results.

The Future

The results obtained using the dual gate FETs at vhf have proved sufficiently encouraging to prompt the start of a 70cm converter using some higher frequency FETs and it is hoped to publish details at a later date if this proves satisfactory.

The use of agc to the rf stage as suggested by RCA will be tried in the future to see if this results in any improvement in performance.

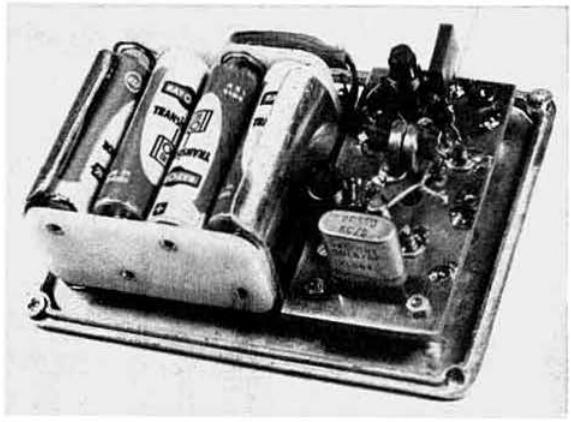


Fig 5. The second mixer and battery pack.

Acknowledgements

Acknowledgements are due to G6HD for the idea of using Lektrokit pins in conjunction with copper clad board for the construction and for obtaining the FETs used to build the prototypes.

Acknowledgements are also due to G3HBW whose two and four metre converter designs provided the basis for the second mixer circuit, and to RCA whose very informative data sheets provided the basis for the rf amplifier and mixer circuits.

References

[1] *RCA application note No AN3435.* Cross modulation effects in single gate and dual gate MOS Field Effect Transistors.

[2] *RCA Technical* presentation No ST 3703. MOS Field Effect Transistors.

[3] *Radio Communication*, Vol 45, No 1, January 1969, "VHF SSB."

Product Detector for a Transistor Receiver

(continued from page 701)

One section of the switch shorts out the detector base as described above, and the other stops the local oscillator by short-circuiting the oscillator transformer secondary. This is preferable to switching the oscillator ht as it minimises frequency change on switch-over, as well as simplifying wiring. The resistor R4 between the switch sections controls the injection level.

A further piece of screened lead from the switch goes to the bfo itself, whose components are grouped round the pitch control. The oscillator uses an if transformer similar to that in the receiver detector, but with the diode removed. If no output is obtained the secondary connections should be interchanged. The pitch control covers about 10 kHz. The author's receiver has quite wide bandwidth, so this pitch control is useful as a bandspreader, often allowing three or four perfectly readable sideband stations to be tuned in turn without touching the main tuning.

Television and Radio Interference Trends

What the Post Office statistics reveal

by PAT HAWKER, G3VA

Of 70,254 interference cases closed by the Post Office interference investigation officers during 1968, 1151 or just over 1·5 per cent were ascribed to amateur radio stations. But few need reminding that the relatively small figure of 1·5 per cent has a profound effect on the amateur radio service and is worthy of the most careful consideration. Furthermore, much of the remaining 98·5 per cent of interference is caused by electrical apparatus that also interferes with amateur reception—and is equally deserving of study.

The following statistics and notes are based on the official analysis of Radio Interference Complaints, 1968 (PO Memorandum NP8,1.2/926) though, except where otherwise indicated, the conclusions are unofficial. For a more rigorous analysis it would be necessary to take into account various specialized Post Office definitions, though these would not affect the trends shown in this survey.

Table 1 shows clearly that, at present, the most vulnerable band, by a very long lead, to every form of interference (except that caused by oscillator radiation from tv receivers operating on Band I) is Band I television. The amateur problem breaks down to: lw and mw radio, 55; Band I tv, 725; Band II (vhf/fm) radio, 34; Band III tv, 319; Bands IV-V (uhf) tv, 12; interference to mobile radio services, 6. It is worth comparing this to interference ascribed to UK transmitters other than amateur in which the number of Band II and Band III complaints seems to indicate the appreciable influence of the mobile radio services: it is also worth noting that over 50 complaints occurred on uhf tv. In view of the still relatively small number of viewers using uhf—a number expected to increase significantly as the effects of " duplication " become apparent—it is clear that although uhf tv is much less susceptible than the lower frequencies, *uhf tv is still vulnerable to interference from transmitters.*

It is alarming to note that in 1968 interference from radio transmitters of all types rose by no less than about 35 per cent (compared to an overall increase of 10 per cent), the largest rate of increase noted in the PO memorandum. This seems to support the contention (not made by the PO) that the transistorized front-ends of many modern receivers cannot cope with really strong local signals, even on frequencies well removed from that in use. In another recent report, the set-makers go so far as to state of Band II vhf/fm receivers that " it is unreasonable to expect domestic type receivers to cope with a non-co-sited transmitter situation unless the transmitters have a minimum frequency separation of 600 kHz, and even then there will be trouble close to the base station." Although this comment was related specifically to interference from mobile services, the significance of such a situation to amateur stations, particularly vhf stations, should not be overlooked.

Table 2 indicates the large numbers of complaints of interference that are ascribed by the Post Office to faulty conditions at the receiver, of which inadequate aerials and faulty receivers account, as might be expected, for the vast

Table 1—Interference from Specified Sources

Source	LW/MW	Band I	Band II	Band III	Band IV	Band V	Mobile Radio
Electric motors	505	5689	124	1512	5	2	10
Contact devices	929	8389	187	1685	9	10	16
Gaseous discharge lamps (exc. neon signs)	437	588	9	83	1	2	—
Neon signs	49	1160	12	183	2	—	2
Industrial rf apparatus	15	651	29	149	8	4	23
Medical rf apparatus	1	37	2	29	1	—	—
Amateur transmitters	55	725	34	319	9	3	6
Other UK radio transmitters	86	765	137	635	46	9	141
Foreign transmitters	68	375	10	50	10	2	25
Local oscillators, Band I tv	—	220	6	451	15	3	2
Band II radio	—	—	2	27	—	—	—
Band III tv	—	—	—	23	4	2	1
Band IV-V tv	—	—	—	—	1	—	—
TV time-base radiation	39	1260	3	256	11	6	—
Misc. receiver radiation	33	799	4	330	8	4	3
Power lines, overhead 11–66 kV	93	3628	18	460	1	20	14
132 kV	4	297	1	27	—	—	1
275 kV	3	133	—	7	—	1	—
400 kV	1	93	—	14	—	—	—
Electric overhead railways	6	40	—	14	—	—	—
Other identified sources	599	4164	72	1279	32	11	72
Unidentified sources	1548	13867	217	3259	80	54	222
Totals	4471	42880	867	10792	275	150	538

Table 2—Complaints arising from conditions at Receiving Site

Condition	LW/MW	Band I	Band II	Band III	Band IV	Band V	Mobile Radio
Inefficient aerial installation	721	4488	357	2245	216	174	17
Faulty receivers	523	5223	297	2825	137	106	41
User maladjustment	45	370	31	160	17	7	14
" Ghosts " (multipath reception)	—	649	—	313	7	17	1
IF breakthrough	5	315	5	92	5	—	2
2nd channel response	6	34	13	24	1	—	1
Other spurious responses	54	556	114	623	12	27	29
Weak signals (outside service areas)	35	328	13	124	16	12	4
(shadow areas)	13	241	11	119	10	22	—
Flutter	6	103	19	21	2	3	3
Totals	1408	12307	860	6546	482	386	112
Table I and Table 2 Totals	5879	55187	1727	17338	757	536	650

majority. Particularly on uhf, the receiving installation is overwhelmingly the major cause of difficulties.

Incoming Interference

Whilst the amateur transmitter causes his small quota of interference, he, more than almost any other user, suffers in his search for weak signals from the pollution of the radio frequency spectrum by electrical apparatus and power lines in residential and rural areas. Furthermore, the amateur cannot call upon the Post Office for free assistance in tracing causes of interference unless this is of such strength as to affect also reception of the local radio or television stations.

Here undoubtedly the most significant development in recent years has been the growth of interference from contact devices, such as the thermostats used for domestic temperature control. The Post Office goes so far as to state: " clearly the present design of thermostats is unsatisfactory from an interference point of view." The number of complaints from contact devices now exceeds those due to the formerly ubiquitous electric motors. The 27 per cent increase in cases traced to contact devices is believed to reflect the increase in the number of installations of domestic gas and oil fired central heating systems employing thermostatic control. The Post Office state that " the manufacturers are currently looking into the problems of thermostat contact wear, and the resultant radio and television interference, which appears to increase rapidly within a year of installation." Domestic use of silicon controlled rectifiers (thyristors) for lamp dimming or power tool control has yet to make an impact, but could become an important new source of interference unless manufacturers are careful to incorporate efficient suppression. The large amount of interference already caused by lamps is worth noting.

Electric motors, as a source of interference, have fallen steadily, year by year, from 18,075 in 1959 to 7,848 in 1968—undoubtedly reflecting the increasing effectiveness of suppression devices fitted voluntarily during manufacture. This is also a good indication of results that *can* be achieved in reversing the trend towards greater interference. In some cases, unfortunately, radiation levels which do not interfere with radio or tv reception may still be an embarrassment to amateur operation. In this connection, it is worth pondering on the implication that the expected steady transfer of viewers to uhf and sound radio listeners to vhf/fm could result in a decline in interference complaints that would not truly reflect any absolute improvement in the cleaning up of the spectrum.

SOLDERING HANDBOOK by B. M. Allen. Published by Iliffe Books Ltd. 128 pp. 100 illustrations. Size $8\frac{3}{4} \times 5\frac{1}{2}$ in. Price: 45s. casebound. 21s. limp edition.

Only a proper understanding of all the factors which go into the construction of a correctly soldered joint can produce the high degree of reliability which is now required. What was once regarded as an art is now becoming a recognized field of engineering with its own rigorously based codes of practice. In keeping with this current trend it can be said that this book adopts a scientific approach to soldering whilst maintaining the emphasis at a practical rather than theoretical level.

The first part of the book describes how to use the more common of the methods and materials now available and should be useful both for the industrial solderer and the amateur. The second part is aimed more specifically at the designer and engineer and includes the latest automatic machine soldering methods. The third part of the book lists a large number of practical joint forms, typical applications of solders and also includes a very useful international list of solder and flux standards.

"Just been on 2 but it's as dead as a doornail . . ."

Television Interference Its causes and remedies

By D. M. THOMAS, GW3RWX*

ALMOST all amateurs at one time or another have been responsible for causing a complaint of television interference to be made either to himself or to the GPO Interference Group. It is rather interesting to note that since the writer has been engaged on investigating TVI cases in conjunction with the Post Office Group only ten per cent of the cases have been attributed to the amateur installation, the rest being due to deficiencies in the domestic television set or aerial installation belonging to the tvi complainant.

Interference can be caused in the following ways:

(*a*) Harmonics or spurious emissions radiated by the transmitter.

(*b*) The re-radiation of large signal frequency currents circulating in apparent earth systems.

(*c*) Deficiencies in the television receiver causing either front end blocking or i.f. break through.

(*d*) In the case of wire distribution television systems, the induction of signal frequencies on the overhead feeder system.

One of the difficulties the amateur is faced with is the lack of specialist test equipment required to carry out tests on his own installation to ensure that items (a) and (b) are eliminated. As will be appreciated, the number of amateurs who possess a high quality search receiver or field strength meter covering the range 35-220 MHz is very limited and therefore the only way of ensuring items (a) and (b) are not the causes of trouble is to take the following steps.

To reduce the harmonic or spurious content of any transmission, it is necessary to have the equipment fully screened. In the case of commercial equipment, in general, this requirement is met by the manufacturer. For those who construct their own equipment they must ensure that each section of the transmitter is screened and that power and monitoring leads are adequately decoupled. An ideal way of inter-connecting sub-assemblies is by feed-through capacitors on all power distribution circuitry. It is interesting to note that, usually, this practice is followed when building vhf equipment but is neglected at the lower frequencies. This subject is covered fully in the *Radio Communication Handbook* and it is not intended to elaborate further. The use of anti-parasitic chokes in both the driver and power amplifier anode circuits will reduce the chance of parasitic oscillations building up in these stages. It is suggested that reference be made to a recent article by B. Priestley, B. Sc., G3JGO in the January 1969 edition of *Radio Communication*, which covers the magnitude of harmonics which can be generated when using ssb.

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With the transmitter finally secured in a metal cabinet and the aerial outlet consisting of a coaxial connector, the most important precautions against direct harmonic and spurious radiation will have been achieved. The indirect radiation via the tank circuit to aerial will be taken care of by the insertion of a low pass filter in the aerial feeder.

Method of coupling the transmitter to the aerial

The most usual practice these days is to have a pi output circuit which matches the output impedance of the pa valves to the characteristic impedance of the coaxial feeder. This is not to be confused with matching the valves to the aerial input impedance. The use of pi-networks coupled via coaxial sockets into coaxial feeder ensures no stray radiation takes place up to this point and the coaxial feeder ensures a matched condition at its characteristic impedance to the remote aerial system.

At this point, it is worth remembering that all dipole or doublet aerials are inherently balanced devices and if fed directly from unbalanced feeders such as coaxial, the symsme try will be upset resulting in an unbalance of feed current in-each leg, leading to a proportion of this feed current flowing in the outer screening of the coaxial cable. (See Fig 1). The

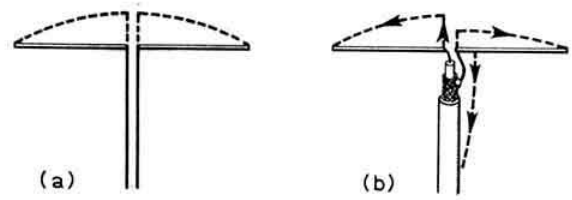


Fig 1(a). Current distribution in a dipole using balanced feeder.

Fig 1(b). Current distribution in a dipole using coaxial feeder.

feed current flowing in the braiding brings the rf potential above that of true earth and depending where the earth reference for the station may be, there will be considerable re-radiation from both the feeder and even the casing of the equipment. (Fig 2). Since with single phase power supplies it is practice to connect earth and neutral together, there will be considerable radiation and direct pick-up of both signal frequency and harmonics on the power distribution in the locality.

The only aerial which may be coupled directly to a coaxial feeder is a correctly dimensioned ground plane with

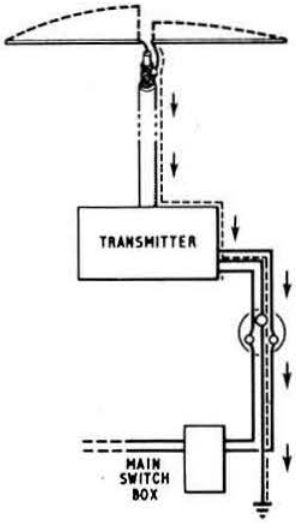


Fig 2. Due to the unbalance of aerial currents, a proportion of the current on the leg connected to the braiding flows down the feeder, through the equipment casing to earth. Should there not be a separate earth, these currents will flow via the power wiring to the house main earthing system. It is usual practice for the mains neutral to be connected to earth at the sub-station and this can result in considerable radiation on the mains distribution.

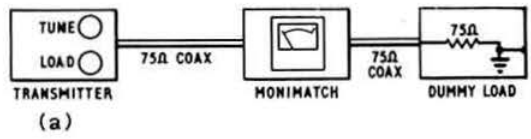


Fig 3(a). Tuning adjusted for optimum power in dummy load. The forward reading on the reflectometer may be used for power indication. Confirm there is no reflected indication present.

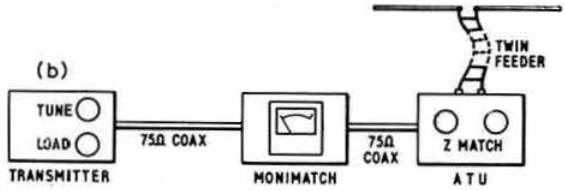


Fig 3(b). Without further adjustments on the transmitter, the atu is tuned to give zero indication of reflected power on meter

the radials matched to the correct angle and length to enable a match of a resistive 50 ohms. Obviously, the feeder is of 50 ohms impedance. It is surprising how many amateurs ignore the problem of mis-match and pursue their hobby with complete disregard of the potential tvi and loss of efficiency of their aerial system. In the case of a mis-match, the power dissipated through the earth system is subtracted from the total power available to the aerial.

This now leads us to discuss how to correctly feed and match into the more usual balanced aerial system. Essentially, there has to be an unbalance to balance matching unit which may be either an atu or a balun. The atu is by far the most versatile unit as it will match a wide variety of resistive and reactive mis-matches between the transmission line and the aerial. If a half-wave dipole cut for 80m is used on any other band, it is going to present a load which is anything but 75 ohms resistance and the only method of matching its input impedance is to use an atu in conjunction with a reflectometer. The most popular of these items in current use are the "*Z*" *Match* Coupler and the ARRL "*Monimatch*". These are available commercially from manufacturers and the *Monimatch* will be described later.

It may be as well to refresh one's memory on the way of using these items correctly. Referring to Fig 3:

(1) Tune and load the transmitter into a 75 ohm non-inductive dummy load.

(2) Insert the *Monimatch* in the coaxial feeder between the transmitter and dummy load and confirm there is no reflected current indication visible.

(3) Transfer the connection from the dummy load to the atu which is coupled to the aerial and adjust the tuning of the atu until minimum or no reflected indication is present. Do NOT carry out any further adjustments to the transmitter tuning as this has been correctly set for working into a 75 ohm load.

Under these conditions, maximum power is transferred to the aerial with minimum earth currents flowing. It must be noted that by using an atu there are additional tuned circuits involved and although little or no loss is experienced at the required frequency, harmonics and spurious signals are outside the pass-band and further attenuated.

When using the atu and feeding the aerial with balanced feeder, either open wire or flat twin transmission line may be used. The differences in impedance between the line and the aerial will be matched by the atu. Since the construction of open wire feeder is covered in the *Radio Communication Handbook*, there is no necessity for duplication here. In the case of using flat twin feeder, it is perhaps useful to note that a source of this is the clear plastic covered 5A domestic lighting flex sold in well known chain stores. The characteristic impedance is about 85 ohms and the only disadvantage, which is common to all solid flat twin feeder is that, when wet, the characteristic impedance will change slightly, necessitating a small re-tuning adjustment of the atu. Some amateurs have warned that the insulation will crack with age and cause corrosion but my own installation has been in use for some years without any ill effects taking place.

The reader is referred to the RSGB *Radio Communication Handbook*, H. F. Aerials chapter, for information on aerial tuning units. The Z Match coupler is described on page 13.37.

In the case of using single band dipoles where the impedance is nominally 75 ohms, the atu may be replaced by a 1 : 1 ratio balun. An excellent version was constructed by G3HZP and described in the July 1966 issue of the *RSGB Bulletin*. These baluns utilise the properties of ferrite rings concentrating the magnetic field of a coil into a closed loop and are both very efficient and wide band.

Construction of the toroidal balun

Two Mullard FX1588 toroidal cores are stacked and bound with acetate, polyester or silk tape before the primary

and secondary coils are wound. The primary, L1, consists of 10 turns, while the secondary comprises two windings of five turns connected as shown in Fig 4(a). The wire used is 0.110 in × 0.060 in enamelled copper tape, 20 in being required for L1, and 13½ in for each section of L2. When the winding is completed, the balun can be completely enveloped for protection with one of the following materials: bitumen, Chatterton's compound, several coats of tropical varnish or polyurethane varnish of the type supplied for small boats or yachts, fibreglass (Holts car Kit), Araldite, or solidifying silicone grease (EP5555, ICI Ltd). Alternatively, it can be encapsulated in a small hermetically sealed metal box.

Three methods of mounting have been found suitable. Perhaps the simplest method is to attach the toroid to a triangular sheet of Perspex, and completely envelop the assembly in Araldite. The coaxial line can be readily secured with a sheet metal clamp bolted to the Perspex; the toroid is held in position by the combined action of the mounting wires and Araldite. The dimensions and drilling points are shown in Fig 4(b); the inner holes X retain the balun lead-out wires and the holes Y secure the aerial wires. The jumper between holes X and Y should preferably be a length of copper braid to prevent damage owing to flexing of the assembly in high winds.

A second fairly simple method of mounting is to enclose the balun in a short length of Marley plastic drainpipe, the ends being covered with discs of paxolin. The discs can be cut with a fly-cutter, the pilot holes being used to allow a brass screw to clamp the ends together, or alternatively used as fixing points to tie the units to a mast. The coaxial cable is held tight by a rubber grommet in the centre of the tube wall, while the balanced winding can either be connected to the dipole by braid fly leads, or alternatively a small strain insulator cut from Perspex sheet can be mounted within the unit; this possesses the added advantage that all joints are totally enclosed. The unit should be sealed with Evostik or Twinpack Araldite.

The third, more complex, system of mounting the balun is to seal it hermetically within a metal box. Suitable measurements are 2 in × 1½ in × 2½ in with the type 83 coaxial socket mounted on the 2 in × 1½ in dimension. Glass feed-through insulators are used for the aerial connections. Unless a suitable box is available, one can be fashioned without too much difficulty from tinplate and the joints soldered.

It may be that there is a degree of difficulty in obtaining the Mullard FX 1588 ferrite rings required. An alternative is to use an S.T. & C. toroid available from either the S.T. & C. Electronic Services or from Electroniques. The reference number is CR071-24C/C. As with the HZP balun, the number of turns remain the same but for copper strip read 18 swg enamelled wire, the primary and secondary windings being separated by a layer of oiled silk tape. Although this balun is physically smaller than the original, it has matched up to 400 watts on all bands to 30 MHz without becoming more than perceptibly warm and without any flash-over. The unit can be sealed and mounted on the centre spacer of the dipole and then fed with standard 75 ohm coaxial cable. These comments are also applicable to beams and quads as well as dipoles or doublets.

In the case of amateurs using end fed or long wire aerials, the following atu is described. (See Fig. 4.) The method of tuning is the same as with the Z Match. Having set the transmitter into a dummy load of 75 ohms, the tuning

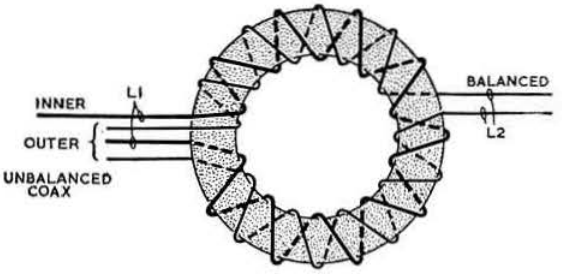


Fig 4(a). The construction of the windings on the toroidal core. L1 consists of 10 turns, and L2 is formed with 5 + 5 turns.

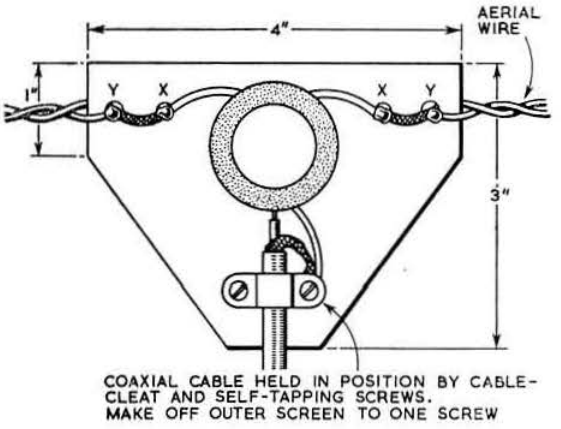


Fig 4(b). A triangular block of perspex makes a strong mounting for a balun positioned at the centre of a half-wave dipole. The balun is anchored with its connecting wires and a coating of Araldite, the coax is held with a cable cleat, and the aerial wires are passed through holes Y. Braid is used to connect the output of the balun to the aerial wires to avoid straining the connections owing to flexing in the wind.

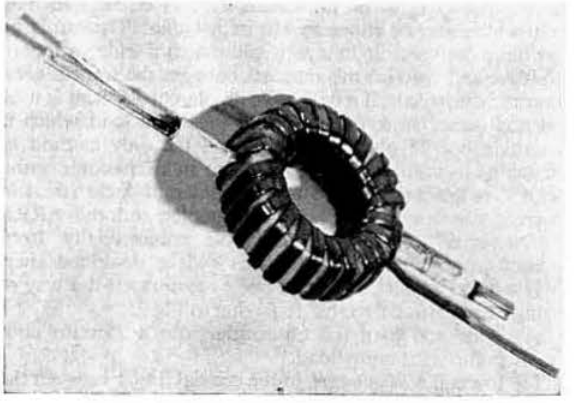


Fig 4(c). The completed balun. The two right-hand leads are the balanced aerial connections (L2); the other end of each of these windings is connected to the earthy end of L1.

capacitance is adjusted for minimum S.W.R. The aerial tap is varied until the S.W.R. becomes zero. Note, C 1 will have to re-set each time the tapping on L 2 is changed.

Swr measurement

The *Monimatch* is an swr monitoring bridge that can be used continuously in the transmission line at power levels up to the legal limit. It makes use of the combined effects of inductive and capacitive coupling between the centre conductor of a coaxial line and a length of wire parallel to it. When the coupled wire is properly terminated in a resistance, the voltage induced in it by power travelling along the line in one direction will be balanced out in the crystal-rectifier rf voltmeter circuit, but power travelling along the line in the opposite direction will cause a voltmeter indication. If the bridge is adjusted to match the Z_0 of the coaxial line being used, the voltmeter will respond only to the reflected voltage just as in the case of the resistance-type bridges. The power consumed in the bridge is below one watt, even at the maximum power permitted for amateur transmitters.

The circuit of Fig 5 shows a double pole double throw switch to exchange the voltmeter and the terminating resistance, so that either the forward or reflected voltage can be measured. The sensitivity of this type of bridge is proportional to frequency, so higher power is required for a given voltmeter deflection at low than at high frequencies. The sensitivity also increases with an increase in pickup length, but this should not be longer than about 1/20 wavelength, to avoid standing-wave effects in the pick-up circuit. For higher frequencies the length should be decreased in proportion to the wavelength. This reduces the sensitivity considerably at the lower frequencies, so it is advisable to make separate units for vhf and the frequencies below 30 MHz.

The additional conductor in the bridge is a length of No. 20 enamelled wire running under 8 in of the RG-8/U shield. The length of the RG-8/U is 14 in. To insert the No.20 wire under the cable shield, first loosen the braid by bunching it from the ends toward the centre. Punch the two small holes for the wire and then snake the wire through one hole under the braid, and out of the other hole.

Next, smooth out the braid to its original length, being careful not to apply so much pressure that the enamel on the wire is scratched. Check with an ohmmeter to make sure the wire and braid are not short circuited. There are several types of enamelled wire (e.g. Formvar, Nylclad) that have an extremely tough covering, and the use of one of these is recommended. The covering is somewhat difficult to remove for soldering, but the use of the wire will insure against an inadvertent short-circuit to the outer conductor of the coaxial line.

It is important when assembling and wiring the *Monimatch* that good symmetry be maintained. Each end of the length of the RG-8/U should be connected in the same way, with at least two connections made between the outer conductor and the coaxial connectors. The ground connection for R1 and for the 0.001μF capacitor should be the midpoint on the outer conductor of the RG-8/U. The outer conductor is connected to the chassis only at J1 and J2; the cable is stiff enough to be self-supporting and can be dressed away from the chassis at other points.

A dummy aerial of the same resistance as the Z_0 of the line should be used to adjust R1. Make the connecting leads

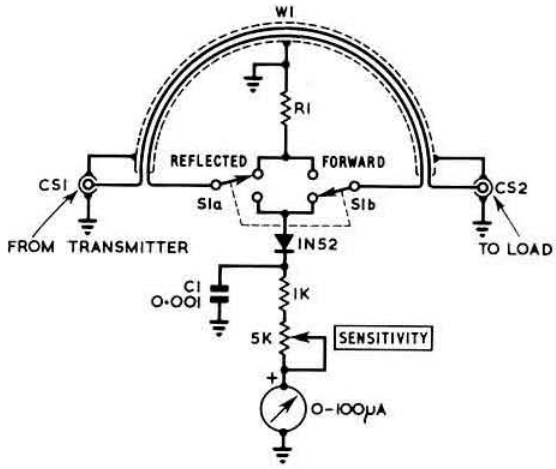


Fig 5. Circuit diagram of the Monimatch.
$CS1_1$, $CS2_2$, coaxial sockets.
R1 Nominally 33 ohms. See text for adjustment procedure.
S1 2 pole double throw rotary switch.
W1 14 inch length of RG-8/U with length of No. 20 enam. inserted under outer conductor. See text.

as short as possible. Only 30 or 40 watts will be required at 21 and 28 MHz to give close to full-scale deflection, and a dummy load capable of handling this power for a short time can be made from thirteen 680 ohm one watt resistors in parallel. Try several different 33 ohm resistors (with slightly different dc resistances) at R1, and use the one that gives a minimum reading with S1 at "Reflected" when nearly a full-scale reading can be obtained with S1 at forward. A final test on the *Monimatch* is to reverse the transmitter and local connections; a good minimum should be obtained with S1 at forward.

The television installation

Quoting GPO Radio Interference Group here, it is required that the aerial system for the domestic television set must be up to the standard required to give adequate reception for the field strength available in the locality of the complainant. This statement may well leave a lot to be desired in some cases of tvi and it is unfortunate that the amateur is in no position to offer constructive criticism to the complainant as it is, strictly speaking, none of his business. However, diplomatic advice given freely together with a demonstration of clear reception, as in the case of the amateur's installation (it is hoped) may well yield positive action on the part of the complainant to improve his own installation.

A very common cause of tvi break through is due to the braiding of the coaxial cable not making contact on the casing of the aerial plug. In fact, for some reason, a lot of people in the trade, when installing television systems merely offer the coax feeder to the aerial plug and just bend the excess end of the live conductor over the centre pin of the plug and rely on this as a lasting and permanent joint. This is to be deprecated. The centre should always be soldered to ensure an adequate connection. Similarly, the connections

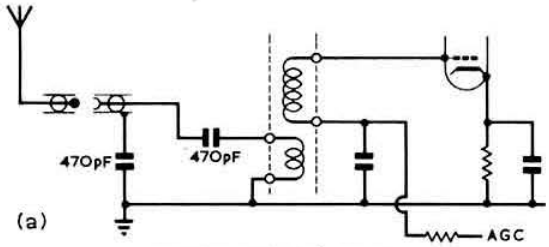


Fig 5(a). Valve rf stage.

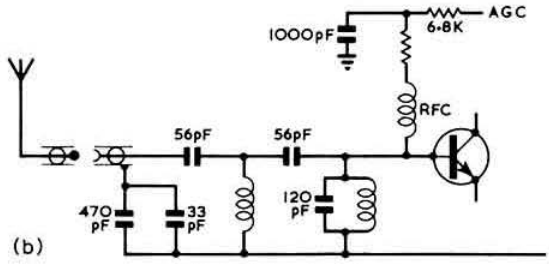


Fig 6(b). Solid state rf stage.

at the aerial itself will, in time corrode and cause a degree of self rectification on the connection when in a strong radiation field such as a local amateur transmission.

If it is established that the aerial system is beyond reproach, the next stage is to consider the television itself. Interference may be caused in the following ways:

(*a*) Harmonics or spurious signals breaking through at the television carrier frequencies.
The only remedy here is to fit an efficient low pass filter to the amateur transmitter. It is to be noted that the GPO Interference Group will have measuring equipment to confirm the presence of harmonics.

(*b*) Front end saturation of the television turret tuner at the signal frequency used by the amateur.
This is by far the most common fault experienced when investigating interference cases and it justifies explaining in some detail the manner in which this fault condition arises.

Since most television sets are of ac/dc type, it is necessary to allow for the user making the mistake of connecting the power lead the wrong way around and having the chassis at full mains potential, the aerial socket is therefore arranged to be coupled to the tuner via two capacitors, and in some models, capacitors paralleled with high value resistors. (See Fig 6). A British Standard requirement is that the reactance of the capacitors will be sufficiently high at 50 Hz to prevent a lethal electric shock to anyone handling the aerial plug. To conform with this, the value of capacitance is generally made about 470 pF. This offers reactance of about 7 megohms at 50 Hz and as low as 4 ohms at Band 1 television frequencies (50 MHz) so that as far as the television signal is concerned, it is offered a very low impedance and the system is matched into the rf amplifier. Unfortunately, when the reactance at 3.7 MHz is considered, it looks about 100 ohms and bearing in mind that the average length of down leads from the aerial is between 30 and 60 ft, the braiding of the coaxial feeder becomes a very efficient vertical aerial which is offered a reasonable terminating load, i.e, the reactance of the earth isolation capacitor which will be about 100 ohms. The rf induced on this braiding is developed across this capacitive load resulting in a potential which can be in the order of volts applied to the rf amplifier tuned circuit and consequently, since this is a wide band, low Q circuit, the rf amplifier grid is overloaded at the signal frequency of the amateur transmitter.

This condition is appreciably worse when considering the more modern transistorised tuner unit. Since the transistor input impedance is much lower than the valved version, the tuned circuit is virtually wide open and usually, for the Band I configuration, takes the form of a low pass filter. This is to give a degree of isolation to image problems with Band 2.

Having discussed the problems at 3.7 MHz, the same situation applies at 7 MHz. The downlead braiding has large interfering currents induced in it and the capacitive load now appears to be a value of about 50 ohms. This load again develops a considerable voltage across the rf amplifier. As the amateur frequency band in use increases, the capacitive load reduces in value, appearing as a rather lossy earth, i.e. at 14 MHz as 25 ohms, at 21 MHz as 16 ohms and at 28 MHz as 12 ohms, resulting in the longitudinal or interfering currents being brought to about earth potential and this source of overloading being reduced. Unfortunately, as the position is improved as far as the longitudinal currents are concerned, the live element of the television aerial becomes more efficient and the interfering signal is fed directly down the inner of the feeder.

In so far as the lower frequencies are concerned, i.e, 80 and 40 metres, it is of no surprise to find that the conventional

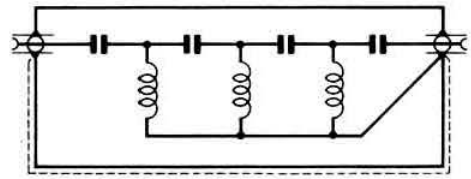


Fig 7. Belling-Lee sockets connected to metal casing forming a connection from input to output of the filter.

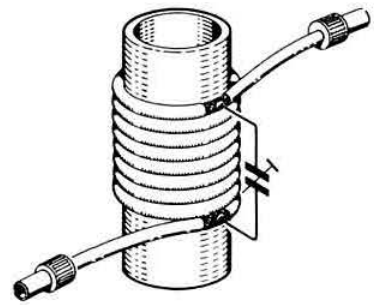


Fig 8. The coaxial outer forms a parallel tuned circuit at the interfering frequency.

high pass filters as recommended by the Post Office have little or no effect when inserted at the aerial socket of the set in question. The reason is that the filter only affects the signals on the live or inner leg of the coax feeder, the braiding or earth leg being connected from input to output, (see Fig 7). A method of overcoming this problem is to arrange that the coax is wound into a coil with the metallic braiding exposed at each end, a variable capacitor connected across these points and the circuit resonated to offer a high impedance at the interfering frequency (see Fig 8). This is the basis of one of the Post Office filters available, the type 49/a. The high impedance available at resonance in series with the comparatively low reactance of the earth leg capacitor results in only a small proportion of the interfering signal being applied to the rf stage, (see Fig 9). The disadvantage of this type of filter is that it is a single frequency device and is unsuitable for more than a limited portion of one band without re-adjustment. An improved version of this type of filter is again a Post Office type as described by G2BVN in the February 1969 edition of *Radio Communication*. This filter utilizes a pair of ferrite rings with thin coax feeder wound toroidally around them. Due to the closed magnetic loop, the inductance is very high for the number of turns used. The method of operation of this type of filter (see Fig 9(b)) is that the toroidally wound coax behaves rather like a 1 : 1 transformer. As far as the television signals are concerned, the flux is self cancelling and the effect of the transformer is to provide little or no loss. For longitudinal or interfering currents induced on both the braiding and live

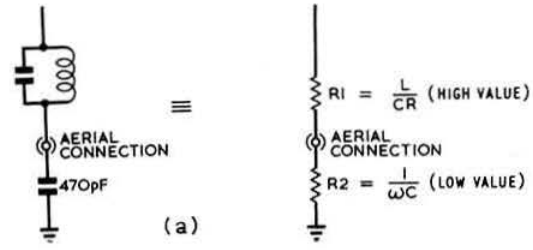


Fig 9(a). Operation of ferrite ring filter.

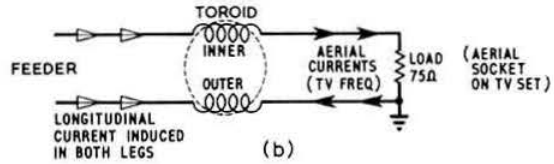


Fig 9(b). The longitudinal currents induced sees the above potential divider.

conductor, the flux adds and offers a high impedance to these currents and can be used as a wide band high impedance device.

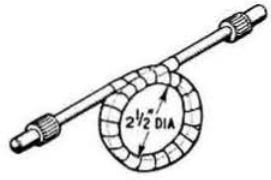
On the method of isolating the longitudinal current on

Fig 10. Utilizing ferrites in r.f. filters.

(a)

Two Faraday loops coupled side by side (magnetically)

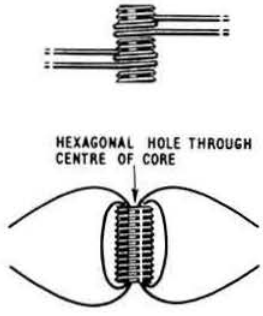
Insertion loss 6dB

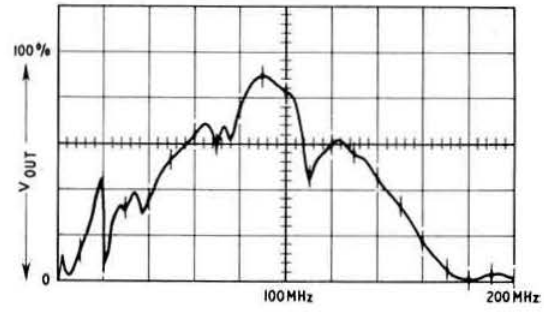


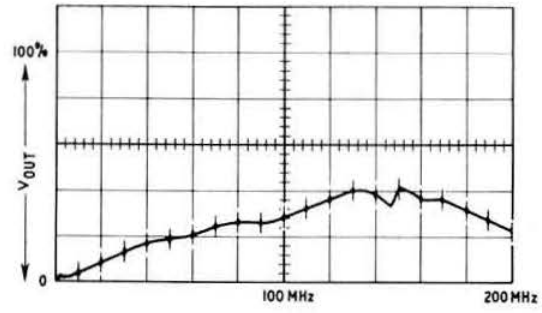
(b)

Low turn inductors wound on ferrite cores

Insertion loss 6 to 9dB







coaxial feeder, a lot of useful information has been published utilizing ferrite and a combination of low turn inductors behaving as wide band transformers. Single turn coupled Faraday loops also behave in a similar manner. The object of these devices is to arrange that there is insufficient inductance to provide coupling at frequencies lower than about 20 MHz but nevertheless ensure a reasonable transfer of energy from 50 MHz to 150 MHz. A great deal depends on the type of ferrite being used and of course the number of turns. Having constructed and carried out considerable tests on these devices, in general, they are successful to a point but do exhibit some insertion loss; see Fig 10.

A suitable filter which has been developed by the writer is one which utilizes an efficient wide band coupler followed by a high pass unit which results in a dc isolation of the feeder braiding followed by a network which attenuates all frequencies below 37 MHz. It has an insertion loss of 0·2 dB in the pass band and the attenuation on the lower portion is a minimum of 40 dB (see Fig 11). It is worthy of noting that this type of filter has been found effective in clearing all the cases of tvi caused by front end overload investigated by the GPO and myself in Region 10. Arrangements are being made to see if these units can be put into limited production.

There are however, oddities which do occur and the television set does not react to filter treatment. A case in point happened when my next door neighbour bought a new set on which my transmissions wiped out the picture. All tests proved negative and having exhausted the variety of filters available, the manufacturer was approached. It appeared that this model of television set, a *Bush* 167, has an agc line between the if chassis and the tuner which is particularly susceptible to pick up. The insertion of a 1 mH choke at the tuner end of this lead cleared the fault completely. It appears that the *Rank-Bush-Murphy* combine now issue a filter kit for this problem if approached by the dealer who supplied the set to the complainant.

Mains borne interference can also be eliminated by the use of a suitable filter although this problem should be solved by correct suppression of the amateur installation as described earlier.

Interference caused to a wired relay distribution system is perhaps best left to the Post Office and the contractor concerned and it is suggested that the amateur leaves the problem to them. If the outcome is unsatisfactory, contact the RSGB GPO Liaison and TVI Committee and explain the case to them.

This article has tried to cover the more frequent types of interference and the methods by which it is overcome. Naturally, there will always be cases which have not been covered here and it is suggested that the reader who has no success informs the GPO Liaison and TVI Committee and requests advice. However, in general, if the amateur ensures that his own station is in order, the Post Office Interference Staff will usually be very sympathetic as they can then concentrate on the television installation of the complainant.

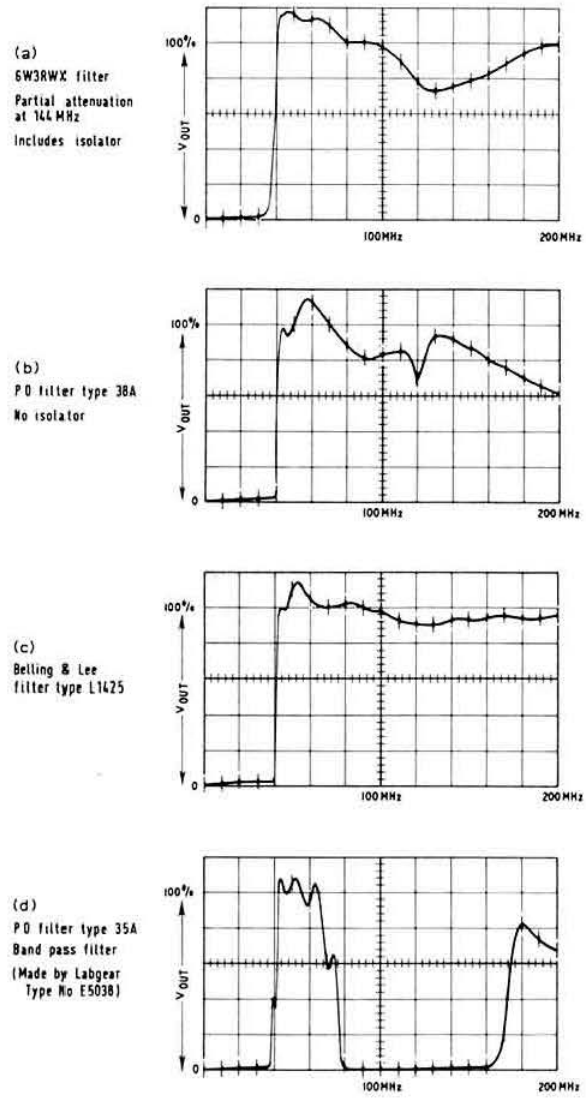


Fig 11. Characteristics of four typical filters. These curves are copied from actual photos of oscilloscope traces.

References

" Z Match Coupler." *RSGB Radio Communication Handbook*. Chapter 13.37.

" The Monimatch." *ARRL Handbook* 1967. (This material was reproduced with the permission of the ARRL.)

"The HZP Balun." H. D. James G3HZP. *RSGB Bulletin*, July 1966.

" High Pass Filter." R. F. Stevens, G2BVN, *Radio Communication*, February 1969.

" Harmonics and SSB." B. Priestley, G3JGO, *Radio Communication*, January 1969.

Project Oscar

By W. BROWNING, G2AOX*

FOLLOWING the formation of the new Radio Amateur Satellite Corporation, AMSAT, in Washington, DC, it now appears that action is at last being taken to put the AUSTRALIS *OSCAR 5* into orbit in the near future.

It is not a translator type like *OSCAR*'s *3* and *4*, but is the first Amateur Satellite built and designed outside the USA, and contains for the first time devices to stabilize the flight and so prevent signal fading, with seven telemetric channels to check this and the operating conditions, as well as now well known *HI HI* signal in Morse. Its object is a test bed for future Amateur Communications Satellites to be put into orbit with solar batteries for inter-continental communication.

It will transmit continuously the usual *HI HI* signal and then seven sets of telemetry on 144·050 MHz, with a power of 50 milli-watts, and simultaneously the same information on 29·450 MHz with a power of 250 milli-watts, on Fridays, Saturdays and Sundays only, in order to conserve battery power. The two transmitters are run from two separate 20 volt alkaline-magnesium batteries with an expected life of about two months.

The *HI HI* signal with two tones will be on afsk, and so no bfo is necessary. The telemetry channels are all amplitude modulated and are as follows:

Channel 0	*HI HI HI*
Channel 1	Battery current drain in milliamps
Channel 2	X Axis rate of tumble
Channel 3	Battery voltage
Channel 4	Y Axis roll
Channel 5	Internal Temperature °C
Channel 6	Z Axis spin
Channel 7	Outer Skin Temperature °C

In the cases of Channels 1, 3, 5 and 7 the parameter is specified by the audio frequency of the signal, and not by any time count as previously. Each of these eight channels will be on for 6½ seconds, giving a total time cycle of 52 seconds before repeating. The frequencies will vary between 500 Hz and 1500 Hz and the formulae for converting the channel frequency to milliamps, volts or °C are given below. Graphs can easily be drawn if examples are worked out for 600, 900, 1200 and 1500 Hz for each of these four channels:

Channel 1 Current in milliamps $= \frac{\text{freq (Hz)}}{9} - 63$

Channel 3 Battery voltage $= 27{\cdot}5 - \frac{\text{freq}}{80}$

Channel 5 Internal Temp °C $= (\cdot0642 \times \text{freq.}) - 34{\cdot}1$

Channel 7 Skin Temp °C $= (\cdot0692 \times \text{freq.}) - 36{\cdot}9$

These figures are different to those originally issued owing to a change in value of the thermistors, and so the published graphs must be amended accordingly.

In the case of channels 2, 4 and 6 for the rate of tumble, roll or spin, the actual frequency is of no interest, but the number of variations from high to low frequency per minute will indicate the rate of tumble, roll or spin on each axis, and should be quoted on the report form as "X rpm, Y rpm, Z rpm."

Special report forms have already been sent to all Societies, Clubs and amateurs that have sae lodged with G2AOX, but further supplies are available from him on receipt of an sae. Each form covers 20 receptions. Reports on any other form **cannot** be accepted or sent on.

All report forms should be sent to G2AOX, who will tabulate results, and acknowledge by a special QSL Card via the bureau unless an sae is sent for a direct reply. These forms will then be sent to Melbourne University.

It is possible that this satellite might be put into a retrograde type of orbit that is now being used, ie one with an inclination angle of over 90°, and this means that it will be travelling in a direction opposite to the rotation of the Earth, and so always moving Westwards relative to the Earth at all times. This type of orbit does not affect the normal type of orbital data calculations as published in the January/February 1966 and June 1968 issues of *Radio Communication*, except that the graphs Figs. 2, 5, 6 and 8 are no longer applicable.

To set up an orbit ring on a globe, as described, it is only necessary to go on counting from 90° down the calibrated curved support bar; ie if set to 80° this equals an orbit on 100° Incl: angle (90 plus 10), but the arrows showing the direction of travel must be reversed. A launch from the usual site in California would then go away across the Pacific Ocean, over E. Antarctica, then up over Suez, Greece, S. Norway and the tip of N.W. Canada, and away again over the Pacific. In the UK therefore it would first come within range about three quarters of the way round its very first orbit from launch.

At a height of approximately 900 statute miles in a near circular orbit, this would ensure that three consecutive orbits should be heard when travelling S/N and four or five when travelling N/S in the UK, and at this height its direct line of sight to the Earth would be a circular area of approximately 4350 miles.

As usual, it is not expected that there will be any advance information regarding the time and date of the launch, but G2AOX will no doubt be heard on 145 MHz at 1900 GMT with any orbital figures directly afterwards, with possible early predictions, which will also be given out each week as previously on the Sunday News Bulletin.

References

Project Oscar, W. Browning, G2AOX, *Radio Communication*, February 1968.

Keeping Track of Oscar, W. Browning, G2AOX, Part 1, *RSGB Bulletin*, January 1966; Part 2 *RSGB Bulletin*, February 1966; Part 3, *Radio Communication*, June 1968.

* Project Australis, Regional Director for Europe and Africa, 47 Brampton Grove, Hendon, London, NW4.

THE MONTH ON THE AIR

A Monthly Feature by JOHN ALLAWAY, G3FKM

ONCE again the time of the Society's annual Exhibition has come round and the writer of this chapter of *Radio Communication* would like to welcome all those who are reading this publication for the first time with the hope that they will join the Society and help to strengthen the Amateur Radio movement in the United Kingdom and overseas.

This would seem to be an appropriate time to thank those who supply so much of the information which goes towards the preparation of *MOTA*. Without the information contained in the various news sheets and publications listed at the end of the chapter this column could not be produced. Unfortunately some of the information given has lost a certain amount of topicality by the time it reaches the reader and those who are keen on up to the minute information may be interested to have details of how they may obtain copies of the several news sheets available. Without doubt the most useful source of up-to-date information available to the UK amateur or listener who is interested in DX is the *DX News Sheet*, produced by Geoff Watts, 62 Belmore Road, Norwich, NOR 72 T, Norfolk. This is a weekly sheet and currently costs 40/- for 56 issues by 1st class mail, or 64 issues by 2nd class mail. It can also be obtained by overseas stations by air or surface mail. Overseas publications include the *DX'ers Magazine* which is available by air mail from W4-BPD, Gus Browning, Route 1, Box 161-A, Cordova, S.C., 29039. USA. The cost of this at time of writing was $23 per year of 45 issues. *DX'press* is also produced at least 45 times yearly and costs 15 Dutch Guilders by surface mail to European subscribers. It may be obtained from VERON, Postbus 9, Amsterdam, Holland, and is printed in English. Subscriptions to overseas publications may be arranged through any bank.

Readers will be sorry to learn that W2LV, President of the NJDXA, passed away during July. Walter was of course a well-known figure in the DX world.

Top Band News

Stew, W1BB, is now home from hospital and reports the first ever Trucial Oman-UK contact on 160m. This was between MP4TAF and G3XAQ and took place on 26 July. More skeds are being arranged. Signals from DHJ have been received in the US on many nights, and PY2BJH has been heard by a number of E. Coast US stations. It is sincerely hoped that the segment of the band between 1825 and 1830 kHz will be avoided by the majority of US stations during DX openings in order to leave a " DX window " where those who are attempting to work outside the USA will be able to copy incoming DX signals.

G3OSU is spending a six month spell as GC3OSU (Jersey) and invites anyone wanting a GC contact to look for him near the low end of the band in the evenings. His address is 1 Savile Court, Savile St., St. Helier.

According to *NARS News* a new set of regulations for Nigerian amateurs was released in June and 5N2 stations are once again permitted to use 1·8 to 2·0 MHz with a power input not exceeding 10 watts.

The 12th Jamboree-on-the-Air

This year's Jamboree-on-the-Air will take place between 00.01 on Saturday 18 October and 23.59 on Sunday 19 October. Although the event is limited to these hours it is emphasized that it is *not* a contest and there are no prizes for making the most contacts. It should be remembered that UK regulations do not permit anyone without a transmitting licence to speak on the air, and this restriction of course includes this event.

News from Overseas

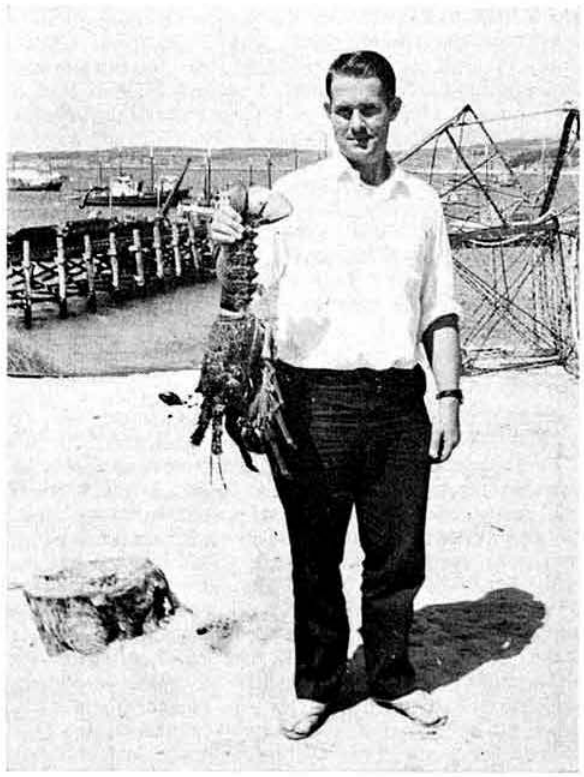
MP4TDB, writing on behalf of the RAF Sharjah Club Station MP4TCE, asks that cards for other Trucial Oman stations be sent to the addresses appearing in *QTH Corner* and not via MP4TCE. Michel himself is from Belgium and specialises in QSO's with French speaking amateurs. Other operators of MP4TCE include Spider, MP4TCS, the club's Chairman who comes from the UK, and Bob, MP4TCZ who is also English and is a keen stamp collector. The club is on the air usually from 10.00 to 14.00 around 21310 kHz, and then until 19.00 on or near 14180 kHz. Later operation occasionally takes place at weekends, and some 40 and 80m operation is envisaged in the near future. Equipment consists of a KWM2A with a 30L1 linear and antennas are horizontal dipoles.

ZB2AV has now left HMS *Fearless* and is back in Gibraltar for a further two years. He operates mostly around 14010 kHz cw and 14260–14280 kHz ssb and says that he finds that the RNARS 14280 kHz frequency is jammed by an rtty station although he does try to use this spot. Ron points out that normal inland UK rates of postage apply to ZB2 and that mail from the UK sent first class arrives by air in two days. Other stations currently operational from the Rock are ZB2BC, ZB2BG, ZB2BO, and ZB2U.

Fred Sawyer, ex-5Z4KO, left Manchester during August en route for South Africa. He will be in Johannesburg for three or four months before moving to a permanent QTH in Salisbury, Rhodesia, where he hopes to be back on the air with a ZE call early in the New Year.

W3HNK (PO Box 14, Norwood, Pa 19074, USA) says

* 10 Knightlow Road, Birmingham 17. Closing date for the November issue is 14 October and for the December issue—12 November.



A piece of good DX in the bag at Chatham Island.

It was thirsty work operating from Chatham Island, ZL1DE and ZL2AFZ.

that he is available to help out any overworked DX station looking for a QSL manager. He invites anyone interested to write to him for full information with no obligation implied. A full list of Joe's current protéges was given on page 548 of August *MOTA*.

G3MCN reports the receipt of a letter from Iris and Lloyd Colvin in which they say that all QSL cards have been sent out via the YASME Foundation. Anyone still needing confirmations for contacts with their expedition is invited to write to YASME Foundation, 5200 Panama Avenue, Richmond, Cal, USA.

Van, W4UAF/KH6, will be leaving KH6 early in September and moving to Norfolk, Va, where he hopes to be on the air again as W4UAF in about three months. QSLs for all contacts with W4UAF/KH6 are handled by DL7FT.

Stephen Gibbs, VQ8CC, has very kindly supplied an up to date list of amateurs in the VQ8 area, with their current QTH's. Cards for VQ8CDC and VQ8CDB should be sent via VQ8CD. The addresses of all those not given in recent *MOTA*'s will be found in *QTH Corner*. All others should be sent to their callbook addresses or via the VQ8 QSL Bureau, PO Box 467, Port Louis, Mauritius.

9M2DQ remarks on comments which he has seen from time to time concerning apparent lack of activity from the UK. Between 1 January and 25 August this year he worked 14 G2 plus twos, 12 G2 plus 3s, 12 G3 plus 2s, 112 G3 plus 3s, 6 G4s, 7 G5s, 10 G6s, 12 G8s, 4 GCs, 0 GDs, 9 GWs, and 15 GMs—a total of 216 different stations. He is impressed with the many new calls worked in the G3V, W, X, and Y series and says that if these newcomers can beat tvi then the others should be able to! James has just completed the erection of an 80ft vertical antenna with 16 buried radials each 75 ft long so hopes to be putting out a much better 40 and 80m signal. He finds 12.30 to 22.30 GMT good for lf band working.

Awards

The USSR-50 Award.

Issued by the Central Radio Club of the USSR, PO Box 88, Moscow.

Requires (European applicants) 50 QSOs with different U stations including at least one with each of the 15 republics, two with Moscow and two with Leningrad. Non-European applicants need five republics and one each with Moscow and Leningrad. All contacts must take place between 00.00 15 October and 24.00 15 November. This award is to celebrate the 52nd Anniversary of the October revolution. A list of claimed contacts (showing date, mode, and band) certified by a national radio club or " official radio club " should be submitted, no QSL's are needed and there is no charge. This certificate is also available to listeners.

The N.I.DX.A. Award (Northern Illinois DX Association)

DX stations require QSOs with 7 members, US/VE stations 15 members, since 1 January, 1968. Log extracts may be submitted but will be checked against members logs, if QSLs are sent sufficient return postage must be enclosed. A fee of 5 IRCs or 75 cents should be enclosed with applications which should be sent to: Bud Frohardt, W9DY/W9GFF, 3620 N. Oleander Ave, Chicago, Ill 60634, USA. A membership list may be obtained in exchange for an sae and IRC. W9s ARV, BZW, BPW, DWQ, DY, EXE, FKC, GXH, ILW, JUV, LKJ, NZM, OHH, OPD, QQN, WYB, OD, K9s CSW, KDI, KYF, LUI, VLE, WEH, and WA9IVL are known to be current members.

Contests

The 1969 CQ World Wide DX Contest.

00.00 25 October to 24.00 26 October (phone).
00.00 29 November to 24.00 30 November (cw).

This covers all bands 1·8 to 28 MHz and the object is for amateurs throughout the world to contact as many others in as many zones and countries as possible in the 48 hours. QSO's with stations in one's own continent count one point, with other continents three points. QSO's between stations in the same country earn no points but may be counted for zone or country multipliers. Entries may be (1) single operator single or multi-band, (2) multi-operator (all band only) single transmitter (only one signal permitted), or multi-transmitter (only one signal per band permitted). Contestants exchange RS/T plus zone number (for the UK this is 14). Two types of multiplier will be used—a multiplier of one for each zone contacted on each band, and a multiplier of one for each different country worked on each band (the CQ Zone map, DXCC Country List and WAE country list are the standards). Only one QSO with the same station on the same band is permitted. To be eligible for an award single operator stations must show at least 12 hours, and multi-operator stations at least 24 hours participation. First place certificates will be winners in each category in every participating country and call area of the US, Canada, Australia and UA9/UA0. Summary sheets, zone maps, and log forms (40 QSO's per sheet) are available from G3FKM in exchange for a large sae. Please give an estimate of the likely number of sheets needed.

The Lebanese DX Contest.

00.01 4 October to 23.59 13 October.

All bands and modes but stations may only be worked once on each band.

The object is to work as many OD stations as possible; contacts from Europe, Africa and Asia count 1 point on 10, 15, and 20m, 2 points on 40m and 3 points on 80m. QSOs from elsewhere count 2, 4 and 6 points respectively. Final score is the total QSO points on all bands. A list of contacts with date and time, band, and points claimed should be posted before 1 November to: RAL PO, Box 1217, Beirut, Lebanon. The overall winners will receive two air tickets to Beirut from any point on the Middle East Airlines routes plus a double room at the Cadmos Hotel, Beirut, for one week. Top scorer on each continent will receive a silver cup, and top in each country a special certificate. This contest is being held to commemorate the 20th anniversary of the formation of the Lebanese Amateur Radio Association (RAL).

QTH Corner

C31CL } via W7CRT, John Knight, 4275 Hilldale Av, Las
C31CK } Vegas, Nev, USA.
CR6CA via VE3GNM, G. Muscat, 3914 Casgrain Dr, Windsor, Ont, Canada.
K6JGS/HK0 via W4VPD, Enos Schera, 8254 SW 37th St, Miami, Fla, USA.
KC6ES E. Suguyama, APO, San Francisco, Calif, 96940, USA.
KH6EDY Box 36, FPO, San Francisco, Calif, 96614, USA.
KX6VF Box 444, APO San Francisco, Calif, 96555, USA.
MP4TCE } via BRS26222, 1 Grove Rd, Lydney, Glos, GL15 5JE,
MP4TCS } or via G2MI.
MP4TDB via ON5MG, Tervuren, Belgium.
MP4TCZ ARC, BFPO 64, GPO London.
MP4TCF via G3WET or PO Box 282, Abu Dhabi, Trucial Oman States, Arabian Gulf.
MP4TCT PO Box 309, Abu Dhabi, Trucial Oman States, Arabian Gulf.
PY7AWD via PY7PO, Rua Prof. L. de Castro 117, Campina Grande, PB, Brazil.
SV0WA PO Box 483, APO, New York, 09223, USA.
VK9BN St. Fidelis Cottage, PO Box Alexinhaven, TNG.
VP2MA via VE3BWY, Rev. H.Whyte, 2 Delbert Drive, Scarborough, Ont, Canada.
VP5MH via W4WRL, 407 SE Fifth St Delray Beach, Fla, USA.
VP9BK via VE2DCY, 8900 Lacordaire, St. Leonard de Port Maurice, Que, Canada.
VQ8CM Mico Palmyre, Frederic Bonnefin St, Forest Side, Mauritius.
VQ8CN Sam Boyjonauth, Gustave Colin St, Forest Side, Mauritius.
VQ8CO Rabindra Sooharah, Palma Rd, Quatre Bornes, Mauritius.
VQ8CS Jules Labat, Brown Avenue, Quatre Bornes, Mauritius.
VQ8RS Mauritius Amateur Radio Society, PO Box 467, Port Louis, Mauritius.
ZB2AV R. Hill, CPO's Mess, HMS Rooke, Gibraltar.
3V8AA via F5OJ, 26 rue d'Est—d'Orves, 92 Bois Colombes, France.
3V8MOL via W2GHK, Box 7388, Newark, NJ, 07107, USA.
4W1BF via F5XN, Maurice Delaplanche, 56 rue de Paris, 95 Villiers le Bel, France.
5A1TL via WB6WAA, Gerald Minnick, 1332 W 214th St, Torrance, Calif, USA.
9N1MM via W3KVQ/2, 2308 Branch Pike, Cinnaminson, NJ, 08077, USA.

RSGB QSL Bureau, G2MI, Bromley, Kent.

Results of the **1968 CQ WW DX Contest (Phone)** in detail have now been received. UK entrants were listed as follows:

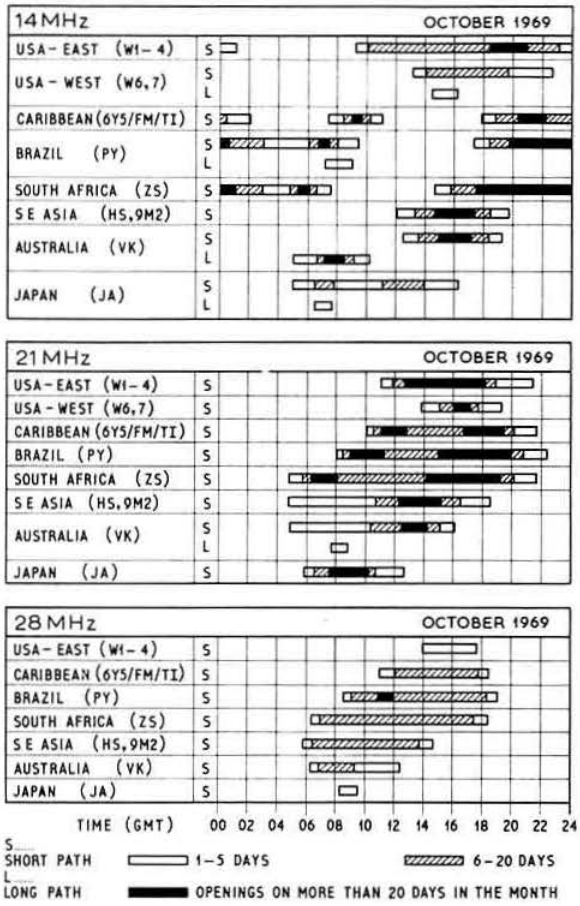
Single Operator

		Points			Points
GW3NWV (All bands)		**721,191**	G3TXZ (28 MHz)		50,876
GM5AHS	,,	**344,832**	G2NH	,,	36,608
G6PD	,,	**219,240**	**GM3BCL**	,,	**30,521**
G3XKV	,,	130,530	G3XFW	,,	7,520
G2AJB	,,	65,736	**G3HCT (21 MHz)**		**576,007**
GM3CFS	,,	50,512	G3VZD	,,	158,159
GD3AIM	,,	**27,144**	**G3SHM (14 MHz)**		**43,296**
G3MWZ	,,	5,760	**GM3SSB**	,,	**19,198**
G2BOZ (28 MHz)		**241,998**	G3OUQ	,,	16,992
G3LSF	,,	239,058	**G5HZ (7 MHz)**		**8,480**
G3VZJ	,,	234,255	**G3IAR (3·5 MHz)**		**15,714**
G3KMA	,,	178,143	G3RHM	,,	14,723
G3WJN	,,	126,730	**GM3RFR**	,,	**9,456**
GW3SFC	,,	**94,527**	**GM3VTB**	,,	**8,360**

Multi-operator, single transmitter

G3KDB (G3's KDB, LNS, NLY) 1,648,578 points.
G5YC (Club) 1,255,499 points.
G3WYX (G3's HTA, RUV, TUW, WYX) 919,240 points.

Propagation Predictions



Propagation conditions will further improve on **28 MHz** after a longish summer break. However, the Eastern USA will only come through under favourable conditions and traffic with the Western USA will be difficult. On the whole traffic with North America will improve later in the month. There will be certain improvement in daytime conditions on **21 MHz**. Because of seasonal changes this band will fade out from about 22.00 to 23.00 GMT towards the end of the month, to re-open again in the early morning. Short-skip conditions will only occur under exceptional conditions on 28 and 21 MHz during the winter months. The season will start again in May. **14 MHz** will lose its role as the night-time DX band because of the longer nights. Only traffic with South America and Africa should be possible during the second half of the night. **7 MHz** will take the place as the night-time DX band, especially during the latter half of the night. There should be good conditions on this band; unfortunately they are often spoilt by QRM from foreign stations. In daytime this band will be ideal for local and European traffic without interruption by the dead zone. The distances on both 7 and 3·5 MHz will increase during the course of the month. There are chances for DX on **3·5 MHz** when the path lies in darkness and QRM permitting. Local traffic will be interrupted by the dead zone in the early hours of the morning.

The provisional sunspot number for August 1969 was 90·9 with the periods of greatest activity occurring at the beginning and end of the month. In accordance with the normal behaviour of the 11 year cycle the rate of decline is considerably slower than the rate of increase. Predicted smoothed sunspot numbers for December 1969, January and February 1970 are 92, 90 and 89 respectively.

G8FC (G3's GNS, JUT, SVG, XIN) 467,798 points.
G3VUM (G3's UJI, VDB, VNR, WZM, XIR, G8AZP) 223,880 points.
G3KMI (G3's TSM, UPK, VRW, WHJ, WNU, WXC, WZH, XBX, XJM) 176,633 points.
G3EBH (G3's EBH, NIC, TGK) 138,425 points.

Multi-operator, multi-transmitter

G3CXX (G3's XIK, XLX, GI3UKS, GW3XST) 259,808 points.

Congratulations to the certificate winners who are listed in bold type.

Results of the 1968 **Independencia de Venezuela** Contest have now been received. Highest European score was achieved by UP2NV (65,043 points). There were 15 UK entrants—led by **G6LK** (5,320 points) and **GM5AHS** (420 points) who were certificate winners in their respective countries.

The IARU Region II World Wide Contest.

00.01 11 October to 23.59 12 October.

All bands and modes. Stations outside Region II (N and S America) work only Region II stations for which they gain six points per QSO. A multiplier of the number of countries worked on each band is used. Exchanges consist of RS/T plus serial QSO number starting from 001. Separate phone and cw logs should be submitted together with a summary sheet listing all scoring information and the category (single or multi-operator) and name and address of the entrant. They should be sent to IARU Region II, Box 4097, Lima, Peru, before 31 December.

DX Miscellany

To celebrate the 200th anniversary of Captain Cook's landing in Australia holders of VK licences will be permitted to change their prefix from VK to AX for the year 1970. Special QSL cards are being supplied by the Australian Tourist Commission and a special award (details of which will be given in a later *MOTA*) has been drawn up. Another special prefix—9V0—was used by stations in Singapore between 9 August and 9 September in connection with the 150th anniversary of the founding of that city. Stations in Holland taking part in the Idzerda Memorial Contest in September were permitted to use the PD3 prefix.

There are now 50 licensed amateurs in the Faeroe Is, about 25 of whom are currently active. Amongst these are OY's 2A, 2H, 2X, 2BS, 4OV, 4OY, 6NRA, and OY9LV who will be using a quad antenna in the near future.

It now seems that all the contacts which have been made

with the station signing " HH9DL " on cw were with a pirate who is thought to be in the US.

Jacques, XT2AA, has been reported on 21280 kHz between 16.00 and 17.00 working European stations. He often appears on 21275 kHz at 18.00 on Saturdays and Sundays when he attempts to work from a list prepared by WB2VAE a little higher in the band. He has also been heard on 14100 kHz.

4J0FR (cw) and 4L0CR (ssb) were the call-signs used by the University of Moscow Amur River Expedition.

It is now understood that Thailand has withdrawn its objection to Thai amateurs communicating with those overseas and contacts with HS nationals will henceforth count for the DXCC award. The only known Thai operator is Chankij, HS1CB. The validity of non-Thai operators will now depend on reciprocal licensing arrangements which may be announced in the near future. It seems that the WB2WYX/HS operation is not an authorised one, contrary to the information given in September *MOTA*.

YK1WB has been reported on 14 MHz ssb and is believed to be the son of Rasheed YK1AA. He also asks for QSL's via PO Box 35, Damascus, Syria.

It has now been confirmed that the station using the call-sign 7G1CG and pretending to be in Guinea was not in fact operating from that country. QSL manager WA3HUP will be returning all QSL's received to their senders.

Ulli, ex-7P8AR, is now in the Republic of South Africa and has the call ZS1UD. He may be reached at 35 Bellvue St, Kloof Nek, Cape Town, and anyone needing confirmation of contacts made with him when he was ZS8L, ZS9D or 7P8AR is invited to get in touch with him.

DXpeditions

Gus, W4BPD, having decided to abandon any further attempts at operating from Indian Ocean islands during the typhoon season, returned to the US in mid-August. He is talking about returning to the area next spring, and one source says that a deposit has been made for the use of a vessel to take him to Blenheim and Geyser Reef amongst other places. The question of " country " status of the various reefs he has already visited has not yet been decided. They are said to be uninhabited and untenable at high tide, with only crabs and ants living there. It is understood that Gus's equipment was not lost when the trimaran capsized.

OD5BZ, who has been trying to obtain permission to operate from **Qatar** for some time, now hopes that he may be able to use his MP4QBR call in November or December.

PJ0DX will be the call-sign of the W3MSK/W4BVV group whilst operating from the island of **Curacao** during the CQ WW DX contest on 25 and 26 October. Operators will include W3MSK, W4BVV, K3EST, W3ZKH, W3AZD, K3NPV, K1ANV/3, and W6RR. Frequencies to be used are given as follows: 160m—03.00 to 06.00 on 1826 kHz (tuning own frequency). 80m—3799 kHz (when band is open). 40m—7090 kHz listening for Europe. 20m around 14195 or 14235 kHz. 15m—21285 kHz 11.00 to 16.00 for Europe only. 10m—28575 kHz 11.00 to 16.00 for Europe only.

The **Cocos Is** (TI9) trip envisaged by K6JGS/HK3 and HK3VA was cancelled due to bad weather. TI2BF is reported to have already made arrangements to hire a boat for a ten day trip (costing $2100) in late January or February. They plan to take along 7 operators as well as 10 crew members, and hope to have two stations active on cw and ssb on all bands 10 to 80m for five or six days. Operators are expected to be HK3VA, TI2EF, K6JGS/HK3, W9FIU, K9KWN, WB8KBK, and two others if volunteers can be found. In the meanwhile TI8JI is reported to be planning a visit to the islands during the first week in December.

ZS5PG operates on the hf bands from Pietermaritzburg. Jack has many friends in the UK acquired during periodic visits during the low periods of the sunspot cycle.

XT2AA hopes to be in **Mali** during November and December and thinks that he will be able to obtain a TZ call. There is some activity by " TZ1NE " at present, but his status is unknown. K4PHY will shortly be in **Cameroun** and has some equipment with him, he will try to obtain a TJ call.

XE1J, Jose, who has been mentioned previously in connection with an expedition to **Revilla Gigedo,** says that he hopes to be able to go there this autumn, probably in October. The Government boat goes there once a month—usually around the 6th—and stays for 24 to 48 hours.

It is understood that a decision has been reached that Rockall Is will count as a " country " after all. With the availability of reciprocal licences the competition to stage an expedition to the rock should be keen!

According to the *West Coast DX Bulletin* DL7FT is hopeful that plans to visit **Albania** may materialize this autumn. Information indicates that a licence would cost $500 plus $200 " to the guy who gets the licence "! Also, two security guards would be assigned to monitor all communications and the operator would also be expected to pay for the cost of these two gentlemen. Further news will be awaited by many with great interest.

VE3EUU will be in the Caribbean in the latter half of October and expects to operate from **St Kitts** (VP2K), **St Lucia** (VP2L), and **St Martin** (FS7) and also possibly from Martinique and Anguilla.

More details of the forthcoming visit to **Lord Howe Is** by VK2BKM/VK2 are now to hand. Karl will be active mostly on cw between 16 and 24 October and on ssb between 25 and 29 October. Frequencies are given as: 3525, 7005, 14060, 21060, and 28060 kHz (cw); 3690, 7075, 14160, 14260, 21260, 21360, and 28560 kHz ssb. QSL's should be sent via W2CTN (sae and IRC please).

CHC Good Will Programme

The CHC Good Will programme exists to assist amateurs

and swl's to obtain Call Books, a book on US Counties or a book on awards. There is no charge and the books are available throughout the world by the generosity of US amateurs. The books are: 1. Amateur radio call books—US and DX. 2. US Post Office Directories—a must for US county hunting. 3. CHC Awards Directories. Requests should be directed to the manager of the CHC International Good Will Programme, Earl A. Gaesser, W2ECY, 33 Buchan Park, Rochester, N.Y. 14605, USA.

Band Reports

Conditions seem to have been quite good during the last month with remarks being made about improvements on all bands. Signals from VO1FG at 21.40 on 80m appear to have been unusually early whilst at the other end of the spectrum 10m has been starting to produce signals from Asia and Australasia and should be really interesting by the time this is being read. As usual 20m has been open all day and night, and good signals from the Far East have been reported in the late evening. Many thanks to the following for providing logs for the compilation of this section: G2BW, GW3AX, G3HB, G3KDB, G3NMH, G3TZU, G3UYM, G3WNT, G5JL, G8VG, BRS2098, BRS25429, BRS26870, BRS30694, A5489, A6098, A6179, A6248, A6254, and A6671. All calls listed in italics were on cw, and all others on ssb unless otherwise stated.

80m. 01.00 9E3USA, 9G1DY. **02.00** HC1PC, HI8SM. **05.00** *VP9GJ, ZL2GQ* (almost daily), *6W8AA*. **20.00** HV3SJ, *UG6AD*, VK2EO. **21.00** GM3LHZ/A (Shetland Is—separate country for WAE), JW2QK, *3V8NC*, 5A2TR, 5Z4KL. **22.00** CR4BB, DJ5JK/CT3, PY's 1MB, 1NBF, 7ASQ, 9HL, VP8KO, VQ8CC, VS9MB, YA1HD, ZS6AK, 5Z4KL/A/5X5, 9J2DT.

40m 01.00 VP5AA. **02.00** *CX3BH, KZ5II, LU4ECO*. **05.00** *CO2BB, HP1HH, HR3JP*, VP2's AZ, GTL. **07.00** CE2SB, VK7AZ, ZL1AGO. **19.00** VP8KO. **20.00** *CR6IA*. **21.00** CT3/DL9VQ, *PY0AWD* (Fernando de Noronha). **22.00** *ET3USA, VK6RU*, ZP3AB, *3V8AA*, 3V8MOL, *5H3KJ*, 5Z4KL/A/5X5, *6W8XX*, 9X5's LM, SP. **23.00** *CE1AD*. **24.00** *EA9EO*, 6Y5GB.

20m. 00.00 K6JGS/HK0, 9N1MM. **05.00** KC4USN (S. Pole). **06.00** KC4USA, many KH6's, VP2KC. **07.00** FO8AA, VR2EK, VR6TC. **08.00** FO8's BH, BY, KJ6CF, M1B, *VE0MD*, VR2FT. **09.00** HB0AAI (QSL via HB9AAI), 4L0CR (Zone 19, USSR). **10.00** HB0XXA (QSL via WB6SCM), *HV3SJ*, KS6CQ. **13.00** C31BT (QSL via F5JB). **15.00** KG6AKR. **16.00** TT8AB (am), *W3AWU/YB6*. **17.00** AP5HQ, CE8AA, *CR8AI*, YB1BM. **18.00** I1WWW/P (Elba), " XV5X " (? pirate). **19.00** *UA1KED* (Franz Josef Land), 3A0CV (QSL via DJ1VP). **20.00** *DU1OR, FM7WF*. **21.00** CR9AK. **22.00** EA9ER, HH9DL, JD1AYB, KR6JT, VP5AA, YV7EC. **23.00** FP8CT.

15m. 11.00 DU1FH, *MP4TDA*. **12.00** *WG6ASE* (Guam), *3V8AA*. **13.00** *VS6AI*. **14.00** TJ1AR, VS5PH, 9V0PP. **15.00** KG6AKR, KL7MF, *MP4MBJ*, VK9XI, *5X5UF*, 9G1GS (QSL via K8BCK). **16.00** HV3SJ, VP8KD, VS6BC (QSL via GM3JDR), YA1SG, 9Y4AA. **17.00** *G2PL/SM6, TG4SR*, 9G1GD. **18.00** CP6GA, HS1CB, *KR8GF*, MP4BHH (Box 155 Manama, Bahrein Is), VP8KD, *VS9MB, 3A2ME* (QSL via ISWL), 3V8MOL, *9L1HC*. **19.00** *G6ZY/M/CN, W4VPD/KC4* (Navassa Is.), VP8's HZ, KL, ZP1AA, 5H3BY, 9Y4AA. **20.00** *G2YS/VE3*. **21.00** EA9ER. **22.00** *FY7YQ, HH9DL* (? genuine), *HI7JMP* (QSL via K3EST), *ZD8DB*.

1969 Countries Table

	1·8 MHz	3·5 MHz	7 MHz	14 MHz	21 MHz	28 MHz	Total
G3KDB	—	—	84	147	104	64	399
G3LNS	—	102	122	174	161	131	690
G3XYP	—	—	37	134	72	63	306
G3TZU	5	32	46	118	130	150	481
G2MI	1	33	35	125	98	52	345
G3UML	—	63	22	101	23	18	227
G3HCT	—	85	73	47	61	111	377
G3JVJ	12	70	24	81	18	2	207
G3KS	1	18	16	73	66	62	236
G3XBY	2	36	37	51	51	43	221
G3PEJ	4	4	20	59	24	32	150
G3VUM	4	4	8	70	51	57	194
G3VLM	1	16	18	59	24	32	150
G3VPS	3	15	15	61	27	20	141
G4RS	4	21	10	61	65	21	182
G3WPO	17	10	37	31	1	23	109
G8VG	2	25	26	30	52	44	179
G3IAR	2	23	21	25	23	26	120
G3PQF	6	13	12	30	8	5	74
G3VJG	—	2	19	9	6	54	90
A5390	9	87	69	170	163	104	602
BRS25429	4	64	90	164	114	74	512
BRS24529	4	55	80	153	94	75	380
A6148	8	64	58	119	101	82	432
BRS31164	4	52	47	127	107	81	418
A6254	6	32	22	128	156	87	431
BRS26870	5	37	42	107	82	60	333
A6278	1	16	27	118	67	16	217
A5662	18	31	31	127	114	86	407
A5154	2	35	18	111	83	62	314
A6248	2	22	18	109	84	12	247
A6431	9	34	31	92	83	46	295
BRS30694	9	29	31	89	117	59	331
A6337	4	38	25	89	70	35	261
A5489	—	48	21	80	78	42	269
A6220	1	16	24	70	15	18	144
BRS27806	6	35	20	67	64	4	236
A6242	1	8	7	80	58	35	189
A6023	4	32	15	67	54	28	200
A6179	3	17	14	66	34	4	138
A6144	—	4	15	62	—	—	81
BRS31172	1	8	17	54	50	9	139
A6003	5	25	24	46	93	61	254
A6923	4	29	14	54	40	27	168
A5593	1	10	9	59	68	8	155
A6201	—	35	20	48	—	—	103
A5466	8	24	27	41	30	37	167
A6098	5	9	21	31	—	—	66
A6553	1	13	8	34	73	59	188
A4253	1	13	8	28	25	11	86
BRS28198	2	27	32	1	—	20	82
A6498	4	14	2	17	8	11	56

(This month's table is in order of 7 plus 14 MHz scores).

10m. 08.00 *VK2EO*. **09.00** *HB0XVW*, *JA*'s, *VK6RU*. **10.00** *OH0AA, VK8HA, VQ8CC, XW8CS*. **12.00** *5H3KJ*. **13.00** VP8KO. **14.00** VU2DK. **15.00** VQ8CV, *4U1ITU*. **16.00** HG2RI (Hungary). **17.00** *HB0XVO* (QSL via DL4CE), G3AAE/ZS6, 5N2ABG. **18.00** *CE8AAR*, EA8DM, *VK0CV, VP8JT*. **19.00** ZP5KA.

Many thanks to all correspondents and especially to the following for permission to quote from their publications: **Florida DX Report** (*K4GRD*), **CQ DX** (*ARI*), **NARS Newsletter** (*5N2AAF*), **Long Skip** (*VE3HJ*), **QUAX** (*SM4DXL*), **On the Air** (*ON4AD*), the **West Coast DX Bulletin** (*WA6AUD*) **DX'press** (*PA0TO*), **DX News Sheet** (*Geoff Watts*), the **Ex-G Radio Club Bulletin** (*W3HQO*), and the **DX'ers Magazine** (*W4BPD*).

Please send all items for **November** issue to reach G3FKM **no later than 14 October,** for **December** by **12 November,** and for **January** by **10 December.**

FOUR METRES AND DOWN

A Monthly Account of VHF Activity and News Compiled by JACK HUM, G5UM*

Updating the bandplans

Twenty years ago G3CYY in a now-historic article in *Short Wave Magazine* propounded a theory for planning the 2m band which with subsequent minor modifications has stood the test of time, and served as the model for the UK metre-wave bandplans as we know them today. There has developed in consequence a degree of self-discipline which both surprises and delights newcomers to the vhf scene in this country, and does much to make operating on 4m and down the pleasant experience that it is.

Because vhf/uhf bandplans have proved to be so flexible very few changes to them seemed needed when the recommendations put forward by the IARU conference in Brussels last May were adopted by the RSGB. These recommendations by providing the opportunity to up-date our UK arrangements in concert with those of Europe, bring us to the threshold of the Nineteen-Seventies with a series of plans for 4m, 2m, 70cm and 23cm that take account of the latest operating techniques, and ought to stand us all in good stead for some years to come.

The plans, shown in detail on the opposite page, have been worked out in conjunction with—and at all times in agreement with—*The Short Wave Magazine*. The importance of this statement will not be lost on those readers who recall the good work done by *SWM* in fostering interest in vhf in general and bandplanning in particular, especially in those earlier days when every possible bit of advocacy was needed. And of course because *SWM* and *Radio Communication* are the only media for influencing British vhf thought and technique, it goes without saying that they should speak with one voice.

* * *

Two major trends of thought which emerged from the Brussels Conference were: put telegraphy at the low end and beacons at the high end of each vhf/uhf band. In the light of their long experience with unattended beacons the RSGB were invited to allocate frequencies for *all* European beacons within the accepted 50 kHz at the top end of each band, an operation of some technical complexity that will eventually mean the translation of old friends such as GB3VHF and GB3CTC from their present spots to new ones at the top end of " Two." The same thinking will be applied to 70cm and 1296 MHz, which are covered by IARU international agreements, and to 70 MHz, which isn't, because our Continental friends don't have " Four."

As for cw, the long standing European use of the bottom 150 kHz of " Two " is to be adopted by the UK. This might look like reducing still further the frequencies available to West Country stations, but in the event doesn't: the opportunity has been taken to simplify UK zoning so that in future there will be four simple geographical-frequency areas that will provide much more room for manoeuvre than was available before. The limits of these areas are detailed on the opposite page.

Another major provision in the replanning of " Two " is the international mobile calling channel neatly placed dead centre at 145·000 MHz. The international calling frequency for ssb remains 145·41 MHz.

What will be noticed about the application of these principles to 70cm is that the cw segment is 100 kHz wide, not 150 kHz as on " Two " and " Twenty Three "; and that the top end of the communications sector is now 433·5 instead of 434 MHz. The area from 433·5 to 434 MHz is now designated internationally for amateur television sound channels. These cannot be put *above* 434 MHz for the very good reason that with 625 line techniques developing as they are, amateur television will require an increased area at the upper end of " Seventy " for what is unquestionably important work. The geographical-frequency zones for communication work have accordingly been slightly telescoped, as shown in the table.

Single sideband on 70cm goes on 432·15 MHz to observe what has been Continental practice for some time.

Amateur teleprinter operation also now has its international assignments both on 70cm and on " Two," and a spot frequency on " Four " as well.

Attention should be drawn to a couple of special provisions on " Two." It is anticipated that when artificial satellites carrying 2m translators go into orbit, people will want to use single sideband as well as cw in the narrow frequency areas likely to be employed by such devices. Hence the small " satellite sections " shown in the table opposite. And secondly, where random attempts are made to effect meteor scatter communication it is recommended that these be done in the 10 kHz slice below 144·1 MHz to obviate searching the whole of the telegraphy segment on such occasions.

This is also the place to mention a special provision on " Four ": RAEN operation, hitherto confined by the terms of the licence to a spot frequency, may now occur anywhere within the band. To avoid interference from the higher powered users of " Four " it is recommended that for practice purposes RAEN nets should congregate towards the top end of the allocation.

* * *

And there you have it, the metre-wave bandplan for the " Seventies," designed to provide the most effective operational use of our allocations both nationally and internationally. Flexibility remains an inbuilt characteristic: if to

* Houghton-on-the-Hill, Leicester, LE7 9JJ. Send reports for the November issue by 10 October and for the December issue by 14 November.

VHF and UHF Band Planning for the Seventies

In May of this year delegates from IARU member societies in the Region 1 area (Europe and Africa) met in conference at Brussels. Several decisions which were reached in respect of the future international planning of the vhf and uhf amateur spectrum were taken back by delegates for ratification by their own societies—in the case of the UK, the Radio Society of Great Britain.

Implementing these decisions in Great Britain provides the opportunity to introduce a number of modifications to our domestic bandplans that will have the effect of bringing them up to date and so help to shape the pattern of metre-wave operation in the 'Seventies. Accordingly, a special meeting was convened in London between the *Short Wave Magazine* (which sponsored the first-ever 2m band plan twenty years ago) and the VHF Committee of the RSGB, under the chairmanship of Geoff Stone, G3FZL, to formulate a mutually agreed policy.

Following these discussions the present announcement was prepared, to appear jointly in *Short Wave Magazine* and *Radio Communication* in October in order to give readers ample time to prepare for the revised UK Band Plan Changes to be effected on 1 January, 1970. These are shown herewith:

FOUR METRE BAND

70·025 to 70·1 MHz	CW only.
70·1 to 70·7 MHz	All modes including ssb.
70·675 to 70·7 MHz	Beacons.
70·26 MHz	National mobile net calling working frequency.
70·56 MHz	RTTY.

TWO METRE BAND

144·00 to 144·15 MHz	CW.
144·15 to 144·5 MHz	Zone A, the South West (This combines old Zones 2 and 3).
144·5 to 145·1 MHz	Zone B, the South East (This combines old Zones 4 and 5).
145·1 to 145·5 MHz	Zone C, the Midlands (This combines old Zones 6 and 7).
145·5 to 145·95 MHz	Zone D, the North, Scotland and Northern Ireland. (This combines old Zones 8 and 9).
145·95 to 146·00 MHz	Beacons.

Special Services in the 2m band:

144·09 to 144·10 MHz	CW for random meteor scatter contacts, but not held exclusively for this.
144·1 to 144·15 MHz	Single sideband *only* when artificial satellites or translators are operational.
145·85 to 145·95 MHz	Ditto.
145·00 MHz	Mobile calling channel (international).
145·30 MHz	RTTY international and UK north.
144·60 MHz	RTTY UK south.
145·41 MHz	SSB calling channel international.

SEVENTY CENTIMETRE BAND

432 to 432·10 MHz	CW.
432·10 to 432·20 MHz	Zone 1 (old Zone 2).
432·20 to 432·30 MHz	Zone 2 (old Zone 3).
432·30 to 432·50 MHz	Zone 3 (old Zone 4).
432·50 to 432·70 MHz	Zone 4 (old Zone 5).
432·70 to 432·90 MHz	Zone 5 (old Zone 6).
432·90 to 433·10 MHz	Zone 6 (old Zone 7).
433·10 to 433·30 MHz	Zone 7 (old Zone 8).
433·30 to 433·45 MHz	Zone 8 (old Zone 9).
433·45 to 433·50 MHz	Beacons.
433·50 to 434 MHz	Television sound.
434 to top of band	Video.

Special Services in the 70cm Band:

433·30 MHz	RTTY (international and UK north).
432·60 MHz	RTTY (UK south).
432·15 MHz	SSB calling channel (international).
425 to 429 MHz	Self-excited transmissions.

TWENTY THREE CENTIMETRE BAND (narrow band communication segment)

1296 to 1296·15 MHz	CW.
1296·15 to 1297·95 MHz	All modes (narrow band).
1297·95 to 1298 MHz	Beacons.

★

NARROW BAND FREQUENCY MODULATION

It was agreed at Brussels that the following standard should be adopted for the use of NBFM in the 4m, 2m and 70cm bands:

Modulation index 1.

Audio bandwidth restricted to 3 kHz.

raise a station quickly and efficiently it becomes necessary to zone-jump, there can be no objection to this practice, nor indeed *has* there been for some years past. It is self evident to the sensible zone jumper that if he doesn't move back into his own zone afterwards others won't know where to look for him, nor have their beams trained upon him. And in respect of initial calling procedure, if this can be done co-channel with the wanted station, either in zone or out of zone, all the better in the interests of efficient frequency utilization.

Using " The Band Plan for the Seventies " in conjunction with " The Metre Wave Man's Code " (this page last January) will make the four metres and down spectrum an even more enjoyable place in which to conduct one's amateur radio over the next decade than it has been over the past two—and that is a target well worth aiming for.

Eighth Field Day

The last entries for VHF National Field Day, 1969, should have reached the VHF Contests Committee about ten days ago, leaving a couple of thousand metre-wave men keenly awaiting the publication of the results—which last year came out in November following some incredibly swift work on the part of the Committee's midnight-oil burners, faced with almost 400 separate band entries to process. Don't chide them if they find themselves unable to repeat the performance *this* year; for VHF National Field Day expands annually at a rate which may be seen at a glance in the accompanying table, the entries doubling in the five years after 1963.

What is also obvious from the table is how the 23cm entry has virtually increased sevenfold since the band became valid for VHF/NFD back in '63. No contesting group can expect to see themselves very high up in the table in future Nationals if 1296 MHz doesn't figure in their entry. Of the top ten in the 1968 tables, all put in a 23cm claim.

The last thing we want to suggest, however, is that if you don't put in a 23cm entry then it isn't worth entering at all. Very many groups which don't have microwave expertise available to them still manage to do enormously well on the lower " very high " frequency bands. All credit goes to them, and to the single operator men who take portable rigs out for the day. (One of them, G2WS, operating solo, put in a *three* band entry last year!).

And now, if several well known calls are missing from the vhf bands these next few weeks don't be surprised: it'll be because the VHF Contests Committee-men are heavily engaged doing their Field Day homework.

* * *

A quick round up of comments received about VHF/NFD, 1969, just as this column was closing up:

" Best contest I've ever taken part in . . . from 1,600 feet up worked 33 counties and 5 countries, 110 contacts . . . 70 cm of course "—G8AWS/P.

" Worked six countries in a row on 2m between 0700 and 0745GMT on the Sunday, including OZ9SW/P in the southern part of the province of Fyn "—G8AXA/P.

" Please stress again the curse of phone in the 144.0 to 144.1 part of the band. Heard three stations merrily working there over Field Day weekend; two were G8s and the third a GW8 "—G6LK.

" A very rewarding weekend operating G3XIM/P from Westmorland (very amused to share 071 with G5UM/P!). Best DX was G3TTG/P in Cornwall. The four of us running the outfit really enjoyed our session. One thing we felt needs further investigation is the RSGB scoring system. We think 50km circles should be used throughout. It seems rather daft that a contact at 105km gets the same points as one at 195km, and so on. We of Ainsdale Radio Club noted the same effect when checking results in our own North West VHF Contest, which was based on RSGB concentric circle rules. A *progressive* increase would make quite a difference to the total score, and would benefit the stations getting the longer distance contacts "—G2CUZ.

" Twenty-three " This Weekend

Much of the 23cm equipment exercised during VHF National Field Day will be earning, a month afterwards, a further airing during the 1296 MHz Open Contest this coming weekend, 5 October. Most metre-wave contests advance the state of the art to a greater or lesser degree: this one does so more than most. The element of competition introduced since " the 23cm tests " of a few years ago developed into official 23cm contests has spurred endeavour to the extent that 100-mile contacts on this band are now looked for as a matter of course.

These, needless to say, take place under portable conditions, for the very good reason that not enough members enjoy in-the-clear locations where narrow-beam parabolas can " see " one another over reasonable distances. Last year's 23cm Open was won handsomely by Les Sharrock by putting GW3BNL/P a couple of thousand feet up a Welsh mountain in uncomfortable conditions that certainly paid off in terms of miles covered. Last year's table of results demonstrated the good ranges to be obtained on this band by high-spot portable operation: separate classes and awards for portable and fixed stations ensure that the latter are not set at a disadvantage.

Of the thirty or so stations active in the 1967 and 1968 Autumn contests on 1296 MHz it was clear that many entered not with any hope of achieving a high place but rather to give an indication of who was active on this band at the time. We recall particularly the spirited attitude of G8AUF who from an impossible site deep in a Derbyshire

A Miniaturized History of V.H.F. National Field Day

1962 (for 2m only and held in July): 39 entries, winners Wolverhampton Group, GW3KMT/P.

1963 45 entries, winners Surrey Radio Contact Club G2RD/P-G3ODY/P, using 70, 144 and 432 MHz. Three contestants used 1296 MHz.

1964 54 entries, winners Wolverhampton Group in conjunction with Severn Valley ARC, GW3KMT/P-G3SVR/P, using 70, 144, 432 and 1296 MHz. Ten contestants used 1296 MHz.

1965 54 entries, winners The GB2GC Group, using 70, 144, 432 and 1296 MHz. Twelve contestants used 1296 MHz.

1966 57 entries, winners The GB2GC Group, using 70, 144, 432 and 1296 MHz. Fourteen contestants used 1296 MHz.

1967 66 entries, winners The GB2GC Group, using 70, 144, 432 and 1296 MHz. Sixteen contestants used 1296 MHz, and one contact was reported on 2300 MHz.

1968 91 entries, winners Mid-Essex VHF/UHF Contest Group G3VPK/P-G3ORL/P-G3LTF/P, using 70, 144, 432 and 1296 MHz. Twenty contestants used 1296 MHz, three used 2300 MHz and one (G3WZR/P) the 10 GHz band.

valley could not hope to work more than one station. He turned in an entry all the same.

Advancing the state of the art on " Twenty-Three " is helped by high activity whether one or a couple of dozen stations happen to be worked. It is useful if this activity is known—and no better place exists to chronicle it than an RSGB Contests table. It is hoped that everybody operational on 23cm this coming weekend will turn in an entry.

Top Listener for '69?

Writing of contests prompts us to drop a reminder to all BRS and A members who have 23cm receiving equipment available to use this week-end's contest as a valuable multiplier to their scores. Those who are able to do so will be well in the running to become the top vhf listener for 1969.

Details of the VHF Listeners' Championship were given here in January on a page adjacent to the " General Rules for VHF Contests 1969 " with which they are linked. To newer members who may not have that number of *Radio Communication* to hand, a copy of the rules will be willingly posted off if an sae is sent to G5UM.

New M-S Records

Two records claimed during the August Perseids meteor shower won the distinction of a mention by the official Bulgarian broadcast system. John Singleton, BRS27806, of Hull, while listening to the DX programme of Radio Sofia on 15 August, noted that a detailed story was put out about the good work done by LZ1BW in contacting PA6MB and LX1SI on 13 August on 144·325 MHz telegraphy via the Perseids. A recording made of the LX1SI single sideband signal was played over Radio Sofia.

It was also announced, says BRS27806, that another Bulgarian amateur, LZ1AB, had initiated an additional " first " by working UG6AD—and that's 2m into Asia.

It is claimed that LZ1AB now has 16 countries worked and QSL'd and LZ1BW twelve as the result of meteor scatter contacts.

* * *

Another believed-European record for sideband-via-MS was set up when F9FT of Reims worked SV1AB of Athens over a path 2050 km long, both on 144·1 MHz, this on 12 August. Marc Tonna, F9FT, gives 11 and 12 August as the peak time of the Perseids results. He was amused to be told by SV1AB on a particularly good burst that there was QRM between F9FT and LX1SI, who were both on the same frequency. And LZ1BW reported the same effect. Marc Tonna himself had QRM between LX1SI and EA4AO, the Spaniard's MS signals at times peaking at 15dB above noise off the side of the beam at Reims.

ACROSS THE CHANNEL ON 3CM

The English Channel has been spanned on the 10,000 MHz amateur band. On 5 September Dain Evans, G3RPE, operating portable from the cliffs of Dover, worked F2FO/P near Cap Griz Nez, over a QRB of about 25 miles at S9 both ways.

Although the 3cm rig at G3RPE/P was delivering only 15mW of rf, the system gain was high: a 10-inch dish was used. At F2FO/P a horn aerial with 20dB gain was fed by a 723AB klystron.

Fuller details later. Meanwhile, all congratulations to both operators concerned.

BEACON STATIONS

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3ANG	Craigowl Hill, Dundee	145.950 MHz	A1	S
GB3CTC	Redruth, Cornwall	144.13 MHz	A1	NE
GB3GW	Swansea	144.250 MHz	A1	ENE
GB3GM	Thurso	70.305 MHz	A1	N/S
GB3GEC	W. London	434.000 MHz	F1	N/W
GB3SU	Sheffield (temporary location)	70·695 MHz	A1	Omni
GB3SX	Crowborough,Sussex*	28.195 MHz	A1	E/Omni
GB3SX	Crowborough *	70.026 MHz	A1	Omni
GB3VHF	Wrotham, Kent	144.500 MHz	F1	North-West

* Not operational

ZB2VHF is now operational on 50·0092, 70·311 and 145·1298 MHz. Reports to G3JHM.

Parchments Up

Twenty more call-signs plus one BRS appear in the latest reprint this month of the " Four Metres and Down Certificates " table—and one of them as we briefly announced here last month deserves special commendation: John Warrington of Melton Mowbray, G8AKE, now joins Bill Hawthorne's (G3MCS) hitherto lonely state in the 70cm Senior Transmitting Section.

Someone else who has been very much on his own for a long time in two sections of the Certificates Table is Ron Ham of Storrington. He now has BRS15822 as a companion in the 70 MHz Receiving Section, but to date there are no more BRS claimants to join Ron in the 432 MHz Receiving Section. The 70cm band is an area where more receiving-station activity is desirable to provide long term propagation observations: the band is by no means limited to line-of-sight operation, as the regular G8AKE-ON4HN schedule proves. The surprises it throws up from time to time are just those which BRS observation can catch.

* * *

When the VHF Committee at its August meeting approved the latest batch of certificates claims it welcomed two new admissions to Senior Categories—G8AKE for 70cm, as already mentioned, and Mike Dormer, G3DAH, as Holder No. 21 in the 2m Senior bracket.

What was also significant was the big increase in 70cm Ordinary claimants: six were dealt with as compared with three for the 2m Ordinary award (it's usually the other way about). Among these was the first 70cm claimant in the G8B—callsign block, namely G8BGQ of Rickmansworth. May this be a spur to many more G8B—licensees to join him. Congrats to him and also to G8BQX of St Leonards, who earns the distinction of becoming the first in his particular call-sign block to collect the needful 5 × 30 cards for the 2m award.

Now for a special announcement on the Certificates front. . . .

Certificate for " Thirteen "

As activity develops on 13cm, the time is approaching when—probably as the result of specially organized high-

Four Metres and Down Certificates

70 MHz Transmitting Section

1 G3EHY
2 G3PJK
3 G2AIH
4 G3OHH
5 G3KEU/P
6 G3NUE
7 G3IUD
8 G6NB
9 G8PD/A
10 G5FK
11 G3NDF
12 G3IMV
13 GI3HXV/P
14 G3SKR
15 G3OUF
16 G3BNL
17 G3PMJ
18 G3PHG
19 GC3OBM
20 G3TLA/P
21 GI3HXV
22 G5UM
23 G3OJE
24 G3SEK
25 G3RWM/P
26 G3FDW
27 G3PPG
28 G3FIJ
29 G3GGL
30 G3RDO
31 G3NJF/P
32 G3RWN/P
33 G3NUE/P
34 G3AZI
35 G3FWD
36 GI3HCG
37 G3LAS
38 G3HRH
39 GM2UU
40 GI3PGG
41 G3VPK
42 G3RLE
43 G3UFS
44 ZB2VHF
45 G3OUL
46 G3UUT
47 G5NU
48 G3OZJ
49 GI3HCG/P
50 GI3PGG/P
51 G3UBX
52 G3VSA
53 G3NKL
54 G3JHQ/P
55 G3JHM/A
56 GI3VJS/P
57 G3EKP
58 G3JHM
59 G3VOF
60 ZB2BO
61 G3JHM/P
62 G3NNO
63 G3WQP
64 G3OXD/A
65 GI3WEL

70 MHz Senior Transmitting Section

1 G3SKR
2 G3RWM/P
3 G3FDW

70 MHz Receiving Section

1 BRS15744
2 BRS15822

144 MHz Transmitting Section

1 G3HBW
2 G3BLP
3 G3MTI
4 G5YV
5 G3BNL
6 G3MCS
7 G3LAR
8 G3CO
9 G3BA
10 GW3MFY
11 G3DFL
12 G3NAQ
13 G3NNG
14 G3OJY
15 G3KPT
16 G3JYP
17 G3KMT
18 G3OHD
19 G3BBR/A
20 G3HRH
21 GM3EGW
22 GI3OFT
23 G3OBD/P
24 G2HIF
25 G3JDN
26 G8VZ
27 G2AXI
28 G3JYT
29 G5UM
30 G3EJO
31 G3PBV
32 G3FDG
33 G3OSA
34 G3JLA
35 GC2FZC
36 G3BOC
37 G3MTI/M
38 G3OJY (new QTH)
39 G3JWQ
40 G3NOH
41 G3PSL
32 G3LBA
43 G3FUR
44 G2BJY
45 G3MRA
46 G3AGN
47 G3MDH/P
48 G3GMY
49 G3GGK
50 G3MDH
51 G3NLR
52 GM3LDU
53 G3CKQ
54 G5HZ
55 G3NNK
56 G6GN
57 G5ZT
58 G2PL
59 G3FZL
60 G3SAR
61 G3NUE
62 PA0EZ
63 G3AHB
64 G3PTM
65 G3LAS
66 G3RMJ
67 G2CDX
68 G3ORL
69 G2DHV/P
70 G3FIJ
71 G3CXM
72 G3HRH/P
73 G3BDS
74 G3FNM
75 G3IMV
76 G2BG
77 G3KHA
78 G3OHC
79 G3SHZ
80 G3PKT
81 G3UFA
82 G3RST
83 G5NU
84 G2BHN
85 G3OZP
86 GW3KYT
87 G3ICO
88 G3ETH
89 G2WS
90 G3NJF/P
91 GW3CBY
92 G3TLA/P
93 G3JFO
94 G3TDR
95 G5UM/P
96 GM2UU
97 G3UUT
98 G3BNC
99 G3SZX
100 G3UKV
101 GC3OBM
102 G3FVC
103 G3BJD
104 G3PWJ
105 G2ATM
106 G3ISX
107 G3USF
108 G3OUL
109 G3UIK
110 G3GZJ
111 G3EJA
112 G3JHM/A
113 G8AAZ
114 G3EHR
115 G8ATK
116 G3WW
117 G8APZ
118 G3TR
119 G3WZT
120 G2WS/P
121 G3EHM
122 G3WSN
123 G3RZK
124 G3ILO
125 G3RQL
126 G3OXD/P
127 G3WQG
128 G8APO/P
129 G8BQX

144 MHz Senior Transmitting Section

1 G3CCH
2 G3FAN
3 G5MA
4 G3BLP
5 G3CO
6 G3BA
7 G6NB
8 G3EDD
9 G3HRH
10 G8GP
11 G3LAS
12 G3IMV
13 G3PTM
14 G5NU
15 G6GN
16 G3KHA
17 G3AOS
18 G3MRA
19 G3BHW
20 GW3MFY
21 G3DAH

144 MHz Receiving Section

1 BRS22550
2 BRS22322
3 BRS15822
4 BRS15744
5 NL687
6 BRS20108
7 A3470
8 A4048
9 BRS21667
10 A4871
11 BRS23140
12 BRS7323
13 A3942/P
14 A3942
15 BRS24550
16 BRS30352
17 A5032

144 MHz Senior Receiving Section

1 BRS15744

432 MHz Transmitting Section

1 G3NNG
2 G3KPT
3 G3LHA
4 G3BNL
5 G3MCS
6 G8AAZ
7 G8ABP
8 G3AHS
9 G5UM
10 G8ACQ
11 GW8ACG
12 GW8ACG/P
13 G8AHQ
14 G8AEJ
15 G8AGG
16 G8AGU/P
17 G3PTM
18 G8AAY/A
19 G8AGQ/A
20 G3HRH
21 G8AJU
22 G8ARM
23 G8ADP/P
24 G8AUE
25 G6GN
26 G8AQA
27 G8AWO
28 G8AXP
29 G8AHE/P
30 G8AOD
31 G8AWW
32 G8AKT
33 G8ANS
34 G8ARD
35 G8AIE
36 G3PKT
37 G8ATK
38 G8ACP
39 G8AQZ
40 G8ARC
41 G8AVL
42 G8ART
43 G5NU
44 G3FIJ
45 G3XEB
46 GW8AHI
47 G8AVX
48 G8AKQ/P
49 G8ABB
50 G8ADC
51 G8ADC/P
52 G8ATL
53 G3UBX
54 G8AZO
55 G2WS
56 G8ALM
57 G8AYN
58 G8BGQ

432 MHz Receiving Section

1 BRS 15744

432 MHz Senior Transmitting Section

1 G3MCS
2 G8AKE

1296 MHz Transmitting Section

1 G3MCS

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sited across-the-water operations—it will be necessary to provide official recognition for communications prowess on this band.

The VHF Committee at its last meeting considered this possibility, and having duly submitted the suggestion for the consideration of Council now invites all 13cm operators to aim for the challenging target of *THREE COUNTRIES AND FIFTEEN COUNTIES.*

Already there are a number of 2300 MHz portable expeditionaries who can show proof of contact with two countries as well as many counties, and it wouldn't surprise us if the first claim for a " Four Metres and Down " certificate in this category does not show up fairly soon. He will certainly deserve to have the news noised abroad in bold type in this column when it happens, as G3MCS did two years ago upon obtaining the first ever 23cm award—a performance which to date has yet to be equalled.

Countries, Counties and Certificates

Publication of this month's up-dated list of " Four Metres and Down Certificate " holders will prompt many readers to check over their QSL intake, and where counties worked show cards missing to send off stamped addressed envelopes in the hope of getting them in. Although interest in the QSL card as such has a low priority with many vhf workers, few of them are churlish enough to ignore requests when these are accompanied by the courtesy of an sae.

All claims for a " Four Metres and Down Certificate," fully supported by QSL cards relating to contacts made after 1 January 1961, and with a check sheet, should be sent to Frank Green, G3GMY, 48, Borough Way, Potters Bar, Herts, enclosing a large sae for the return of the cards. If all is in order Frank submits details at the next meeting of

Next page

the Society's VHF Committee and recommends that certificates be issued.

70 MHz Transmitting Section:
70 MHz Receiving Section:

QUALIFICATION: Production of QSL cards from 20 British counties and three countries.

70 MHz Senior Award:

QUALIFICATION: 60 British counties and six countries.

144 MHz Transmitting Section:
144 MHz Receiving Section:

QUALIFICATION: Production of QSL cards from 30 British counties and five countries.

144 MHz Senior Award:
144 MHz Senior Listener Award:

QUALIFICATION: 60 British counties and 15 countries.

432 MHz Transmitting Section:
432 MHz Receiving Section:
1296 MHz Transmitting Section:

QUALIFICATION: 20 British counties and three countries.

432 MHz Senior Award:

QUALIFICATION: 40 British counties and nine countries.

2300 MHz Transmitting Section:

QUALIFICATION: 15 British counties and three countries.

Stations eligible for these awards are (*a*) fixed stations; (*b*) alternative address stations operating " Stroke A " from any address; (*c*) portable stations operating " Stroke P " from any location; and (*d*) mobile—but categories cannot be mixed.

Supreme Award:

QUALIFICATION: The holding of three Senior Awards or two Senior Awards plus the 1296 MHz Ordinary Award. There have been no claimants to date.

Skeds Operative . . .

Here are a couple of interesting across-the-mountains schedules which 2m listeners along the path may care to observe: G8ANQ of Bishop Auckland in County Durham (usually around 145·8 MHz) to GI8AYZ every Monday, Wednesday and Friday at 2130 GMT (half past ten clock time), and to G3VVT of Nelson in Lancashire every Wednesday at 2000 GMT and Sunday at 1100 GMT.

. . . and Wanted

News of a very, very rare one comes from G5AMH (who when he is at home is SM5CJP). He forwards the info that OY2BS in the Faeroe Islands is anxious to work GM (and even G!) on the 2m band. With 200 watts available and a four-by-6 element beam array, OY2BS would seem to be reasonably well placed for working into the British Isles. His frequency is 144·1, with cw, pm or ssb on tap. To make schedules write to him at Box 184, Thorshavn, Faeroe Islands, or look out for him on 14345 kHz sideband on Saturdays and Sundays at 1200 GMT.

Here and There

" . . . when a long message sent by a single operator is analysed it frequently turns out that some dots are longer than some dashes, and that some mark spaces are longer than some character spaces.

" With a little practice in receiving code, the average person has no trouble with these irregularities. The patterns of the letters are defined for him in terms of the continuing consensus of experience, and he adapts to them as he listens. Soon he does not hear dots and dashes at all, but perceives the characters as wholes. Exactly how he does so is still obscure and the mechanism probably varies widely from one operator to another"—from the *Scientific American*, August, 1960, in an article on pattern recognition.

* * *

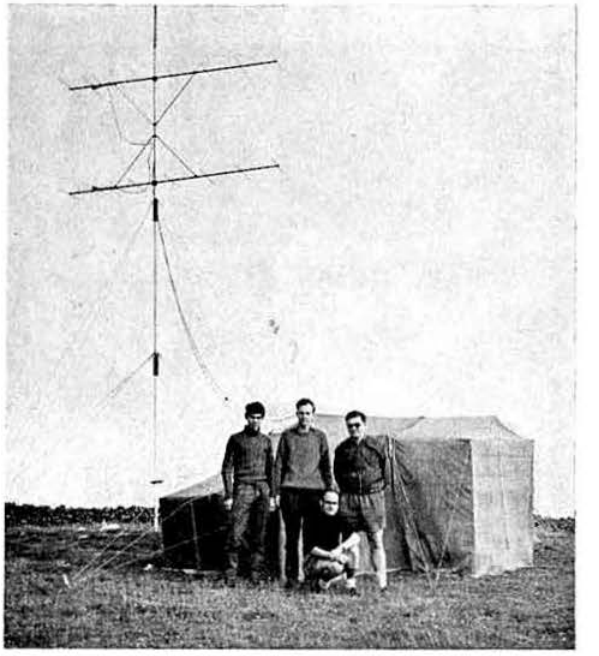
" Have been evaluating 2N4416 FETs in cascode and neutralized grounded source arrangements and find them pretty good "—G8ANQ.

* * *

Welcome to another addition to the vhf literature: the " EI-VHFer," brought to life through the enthusiasm and typing stamina of EI5BH, runs to eighteen closely spaced foolscap pages, seven of them a *magnum opus* on " vhf antennas " by W6GD.

* * *

If you use telegraphy regularly on 4, 2 and/or 70cm drop a card to " Four Metres and Down " stating times of operation, so that a " CW Dossier " may be compiled, for publication here (see page 630 last month).



The ten over ten, the tent and the team (part of it) that helped put GW3VER/P, the Verulam Radio Club portable station, on the 2m air during the trip around Wales. This picture, taken at the Pembrokeshire site, has left to right G3XMP, G8BNR, BRS Ray Tilling and G8ATO. Over 270 contacts were made on am, cw and sideband, and all will be QSL'd via the Bureau unless they have requested otherwise, in which case an sae should be sent to 'XMP or 'BNR, but not to G3VER. The team pays special tribute to the GW8APZ/P group, whose QRPP signal from the top of Snowdon was "first class, weak but always there, first call."

SOCIETY AFFAIRS AND NEWS SUPPLEMENT

A Verulam Club Member, Robert Wilkie, A6030, has gone to some pains to help the RSGB Building Fund. At every club meeting this "Piggy Bank" circulates and collects a remarkable sum over a few months. Thanks, Robert.

(Photo by Paul Fletcher).

A brief report of the Council Meeting held at Society HQ on 9 August 1969

Present: *E. W. Yeomanson (Executive Vice President, in the Chair), Messrs. B. Armstrong, N. Caws, J. C. Graham, R. J. Hughes, A. F. Hunter, E. G. Ingram, G. R. Jessop, L. E. Newnham, J. Petty, R. F. Stevens, G. M. C. Stone, F. C. Ward; (Members of Council), A. E. Dowdeswell (General Manager), and Dr J. A. Saxton (President Elect).*

Apologies for absence were received from Messrs J. W. Swinnerton, (President), H. E. McNally and G. Twist.

In the absence of the President, who was on holiday, the Chair was taken by the Executive Vice President, Mr E. W. Yeomanson.

On behalf of the President and members of Council, the Chairman extended a very warm welcome to the President-Elect, Dr J. A. Saxton.

Membership and Affiliation

Council resolved: (*a*) to elect 113 Corporate members and 30 Associate Members,
(*b*) to grant Corporate Membership to 6 Associates, and
(*c*) to waive the subscriptions of three Members due to blindness or other disability.

The following applications for affiliation were received and approved by Council:

Rank Xerox National Workshops Radio & Electronics Club, Uxbridge, Middlesex. Secretary L. F. Hiller.

Wessex Amateur Radio Group, Weymouth, Dorset. Secretary A. G. Emary, G8AVE.

Library

Following a report on the organizing of the Society Library, Mr Yeomanson proposed that a small committee should be formed to carry out the proposals put forward by Mr Green, G3FBA. Mr Newman and Mr Ward volunteered for this work.

Region 12 Representative's Report

The report from Mr Smith, GM3AEL, was tabled and accepted by Council. The Chairman and Council were unanimous in their appreciation of this excellent report.

Appointment of the President for 1970

In accordance with the articles of Association, Mr Armstrong formally proposed and Mr Newnham seconded, and it was unanimously agreed by Council, that Dr J. A. Saxton be President of the Society for 1970.

Dr Saxton expressed his appreciation to Council and assured them of his continued and utmost support at all times. The date of the Installation of the President will be decided at a later meeting.

Council Nominations

In accordance with the Articles of Association Messrs Graham, Newnham and Yeomanson were nominated by Council to fill the vacancies which will occur on the 1970 Council.

Representative for Region 13

A report and letter of resignation from Mr Sheffield, GM3VEI, were tabled and accepted by Council.

Call-sign of the late John Clarricoats G6CL

Mr Yeomanson read a letter from Mrs Clarricoats who was pleased that the Society should hold the call-sign of her late husband. The General Manager was instructed to write to the GPO requesting the re-issue of the call subject to the stipulated 3 year waiting period.

The President would write a letter of thanks to Mrs Clarricoats.

IARU Proposals

Council approved the proposals of IARU that the following Societies be admitted as members:

Trinidad and Tobago Amateur Radio Society.

The Hungarian National Society (MRS).

Stratford-upon-Avon Celebrations

The President's report on his visit to Stratford-upon-Avon was read and noted by Council.

Recommendations of Committees

The following were accepted by Council.

Membership and Representation Committee

(*a*) That Mr V. Stewart, GM3OWU be appointed R.R. for Region 13 in succession to Mr Sheffield, GM3VEI.

(Continued on page 733)

The Council's Annual Report on the Society's Activities

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

The Council has pleasure in reporting to Members on the more important activities and happenings during the year ended 30 June, 1969. The year was one of continued progress both in the services rendered to Members and the relations with the GPO and other organizations.

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New Headquarters

Council is very pleased to be able to report that in the year under review the Society was able to make the long awaited move, at the beginning of November, 1968, into its new Headquarters in Doughty Street.

An Open Weekend was held in mid-December to allow members and their friends to visit the new premises and some 200 people took advantage of the occasion. A special licence, GB2HQ, was issued for the operation of stations on several bands during the weekend.

There have been many visitors to 35 Doughty Street, both from the UK and overseas. The volume of counter sales was considerably greater than at Little Russell Street.

Council would like to place on record its thanks to all those who contributed to the Lambda Debenture issue and to the Headquarters Fund which enabled the new Headquarters to come into being.

Presidential Installation

On 10 January 1969 the retiring President, John Graham, G3TR, installed John Swinnerton, G2YS, as President for 1969, in the presence of many guests at the Bonnington Hotel, London, WC1.

Staff

Trevor Preece, G3TRP, Assistant Editor, resigned in November 1968. John Adey was appointed Associate Editor, assisted by an Editorial Panel consisting of Pat Hawker, G3VA, George Jessop, G6JP, and Roy Stevens, G2BVN.

Mr C. P. Pope, Secretary, left the Society at the end of February 1969.

Licensing Matters

Some changes in the amateur frequency allocations were made by the GPO during the year. The promised extension of the 4 metre band down to 70·05 MHz was implemented. The 70cm band was split into two sections 425–429 MHz and 432–450 MHz instead of 427–450 MHz previously allocated. The new Post Office Bill was published and it has been studied for any aspects that might affect the amateur radio service.

The number of Amateur Licences current at the end of June 1969 was:

Amateur (Sound) " A "	13216
Amateur (Sound) " B "	1576
Amateur (Sound Mobile) " A "	2627
Amateur (Sound Mobile) " B "	201
Amateur Television	184
Model Control licences	16237

Membership and Representation

The Membership is as follows:

Corporate Members	12659
Associate Members	1355
Overseas Members	1378
	15392

The increase in membership in the past year was 1347 compared with 644 for the previous year.

The number of Affiliated Societies and Clubs was in excess of 300.

In accordance with the Scheme of Representation elections took place for the offices of all seventeen Regional Representatives. In view of the apathy shown by the Membership in this matter Council was obliged to invite some of the retiring Representatives to serve for a further period of three years.

A booklet listing all Clubs and Societies affiliated to RSGB was published during the year.

Committees

Once again Council is pleased to record its thanks to the many volunteers who served on the following Committees:

	Chairman
Education Committee	R. J. Hughes, G3GVV
Exhibition Committee	E. W. Yeomanson, G3IIR
Finance and Staff Committee	B. Armstrong, G3EDD
GPO Liaison and TVI Committee	R. F. Stevens, G2BVN
HF Contests Committee	J. C. Graham, G3TR
IARU Working Group	R. F. Stevens, G2BVN
Membership and Representation Committee	H. E. McNally, GI3SXG
Mobile Committee	N. O. Miller, G3MVV
RAEN Committee	P. Balestrini, G3BPT
Scientific Studies Committee	G. M. C. Stone, G3FZL
Technical Committee	R. F. Stevens, G2BVN
VHF Committee	G. M. C. Stone, G3FZL
VHF Contests Committee	J. B. Butcher, G3LAS

The *Education Committee* was responsible for centres organized for the Radio Amateurs Examination held at the College of Preceptors in December 1968 and at University College in May 1969. It also arranged a show of equipment suited to the Novice at the Exhibition in October. Much work was involved in the preparations for the successful lectures at the Science Museum at Christmas.

The *Exhibition Committee* once again was concerned in the organization of the International Radio Engineering and Communications Exhibition which took place between 2–5 October 1968. A full report appeared in the November 1968 issue of the journal.

The *Finance and Staff Committee* was again mainly concerned with matters at the new Headquarters, together with routine items affecting Staff and organization.

The *GPO Liaison and TVI Committee* was concerned in efforts to obtain Ministry permission for radio masts, within certain limits, to be exempt from the requirements of planning authorities. Investigations into cases of TVI reported by members were many and varied. Close liaison was maintained with the GPO on licensing matters and some amendments to frequency allocations were approved.

The *HF and VHF Contests Committees* continued the work of arranging and adjudicating the many contests held during the year. As a result of contestants' comments minor adjustments are continually being made to contest rules.

The *IARU Working Group* continued the preparatory work for the IARU Region I Conference held in Brussels in May 1969. A full report on the proceedings of the Conference can be found in the July and August 1969 issues of the journal.

The *Membership and Representation Committee* was engaged in considering the present News Bulletin Service with a view to making improvements, as well as matters affecting the liaison between Headquarters and the members in general.

The *Mobile Committee* arranged the Woburn Abbey Mobile Rally and others, but its work was hampered by the lack of support for the Committee. Consideration was given to the present safety standards for mobile operation.

The *RAEN Committee* was pleased to obtain GPO permission to use the whole of the 4 metre band for RAEN purposes. Efforts were made during the year to obtain approval of the VCAS as a user service.

The *Scientific Studies Committee* maintained watch over the operation of the beacon network and began new studies on Auroral and Sporadic E methods of propagation.

The *Technical Committee* carried out a great deal of work in connection with material for publication in *Radio Communication*. Many technical enquiries from Members were dealt with and the majority of the Committee were directly concerned with the production of the *Radio Communication Handbook*.

The *VHF Committee* once again organized a very successful Convention at Whitton, Middlesex. A full report appeared in the June 1969 issue of *Radio Communication*. Papers were prepared for the IARU Region I Brussels Conference with particular reference to band planning, locator systems and 70 MHz band propagation experiments.

RSGB Certificates Manager

Mr C. R. Emary, G5GH, continued his work on the many applications for the Society's hf operating certificates.

Public Relations Officer

Mrs Sylvia Margolis continued to deal with many matters in this field on behalf of the Society and exercised a watching brief on press reports covering items concerned with amateur radio. She accepted several invitations to attend meetings and functions as the Society's representative.

QSL Bureau

Mr A. Milne, G2MI, ably assisted by Mrs L. Milne and the sub-Managers, has managed to control the increasing flood of QSL cards in and out of the Bureau.

RSGB Tape Library

Mr A. O. Milne, G2MI, took over the work of the Library on the departure of the Curator, Mr G. Milne, G3UMI, for Bermuda.

RSGB Slow Morse Transmissions

The service under Mr M. A. C. McBrayne, G3KGU, continues to operate for the benefit of many members in spite of a lack of reports on its effectiveness. The Organizer would be pleased to receive reports on the Slow Morse Transmissions.

RSGB Intruder Watch

Under the direction of Colin Thomas, GW3PSM, the organization continued its valuable work. A move was made for closer integration with other similar networks in Europe.

John Clarricoats, OBE, JP, G6CL

On 7 March 1969 the death occurred of John Clarricoats, G6CL, following his collapse at a function at the Royal Albert Hall two days earlier.

John had been associated with the Society since 1926, becoming its Hon Secretary in 1930, finally retiring in 1963. A full appreciation appeared in the April 1969 issue of *Radio Communication*.

GB2LO

During the City of London Festival in July the opportunity was taken to demonstrate amateur radio to the public by establishing GB2LO at the *Daily Mirror* building in the City. Many thousands visited the station, press and radio coverage was given and altogether it was a very successful venture.

IARU Region I Conference, Brussels

This triennial event was held from 5 to 9 May, 1969 and the Society's delegation comprised: N. Caws, G3BVG, E. G. Ingram, GM6IZ, L. E. Newnham, G6NZ, and G. M. C. Stone, G3FZL. A full report of the Conference proceedings appeared in the July and August 1969 issues of *Radio Communication*.

Following the death of G6CL, the Honorary Secretary of the Region I Division since 1950, Roy Stevens, G2BVN, was elected to this office.

The Conference afforded the opportunity for valuable discussions between the many Societies represented at Brussels. This contact is particularly important in view of the forthcoming Space Communications Conference in 1971. It was evident during the Conference that the standing of the Society amongst the members of Region I is very high indeed.

Royal Garden Party

On 25 July, the President for 1968, John Graham, G3TR, together with Cyril Parsons, GW8NP (Regional Representative for South Wales), accompanied by Mrs Graham and Mrs Parsons, attended a Garden Party at Buckingham Palace. (See *Radio Communication*, September 1968.)

Publications

The year under review saw the appearance of two new publications by the Society, the *Radio Communication Handbook* and the *VHF-UHF Manual*. The former was a production involving many members of the Society and the latter was written by G. Jessop, G6JP. By the end of June 1969 more than 13,000 copies of the *Handbook* had been sold and a re-print was scheduled to appear in July 1969. The sales of the *Handbook* in Europe and the USA have been particularly pleasing. The *VHF-UHF Manual* has found a ready acceptance in Europe and a reprint will be necessary in the near future.

The 1969 edition of the *RSGB Amateur Radio Call Book* was published in October and despite an increased print order compared with the previous year had sold out before the end of June 1969.

Council would like to thank the contributors of the following regular articles to *Radio Communication*:

E. J. Allaway, G3FKM	(*Month on the Air*)
B. Armstrong, G3EDD and P. Simpson, G3GGK	(*Equipment Review*)
J. P. Hawker, G3VA	(*Technical Topics*)
J. Hum, G5UM	(*Four Metres and Down*)
S. Law, G3PAZ	(*RAEN News*)
R. F. Stevens, G2BVN	(*IARU Calling*)

Lectures and Meeting

A highly successful two session lecture meeting was given by G3CSG, G2YS, G6NZ, G3GVV, G3TNK and G3KEP, at the Science Museum on 4 January, 1969 to several hundred young people.

At the IEE in November 1968 four speakers lectured on various aspects of "SSB at VHF." The Meeting was very well attended.

In March the subject was "DX-Aurora or Sporadic E?" and the three lecturers covered different aspects of VHF ionospheric propagation. This meeting also drew a good attendance.

The Society sponsored the Scottish National Mobile Rally and also the Mobile Rally at Woburn Abbey in August which attracted a large number of members and, as usual, proved to be a huge success.

Official Regional Meetings were held in Region 1 in September 1968 and in Region 14 in May 1969. Representatives of Council attended and answered many questions on Society matters.

In September 1968 John Graham, G3TR, and Roy Stevens, G2BVN, attended the annual Convention of the IARC in Geneva and met many representatives of other national Societies. The opportunity was taken to meet members of the ITU staff and to discuss problems relating to the Amateur Service. A propagation report presented by RSGB was received by the CCIR and subsequently embodied in an ESSA Technical Report published in May 1969.

The big event in the NorthWest was the Northern Radio Societies Association Convention in Manchester, in April 1969, attended on this occasion by John Graham, G3TR, on behalf of the Society.

The VHF/UHF Convention at Whitton, Middlesex, also in April was its usual resounding success and honoured this time by the presence of Col. I. St. Q. Severin, OBE, of the Cabinet Office and Dr J. A. Saxton, President-elect of the Society.

Council is very appreciative of the tremendous amount of work done by Committee and other members, without which little progress would have been possible in the past year.

Council Meeting Report

(Continued from page 731)

(*b*) That the following be appointed Area Representatives:
Mr R. H. Newland, G3VW. Edgware and District.
Mr R. J. Redding, G3VMR. Maidenhead.
Mr L. H. Webber, G3GDW. Torbay.

VHF Committee. Council accepted the band plans for the VHF bands as proposed. Details would be published in *Radio Communication*.

Technical Committee. Council approved the awards of Society Trophies as recommended and these will be published in *Radio Communication*.

Minutes of Committee Meetings

Council approved the following Minutes of Committees:
Exhibition Committee (20.6.69).
Mobile Committee (27.6.69)
Education Committee (5.7.69)
M and R Committee (7.7.69)
VHF Committee (9.7.69)
Finance and Staff Committee (14.7.69)
Exhibition Committee (18.7.69)
Technical Committee (22.7.69)
GPO/TVI Committee (25.7.69)
HF Contests Committee (31.7.69)

H. Hoover, Jr., W6ZH

Mr Caws reported that the President had written a letter of condolence on behalf of the Society following the death of Mr Hoover and had received a reply from Mr H. Hoover III, W6APW.

Membership

Mr Stone pointed out that the Articles of Association could be affected by the forthcoming legislation, reducing the age of majoriy from 21 to 18 years.

Publications

Mr Stevens reported that the re-print of the Fourth Edition of the Handbook was now on sale. He also reported that an up-dated version of the Society's booklet on Reciprocal Licensing was now available, 3s 2d post paid.

Beacons

It was agreed that the GB2RS News Bulletin should carry details of changes in the Society's beacon transmissions.

Council was in session for 6¼ hours.

Mobile Rallies

Torbay Rally

The annual Mobile Rally run by the Torbay Radio Society was held on Sunday, 24 August in the Newton Abbot recreation ground. About 250 visitors were seen among the stands and 30 mobile-equipped cars were parked nearby. They came from all parts of the country, as far afield as County Durham, the Midlands and London, quite a few being on holiday in Devon. Prizes were presented to G3EEQ/M and G3DYM/M for the best commercial rig and the best home built station installed, respectively. The talk-in station was heard over a considerable distance owing to the favourable aerial position; on top of a nearby gasometer. The fine weather helped to make the rally a success.

Derby Mobile Radio Event

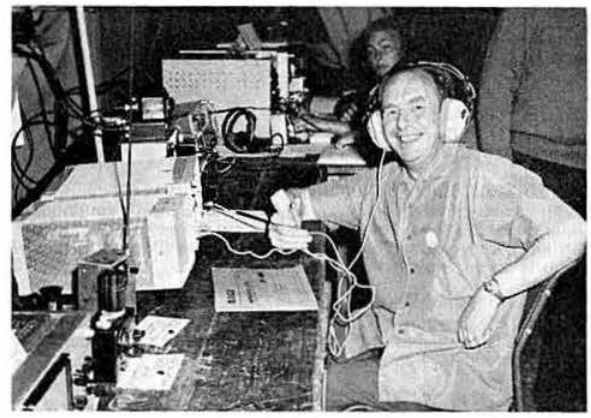
We gather that the Twelfth Mobile Radio Event of the Derby and District Amateur Radio Society was an outstanding success. Over 4000 people attended, most of them being Radio Amateurs and their families. The greatest attractions were the Trade Stands, the Prize Draw and the Mammoth Junk Sale, but a new feature which was a great success was a Children's Playground and Treasure Hunt which raised nearly £10 for the local Children's Charities.

Ian Partridge, G3PRR, was the lucky winner of the Deep Freeze Cabinet and with a little help from G3FGY, managed to get it loaded into his car for the long journey back to Chesham, Bucks.

Owing to the large number of cars present (over 800) they were unable to give the usual display of radio controlled model aircraft but made up for this with a first class concert by the Riddings, Leabrooks and Somercotes Silver Prize Band. There was also a fine Judo display by the Derby Olympus Judo Club, and a model railway exhibition by the Derby Model Radio Society.

Overseas visitors included two VK's, ZL4, VE7, UA1, ZD8 and a OK2, but among the infamous was a collection of local " Pirates " who had the audacity to sign-in on the " Who is Here " notice board.

Talk-in stations were active on 160, 4 and 2m from 10 am until 4 pm, and G3EEO/P worked a great number of stations on the hf bands.



Joe Johnson, G3THT, at the talk-in station for the Cornish Amateur Radio Club's rally on 27 July. The call-sign was GB3CRC, and the site Boscawen Park, Truro.
(Photo by G3VJB)

A typical shot of the Derby Mobile Radio Event, showing a proportion of the number of cars which turned up. In the foreground can be seen a crowd watching the Judo display.
(Photo by G3SZJ)

Taken at Derby Rally. Left to right: G5PP, G2BYI, VK2MZ and G5PP's wife. Although G5PP and VK2MZ are brothers, they had not met for over 40 years until '2MZ came to England on holiday shortly before the rally.
(Photo by G3KPO)

Also at Derby: G3UD, SWL E. Fair, SWL R. Johnson, G2BYI and G3WW.
(Photo by G3KPO)

RADIO AMATEUR EMERGENCY NETWORK

By S. W. LAW, G3PAZ*

NOW that VHF NFD is history, how did the " traffic " sound? You think you are pretty snappy now with all that practice? Brother, you should try and get an earful of our main User Service sometime! Those who have been privileged to sit in at the communications rooms usually come away with a somewhat thoughtful expression. True, we can improvise a channel when things go wrong with the " professionals " (that is what we set out to do) but can we give a good account of ourselves? It is said that a report was asked for by a certain person in authority on the practicability of enlisting the assistance of the amateur service and the person deputed to make the report stated that he had listened on the amateur bands and the procedure that he heard was " so amateurish " that he was convinced that it was of little use to pursue the matter. We cannot help wondering what sort of liaison existed in that area between the User Service and the local group. Who was at fault? Had the User Service in question been offered a demonstration by the local Group? Somehow we doubt it. If, in their (understandable) ignorance, the User Service had listened to the usual friendly amateur nattering under the impression that this was what they could expect from us in times of emergency, then it is not their fault that they were not aware of the capabilities of a well trained RAEN Group. A bus driver whose hobby happened to be " scrambling " at weekends would not expect to have his driving judged by the latter standards in the light of his capabilities at the wheel of a public service vehicle. No more should we allow our RAEN services to be judged by our normal pursuit of what is probably the most friendly hobby in history. Get together with your User Services—who is going to tell them if *you* don't?

Uniformly Cold?

Now that Autumn is almost with us it behoves the prudent to ensure that ample warm clothing is readily available for that sudden call-out. Nobody can give of their best in conditions of acute discomfort and it is foolish to expect an emergency to occur to suit your personal convenience. On the other hand, a loud snort to the suggestion from one of our members that " RAEN should have a distinctive uniform." We are *not* playing soldiers! Our armbands are quite sufficient identification and are still a good buy at 2s 6d. Got yours?

Other Modes

We can think of no reason why a Group should stick to am if the members can cope with other modes. Where an extensive area is to be covered it might well be that either ssb or nbfm could provide better coverage under difficult conditions. The question must, of course, be thoroughly thrashed out between members and the whole set-up well tried before a definite decision is reached. It is food for thought and a nice controversial subject for Group meetings.

The Show

RAEN have nothing spectacular for the Radio Communications Exhibition this month, but that does not mean that you will not see the badge around. Don't neglect the opportunity to chat to your fellow-members from other areas and find out how things are going in their neck of the woods. See you there?

* 130 Alexandra Road, Croydon, Surrey, CRO 6EW.

Looking Ahead

1–4 October—RSGB International Radio Engineering and Communications Exhibition, Royal Horticultural Society's New Hall, Greycoat St., Westminster, London, SW1. 10 am. to 9 pm.

10 October—RSGB Dinner Club, Kingsley Hotel, London, WC1.

18–19 October—GB3CUS. Special Event Station. 160–10m, cw/am/ssb. Skeds and QSL via G3WDS/A.

18–19 October—GB3BES. Special Event Station. 80–10m, ssb. QSL G3XUE.

24 October—RAOTA Dinner, London.

26 October—Scottish VHF Convention, The Carlton Hotel, North Bridge, Edinburgh. 2 pm. Lectures and exhibition. Tickets 7s 6d (convention and tea) and 32s 6d (convention; dinner and tea), from GM3OWU, " Westerlea ", 9 Juniper Avenue, Juniper Green, Midlothian, EH14 5EG.

5 December—RSGB AGM, Royal Society of Arts, London.

25–26 July, 1970—British Amateur Television Club Convention, Cambridge.

Contests

4–6 October—RTTY DX Medallion Sweepstakes.

4–5 October—VK/ZL/Oceania-phone.

4–12 October—Lebanese DX-CW and phone.

5 October—Fourth 432 MHz Open Contest. (644 September).

5 October—Second 1296 MHz Open Contest (644 September).

11–12 October—28 MHz Telephony Contest. (350 May).

11–12 October—VK/ZL/Oceania-CW.

18–19 October—WADM DX-CW.

25–26 October—7 MHz Contest (C.W.) (421 June).

25–26 October—October CQ WW DX Contest - Phone.

3 November—Eighth 144 MHz(SSB) Contest. (736 October).

8–9 November—7 MHz Contest (Phone). (421 June).

15–16 November—Second 1.8 MHz Contest. (736 October).

29–30 November—November CW WW DX Contest—CW.

6–7 December—Tops CW Club 80m Contest.

6–7 December—CHC International DX-CW.

7 December—Fifth 70 MHz (CW) Contest.

13–14 December—CHC International DX-ssb.

Mobile Rallies

5 October—RSGB Scottish Mobile Rally, Beach Ballroom, Aberdeen. Details GM3AEL.

12 October—Peterborough Mobile Rally, Walton County School, Mountsteven Avenue, (off A15), Peterborough. Commencing at 2 pm. Refreshments available, and indoor accommodation will be provided. There will be trade stalls and a junk sale. Talk-in stations G3QS (1980kHz), 4m and 2m. Information from G3KPO.

26 October—The Anglian Mobile Rally, Colchester Radio Society and Ipswich Radio Club Suffolk Show Ground, Ipswich, Suffolk. Talk-in stations on 160m and 2m. Trade stands covering Amateur Radio, hi-fi, colour TV, electrical instruments, records, tape-records, DIY, aerials, spares, " junk ", and a bring and buy. Refreshments will be available on site. All this will be under cover. Trade enquiries to G3SJO, Colchester 78842. Further information from D. W. N. Thomas, G8BVE, 9 Burlington Road, Ipswich. Phone Suffolk 55200.

19 April 1970—North Midlands Mobile Rally.

CONTEST NEWS

Second 1·8 MHz Contest 1969

1. **The General Rules** for RSGB HF Contests, published in January 1969 edition of *Radio Communication* will apply.
2. **When:** 21.00 GMT on Saturday, 15 November, 1969. to 02.00 GMT on Sunday, 16 November, 1969.
3. **Contacts:** CW (A1) only in the 1·8–2·0 MHz band. County Code letters, as published on page 58 of the January 1969 issue of *Radio Communication*, must be sent after the report-serial number group, e.g. for a contact from Surrey 579001 SY.
4. **Scoring:** Six points for each of the first six contacts with stations in any one county; three points for the seventh and subsequent contacts. Six points for each contact with a station outside the British Isles.
5. **Logs:** Column (5) must be headed "County Code letters received." Entries must be addressed to the HF Contests Committee c/o D. Thom (G3NKS), 6 Bracken Close, Copthorne, Crawley, Sussex.
6. **Trophies:** The Victor Desmond Trophy will be awarded to the winning station. The Maitland Trophy will be awarded to the Scottish Member with the highest aggregate number of points in this contest combined with the First 1·8 MHz Contest 1970.

November 1969 144 MHz SSB Contest

This contest has been extended to three hours duration and opened to club and portable stations. Note also the change in Rule 9.

1. **Date and Time:** 1900 to 2200 GMT on 3 November.
2. All **entries** and **check logs** must be sent to the Adjudicator at VHF Contests Committee, c/o G2XV, 165 Cambridge Road, Great Shelford, Cambridge.

3-6. In addition, the following **General Rules** as published in the January issue of *Radio Communication* will apply: 3b, 4a, 5a, 6a, 8c, 9a, 10a, 11-18, 26 and 28. General Rule 7 is not applicable to this contest, see below.

7. This contest is open to any class of station, fixed, multi-operator or portable, with no separate sections.

144 MHz (SSB) Contest

In spite of the "slip-up" concerning the publicity for this contest, the number of entries was very similar to the January event, and the number of stations known to be active was 43 against 40 for January. G8BBB swopped places with G3BA to gain first position, with a very considerably improved score over his January entry. Most entrants commented favourably on the simplicity of the rules, and the weather also seemed to please most people, as it tended to produce reasonable conditions. G3BA would like to see a county multiplier. G3BHW felt that activity was lower, but the above figures disprove this. G3USB found conditions best to the East, and poor to North. G3COJ liked the rules, but would favour a three hour period. G3TCG described the contest as "very enjoyable." EI6AS reported that the band only seemed to open up for one hour. GI3VPK/P said the most outstanding signals were G3BA, G8BBB and G3GZJ.

G2XV

Posn	Call-sign	Points	QSO's	Km	QTH	Pep (in)	Aerial
1	G8BBB	254	33	480	CE	200	10 ele
2	G3BHW	247	27	472	KT	350	6 × 6
3	G3GZJ	218	13	510	CL	125 (Op)	6 × 6
4	G3BA	181	30	380	WK	400	Omni-Vee
5	G3JWZ	175	25	512	SE	400	8 ele
6	G3PWJ	160	24	435	SD	150	6 × 6
7	G3USB	150	23	429	CE	100(Op)	10 ele
8	G3COJ	142	19	435	BS	150	8 × 8
9	G3TCG	129	17	475	EX	100	6 × 6
10	EI6AS	119	12	475	—	400	13 ele

Check log received from GI3VPK/P.

High Power HF Field Day 1969

The Second High Power HF Field Day contest which was held on 12/13 July produced only 11 entries, just two-thirds of the entries received last year. From a study of the logs received, there were 21 portable stations active and four of the non-entrants were passing serial numbers well over 100 toward the end of the contest.

The winners were the Guildford and District Radio Society (**G3KMO/P**) with a score of 1,512 points while the Cardiff Radio Club (**GW3XEJ/P**) with 1,233 points were runners-up. The Durham City Amateur Radio Society (**G3TAK/P**) took third place with 48 fewer points. These contestants will receive Certificates of Merit at the discretion of the Council.

As last year, most of the entrants used transceivers but Guildford used a modified Vespa plus a linear with a home-made double super-het. Two stations used home-made transmitters with Dundee being the only one to use less than 150 watts (90 watts from two 807). The usual assortment of aerials were in use, the winners having a rhombic with 270 feet per leg 36 feet high, two inverted dipoles at 45 feet and 36 feet with a two band Quad at 30 feet. Dundee used a two element two band quad with a 132 feet long doublet while Durham had two inverted vees, a ground plane and a broadside array.

The average number of operators per station was three, the lowest being Dundee & Durham with two each to Cheltenham and Southgate with seven and eight respectively.

The standard of log keeping was very good with fewer than average duplicates claimed for points. All were clearly made out and the Contests Committee thank all those responsible for making out the entries for their part in helping to make the checking easier.

The check log from OK1AEH is acknowledged with thanks.

It is regretted that an entry from Bedford & District ARC, posted on 9 August and with a score of 702 points, was received too late for inclusion.

Posn	Group	Call-Sign	Points 3·5	7	14	21	28	Total
1	Guildford & District Radio Society	G3KMO/P	140	343	726	300	3	1512
2	Cardiff Radio Club	GW3XEJ/P	138	255	600	240	—	1233
3	Durham City Amateur Radio Society	G3TAK/P	18	425	712	—	—	1155
4	Southgate Radio Club	G3BWQ/P	225	159	362	24	—	770
5	Crystal Palace & District Radio Club	G3VCP/P	114	258	118	187	12	689
6	Dundee Group	GM3KYI/P	43	364	216	27	—	650
7	Cheltenham Amateur Radio Society	G5BK/P	249	186	147	9	—	591
8	Pudsey & District Radio Club	G3XEP/P	171	250	126	—	—	547
9	Chesterfield & District Radio Society	G3VKK/P	—	201	240	51	—	492
10	AERE (Harwell) Amateur Radio Club	G3PIA/P	136	86	99	84	—	405
11	Purley Amateur Radio Club	G3WRR/P	63	120	78	63	6	330

It is regretted that owing to pressure on space, the results of the 432 MHz Open Contest on 10 August has had to be held over until next month.

CLUB NEWS

REGION 1 RR B. O'Brien, G2AMV

Merseyside Luncheon Club—First Monday in each month on *HMS Landfall*, 12.30 for 12.45 meal. If you wish to attend please advise *G3VQT* or *G2AMV* beforehand.
Ainsdale (ARC)—1, 15, 29 October, 8 pm, " Morris Dancers", Scarisbrick.
Allerton (Liverpool)—Scout Amateur Radio Society, North West Region—First and Third Thursdays each month, 8 pm. Liverpool County Scout Headquarters Richmond Street, Liverpool.
Blackburn East Lancashire Amateur Radio Club—2 October (" Electronic Novelties," by R. Isherwood), 6 November (Film Show by Esso), 7.30 pm, Edinburgh House, Shearbank Road, Blackburn. Further details from *G4JS*.
Blackpool (B & FARS)—Mondays 8 pm Pontins Holiday Camp, Squires Gate. Morse tuition from 7.30 pm.
Bury (B & RRS)—7 October (Constructional Competition and Any Questions), 11 November (Surplus Equipment Sale), 8 pm, George Hotel, Market Street. Club Secretary *G3VVQ*, 411 Holocombe Road, Greenmount, Bury.
Cheshire (Mid Cheshire ARC)—Club nights every Wednesday 7 pm to 9.30 pm. Instruction nights every Thursday 7 pm to 9 pm. The latter includes theoretical work for the RAE exam, practical construction and Morse practice. Further details from *G3JWK*, Technical Activities Centre, Winsford Verdin Grammar School, Winsford, Cheshire.
Chester (C & DARS)—Thursdays, 8 pm, YMCA.
Crewe and District—Local interest is being kept alive by R. Owen, BRS26847, the local representative. He welcomes calls at his home from local enthusiasts and is searching diligently for a new meeting place. His address is 10 Circle Avenue, Willaston, Nantwich, Cheshire.
Douglas (D & DARS)—2nd and 4th Wednesday each month, 7 pm, 19 Rosemount, Douglas. Further information from W. T. McEvoy at same address. Telephone Douglas 6146.
Eccles (E & DRC)—Tuesdays, 8 pm, Bridgewater School, Worsley, Lancs. Every Thursday Club Top Band net at 20.30 hours.
Leyland Hundred Amateur Radio Group—The Thursday night net at 20.00 hours GMT on 1.915 MHz.
Liverpool (L & DARS)—Tuesdays, 8 pm, Conservative Association Rooms, Church Road, Knotty Ash, Liverpool 14.
Liverpool (NLRC)—10, 24 October, 7 November at 8 pm, Labour party Headquarters, 13 Crosby Road South, Liverpool 22. Secretary Peter Jeffs, 38 College Road North, Liverpool 23. Telephone 051-924 3020.
Macclesfield (M & DRS)—7, 21 October, 4 November, 8 pm. The George Hotel, Jordongate.
Manchester (M & DARS)—Wednesdays 7.30 pm, 203 Droylesden Road, Newton Heath, Manchester 10. Hon. Sec., G. Tilson, G3TJK, 95 Kelverlow Street, Oldham, Lancs.
Manchester (SMRS)—Fridays, 8 pm, Conservative Association Divisional Officer, 449 Palatine Road, Northenden, Manchester 22.
North West VHF Group—Meetings take place every Monday at 8 pm in the Club Caravan, Greeba, Shady Lane, Manchester 23.
Preston (PARSO)—2, 16, 30 October, 13 November 7.30 pm, " Windsor Castle " (Private Room) St Paul's Square.
Salford Dial House Radio Society—This is a Society formed by GPO Engineers who are at the moment endeavouring to increase the vhf activities at the club. They meet every Wednesday evening at 6 pm on the 8th Floor at the river end of Dial House. Anybody interested who is a GPO engineer should write to the secretary at Dial House, Chapel Street, Salford 3.
Southport (73 SSB Society)—Thursdays at 8 pm (All commencing with a talk on part of the RAE syllabus), 73 Avondale Road North, Southport.
Stockport (SRS)—1, 15, 29 October, 12 November, 8 pm. The Brookfield Hotel, Wellington Road South Stockport. New members are always welcome. Further details from the Secretary who is D. I. Lunn *G3LSL*, 4 Farnham Avenue, Macclesfield. (Telephone 7903).
Warrington Culcheth (CARC)—Fridays, 7.30 p.m., Chat Moss Hotel, Glazebury. All visitors will be welcome. Secretary K. Bulgess, 32 Hendon Street, Leigh.
Westmorland—Fridays, 7.30 pm, 24 Park Road, Milnthorpe. Additionally there is an RAE class on Mondays and Thursdays at the same time. Secretary *G3UEC*, 9 Castle View, Sedgwick, Kendal.
Wirral (WARS)—7.45 pm. First and Third Wednesdays each month at former Civil Defence HQ, Upton Road, Bidston, Birkenhead. Coming Events—1 October, 15 October (AGM). On August 6 a DF Contest was held. After much running around in circles the station was eventually located on the roof of the club HQ! On 20 August Bill Evans G3VQT took the chair for a very enjoyable Quiz night. Teams were picked by G3PXX and G3OKA, and the result—almost a draw! Between 21 and 23 August the club set up a station at the Heswell Rotary Club's " Hobbies Exhibition." Thanks to the Organizers and to the many stations worked for making possible for us to demonstrate the hobby to the general public. Public Relations Officer *G3WSD*.
Wirral (Wirral DX Association)—Further meetings are scheduled for the last Wednesday in the month, in October at the home of *G3AKW* when radio slides will be shown and in November at *G3UFO* when the feature will be a RSGB tape and slide lecture. A Christmas gathering is being organized for the December event. Member *G3VVA* has been on holiday in *VE7* (British Columbia) and will provide an evening's entertainment on this in the New Year. Because gatherings are held in member's home we regret members only at all events. Details of Membership are available from the Secretary. *G3OKA*.

Region 2 RR K. Skethaway, BRS20185.

Barnsley (B & DARC)—10 October (" TVI, Causes and Cures," by J. Ward, G4JJ), 24 October (Club Construction Project), 7.30 pm, King George Hotel, Peel Street, Barnsley. *G3LRP*.
Bradford (BRS)—The new season opens with a change of HQ. The new address is Bradford Liberal Federation, 10 Southbrook Terrace, Great Horton Road, Bradford 7, just across the road from the old HQ at Bradford Tech.

The new syllabus is not yet available but in the meantime information on meetings, dates, etc can be obtained from the Secretary R. J. Cockerham, G3WTF, 56 Brantwood Road, Bradford 9. *G3HJP*.
Durham (DCARS)—9 October (" Stabilized Power Supplies" by Dr Brian Stanier), 23 October (" Receiver Accessories " by Ray Kelly), 7 pm, Elvet Riverside Arts Block, Durham University New Elvet, Durham.
Halifax (NHARS)—4 October (London Visit), 8 October (Mr Craven's Lecture), 22 October (" Colour TV " by Mr McArthy of Baird TV), 29 October (Pea & Pie Supper inviting members of Manchester RC), 5 November (Open—so they can let their Bangers off), 7.45 pm, Sportsman Inn, Ogden, Near Halifax. 18/19 October Scout Jamboree running two stations G3MVH/A & GB3KSG. The lecture by Stew W1BB mk 2 Version on DX-ing the hard way is now available. *G3MDW*.
Pudsey (P & DRC)—Meetings every Wednesday, 7.30 pm, Liberal Club, Hough Lane, Bramley, Leeds 13.

The White Rose Rally will be held next year on 26 July, and it is hoped that the same QTH will be available. Now that the RAE results are out the Club is pleased that three more members have passed. RAE is taught every alternate Wednesday and all interested persons will be made welcome.

On Wednesday 13 August, a very interesting lecture was given by Bill G3WOB on " How to work foreign amateurs in their own language." Since then most locals can be heard on local nets using German instead of English. Lectures, talks and films are on Wednesdays when there is no RAE. They are arranged at short notice, so for anyone in doubt, come along and see just what we are up to. *G3XLV*.
Scarborough (SARS)—Thursdays, 7.30 pm, c/o RAF Association, Fulbeck House, 3 Westover Road, Scarborough. *G8KU*.
South Shields (SS & DARC)—Meetings Fridays, 8 pm, Trinity House, Social Centre, Laygate, South Shields. *G3SFL*.
Sheffield (SARC)—28 October (" Quads," by *G3PHO*), 25 November (W1BB Tape Lecture), Cross Scythes Hotel, Dore.
SARC Top Band Contest coming shortly. Secretary: Guy Easton, *G3JMV*. *G8NN*.

Spen Valley (SVARS)—9 October (" Low Power Transmitters " by D. M. Pratt, *G3KEP*), 16 October (" High Power Loudspeakers " by A. Falkus, Fane Acoustics Ltd), 23 October (" Simple Receiver Construction," by A. Petts, G3PXF), 7.30 pm, Heckmondwike Grammar School. *G8BSC*.
Sunderland (SARS)—7 October (" NFD ? Hints & Kinks " by J. Melvin, *G3LIV*, Durham ARS), Meetings first and third Tuesdays each month Sunderland Technical College, 7 pm. *G3XID*.
Teeside—Second Saturday every month, Social Evening, 8 pm, The Crown Hotel, Yarm. *G3JMO*.
York (YARS)—Thursdays, 7.30 pm, British Legion Rooms, 61 Micklegate, York. *G8BOK*.

Region 3 RR R. W. Fisher, G3PWJ.

Birmingham (MARS)—Third Tuesday of each month 7.45 pm, Midland Institute, Margaret Street, B'ham 3. *G8BHE*.
(South)—1 October (AGM) 5 November (" VHF ? Why not ? How ? " Mr T. Douglas *G3BA*) 8 pm, The Scouts Hut, Pershore Road, Stirchely, Birmingham 29.
Bromsgrove (B & DARC)—10 October (Surplus Sale), 8 pm, Co-op Hall. The club's picnic held on 31 August in the grounds of Hartlebury Castle was a great success with 50 mobiles attending.
Coventry (CARS)—3 October (Tape & Slide lecture, W1BB, mk 2). 10 October (Talk by Mr J. R. Tipple about the Birmingham GPO Radio Tower), 17 October (Night on the Air), 24 October (Visit to GPO Radio Tower), 31 October (Night on the Air). Scout HQ, 121 St Nicholas Road, Radford, Coventry.
Dudley (DARC)—7 October (AGM), 21 October, 8 pm, Central Library, Dudley.
Hereford (HARS)—First and Third Fridays of each month, Civil Defence HQ, Goal Street, Hereford. *G3RJB*.
Leamington Spa (MWARS)—6 October, 13 October, 20 October (HW32 Talk), 27 October, 8 pm, 28 Hamilton Terrace, Leamington.
Redditch (EWARG)—9 October (Talk, Slides and film on the visit to USA by Bob Palmer, *G5PP*) 8 pm, Old Peoples Centre, Park Road, Redditch. *G3EVT*.
Shrewsbury (SARS)—2 October (Club Station), 9 October (AGM), 16, 23 30 October (RAEN by *G3MBQ*) 7.30 pm, Shrewsbury School Signals Hut, *G3WNI*.
Solihull (SARS)—21 October (AGM), 8 pm, The Old Manor House, 126 High Street, Solihull. *G3VXV*.
Stourbridge (STARS)—7 October (Talk by Mr Travers of Vero Electronics), Longlands School, 21 October (Informal) Shrubbery Cottage.
Stratford (SUARC)—3 October (Aerials by *G3OOQ*), 17 October (Direction finding by *G3ORI*), 31 October (Early Radar by *G3YIK*) 8 pm, Halls Croft, *G3XFV*.
Wolverhampton (WARS)—6 October (AGM), 8 pm Neachells Cottage, Stockwell Road.

Region 4 RR T. Darn, G3FGY.

Derby (D & DARS)—1 October (Surplus Sale), 4 October (Coach Trip to London), 8 October (Inquest on 1969 Rally), 15 October (Open Evening—Sub Basement clean up), 22 October (Ladies night—" English Churches through the Ages " Illustrated talk by H. R. Nuttal, Refreshments), 26 October (President's Trophy Contest—DF), 29 October (RSGB Tape Lecture—a conducted tour of ARRL by John Huntoon, *W1LVQ*), 7.30 pm, Room No. 4, 119 Green Lane, Derby. *G2CVV*.
Derby (NHCAARG)—3 October (Safari to India—P. Beales), 5 October (DF Practice Run—3 pm to 5 pm), 10 October (Open Evening), 17 October (Transceivers—K. Bierney), 24 October (Surplus Sale), 31 October (Film Show, G3AIA), 7.30 pm, Room No. 8, Nunsfield House, Boulton Lane, Alvaston, Derby. *G3LCV*.
Heanor (SEDRS)—7 October, Transistor Amplifiers. 14 October, Sale of Members Surplus Equipment. All meetings at the South East Derbyshire College of Further Education, Ilkeston Road, Heanor, Derbys. T. W. Clarke.

Region 5 RR S. J. Granfield, G5BQ

Bedford (B & DARC)—Club meets at the Dolphin Inn, Broadway, Bedford, at 8 pm on Thursdays (Morse Classes at 7.30 pm). Full particulars of programme from Ken Whitbread *G3XDU*, at 78 Pipit Rise, Bedford.
Bishop's Stortford (BS & DARC)—Club meets monthly at the British Legion Club, Windhill, Bishop's Stortford, Herts. Contact P. J. Toynton, *G3RGA* at " Wildhern," Old Mead Lane, Henham, Herts, for further information.
Cambridge (C & DARC)—3 October (Film Show—Mervyn Lay, *G3VPK*), 10 October (Informal), 17 October (Mobile Demonstration of HF SSB by Richard Baker, G3USB), 24 October (Informal), 31 October (Guess the Voice . . . Big Brother has been eavesdropping on your QSO!), Fridays at 7.30 pm—Club Headquarters, Victoria Road, Cambridge.
Cambridge University (CUWS)—The new Academic Year begins on 7 October, and the first formal meeting will be a lecture on Audio Amplifiers given by Dr A. R. Bailey on Tuesday, 14 October in the Jesus College Junior Parlour at 8.15 pm. Prospective new members should attend our stand at the societies' Fair, or contact either N. Kingsley (*GI3RCB* , c/o Trinity College or S. C. Cripps (*G3TPF*) c/o Jesus College.
Dunstable Downs (DDRC)—Meetings on Fridays at Chew's House, Dunstable, Bedfordshire. Particulars from A. C. Don, (*G8BWZ*), 51 Manor Park, Houghton Regis (Dunstable 67349).
Luton (L & DARS)—Meetings at 8 pm on the first Tuesday in the month at Club HQ, Putteridge Estate, Luton, Bedfordshire.
March (M & DARS)—Meetings on Tuesdays at Old Police Headquarters, High Street, March, Isle of Ely.
Peterborough (P & DARS)—Meeting on first Friday in the month at 7.30 pm in the Electronics Section, Peterborough Technical College, Eastfield Road. On other Friday evenings meetings are held at the Club HQ in the Old Windmill behind the Peacock Inn, London Road, Peterborough at 8 pm. Further particulars from Douglas Byrne, *G3KPO*, Jersey House, Eye, Peterborough.
Shefford (S & DARC)—The Club has a new Secretary—C. W. Steadmen, *G3XWS* of 10 Wychwood Avenue, Luton, Beds. A programme has now been arranged up to the end of February 1970. 2 October (Ferrite and Toroids—Neosid), 9 October (General Quiz—Club Group), 16 October (" Reminiscing ' The Good Old Days,' " by *G3DPQ*), 23 October (" Transistor Power Supplies," by *G3XTQ*), 30 October (" Transistor Transmitters," by Texas Instruments Ltd.), Meetings in the Church Hall, High Street, Shefford and Thursdays at 8 pm.
Stevenage (S & DARC)—Meetings on first and third Tuesdays at 8 pm, at Hawker-Siddeley Dynamics Ltd., Gunnel's Wood Road, Stevenage, Hertfordshire.

Region 6 RR L. Owen, G8MC.

Cheltenham (RSGB Group)—First Thursday 8 pm, Great Western Hotel, Clarence Street, Cheltenham.
Gloucester (GRS)—Meetings second and fourth Thursdays at 7.30 pm at RAFA Club, 6 Spa Road, Gloucester.
Oxford Radio Society—Weekly meetings during termtime at 8.15 pm on Wednesdays in the Department of Metallurgy, Parks Road. Free access to the Society's transmitting station *G3OUR* for licensed members, Morse classes and RAE instruction will be arranged for those interested. As well as the regular meetings which provide talks on a wide range of topics of both general and specialized interest, the Society arranges visits and other activities. This term a station will be run in the Jamboree-on-the-Air from the local Scout campsite. A DF hunt is also suggested. Contact Simon Watts, St John's College (President), or simply arrive at any meeting, and introduce yourself.

Region 7 RR P. A. Thorogood, G4KD.

See you at the Exhibition. 1 to 4 October same Hall. See USA stand on GB Stand with radio books from there. Win the Communication RX or will change to KW2000A if you have a TX licence.
Acton, Brentford & Chiswick (ABCRC)—21 October 7.30 pm, " 2 Metre Night." Chiswick Trades & Social Club, 66 High Road, Chiswick.
Addiscombe (AARC)—Second and fourth Tuesdays 7.30 pm, Toc H Hall, 158 Lower Addiscombe Road.
Ashford (Echelford ARS)—Last Thursday of Month 7.30 pm, St Martins Court, Kingston Crescent, Ashford, Middx.
Barking (B & DREC)—Tuesdays and Thursdays 7.30 pm. Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking.
Bexleyheath (NKRS)—Second and Fourth Thursdays. 9 October (Donated Junk Sale). 23 October (" Communications in the LEB," by Cliff Leal). August Junk Sale was very enjoyable, George G3OFM and Colin G3VFD in excellent form. Quality of gear was very good, and discussion followed on VHF field day arrangements. 7.30 pm, Congregational Church Hall, Chapel Road, Bexleyheath.
Cheshunt (CDRC)—First Friday of month, 7.30 pm, Methodist Church Hall, opp Theobalds Station, Cheshunt.
Chingford (RSGB Group)—Fridays. Telephone 01-524 1308.
Chingford (SRC)—Fridays 8 pm. Friday Hill House, Simmons Lane, Chingford E4.
Civil Service (CSRS)—First and Third Tuesdays, 6.30 pm. 4 November (" Why I became a Radio Amateur "), 18 November (Dave Bean, member, will speak on " Modifying the Pye Ranger for

2 or 4 metres "). Special invitation extended to all visitors. Car park free after 6.30 pm. Civil Service Recreation Centre, Monck Street, Westminster.

Croydon (SRCC)—Third Tuesdays, 7.30 pm, Swan and Sugarloaf, South Croydon.

Crystal Palace (CP & DRC)—Saturday, 18 October (" RTTY," by Brian Codar, *G8BMQ*), 15 November (Film Show), 8 pm. Club net not yet working well, so why not come on 3550 kHz, Tuesdays, 8 pm. Not just a club net but NFD operating training ground. Emmanuel Church Hall, Barry Road, SE22.

Dorking (DR & DRS)—Second and Fourth Tuesdays. 2nd Tuesday, " Wheatsheaf," 4th Tuesday, " Star and Garter," Dorking.

Ealing (E & DARS)—Tuesdays 7.30 pm. Northfields Community Centre, Northcroft Road, W13.

East London—Sunday, 19 October, 2.30 pm. (Meeting of the Year).

Edgware & Hendon (E & DRS)—Second and Fourth Mondays, 8 pm. St George's Hall, Flower Lane, Mill Hill, NW7.

Farnham, Bucks (Burnham Beeches RC)—Fortnightly, Mondays, Farnham Common, Village Hall, Victoria Road.

Gravesend (GRS)—Wednesdays, 8 pm, Community Centre, Cedar Avenue, Kings Farm Estate, Gravesend.

Guildford (G & DRS)—Second and Fourth Fridays. Guildford Engineering Society, Stoke Park.

Hampton Court (TVARTS)—First Wednesday, 7.30 pm, The Three Pigeons, Portsmouth Road, Surbiton, Surrey.

Harlow (DRS)—Tuesdays (General), Thursdays (CW Practice), Fridays, 8 pm. British Legion House, Western Road, Romford.

Hemel Hempstead (HH & DARS)—First and Third Fridays, 7.30 pm, " Addmult " Sports Club, Hemel Hempstead.

Holloway (GRS)—Mondays (RAE), 7 pm. Wednesdays (Morse), 7.30 pm. Fridays (Club), 7.30 pm. Monten School, Hornsey Road.

Ilford—Every Thursday, 8 pm. 50 Mortlake Road (off Ilford Lane), Ilford.

Kingston (K & DARS)—Second Wednesday, 8 pm. Penguin Lounge, 37 Brighton Road, Surbiton.

Leyton & Walthamstow—Tuesdays, 7.30 pm. Leyton Senior Institute, Essex Road, E10.

London (UHF Group)—All at Exhibition. See you there.

Loughton—Fortnightly, Fridays, Loughton Hall, Rectory Lane (Near Debden Station).

Maidenhead (N & DARC)—Third Tuesday of Month, 7.30 pm. Victoria Hall, Cox Green, Maidenhead.

New Cross—Wednesdays and Fridays, 8 pm, 225 New Cross Road, SE14.

Paddington (P & DARS)—Thursdays, 7.30 pm, Beauchamp Lodge, 2 Warwick Crescent, W2.

Purley (P & DRS)—First and Third Fridays, 8 pm, Railwaymen's Hall, Side Entrance, 58 Whytecliffe Road, Purley.

Reigate (RATS)—Wednesday, 5 November (Constructional Contest), 8 pm. Last meeting report mentions a discussion on Class A versus Class B licences. *G3PNA* pointed out that many " A " licences only operate in class B anyhow! Welcome given to Crawley members also NFD short discussion. Visit to Gatwick Airport Control Tower arranged. George and Dragon, Cromwell Road, Redhill.

Romford (R & DRS)—Tuesdays, 8.15 pm, RAFA House, 18 Carlton Road.

Scouts (ARS)—Third Thursdays of month. 16 October (" Receivers from Scratch," by A. H. Watts), 18/19 October (Jamboree-on-the-Air). 7.30 pm, Baden Powell House, Queensgate, South Kensington, SW7.

Sidcup (CVRS)—16 October (Surplus Sale), 6 November (C. A. Jones on " Integrated Circuits "), 8 pm, Congregational Church Hall, Court Road. Last meetingW. Thompson *G3MQT* gave an instructive talk on Radio Interference Investigation. One of his warnings, never interfere with somebody else's TV—the set never works properly after what you did to it! Never put out calls requesting TVI reports, you'll be blamed for everything later!

Slough (SDR Group)—First Wednesday, 7.30 pm, Civil Defence Hut, Bowes Road, N11.

St Albans (Verulam ARC)—15 October (*G3NOH* will give a talk—" 70 cm and up! "), 19 November (Details still *secret*! Special meeting evening), 7.30 pm. August great month. Our DX-pedition GW3VER /P on 2 metres a great success. August 6 meeting our Treasurers brought KW2000A rig and put it on the air. August 20 meeting record turnout for Tony *G3MED* on home brew SSB equipment. Town Hall, St Peters Street, St Albans.

Sutton & Cheam (SCRS)—Third Tuesday, 8 pm, The Harrow Inn, High Street, Cheam.

Welwyn (Mid-Herts ARS)—Second Thursday of month. 9 October 8 pm. AGM. Welwyn Civic Centre, Welwyn.

Wimbledon (W & DRS)—Second and last Firdays, 8 pm, St John Hall, 124 Kingston Road, South Wimbledon, SW19.

Wembley (GECARS)—Thursdays, 7 pm, Sports Club, St Augustin Avenue, North Wembley. (This Club is open to non GEC employees by invitation. Telephone ARN 1262 for details).

Region 8 RR D. N. T. Williams, G3MDO.

Canterbury (EKRS)—New HQ premises will be available shortly. 17 October (Visit to UHF meeting at Wye College). Information of future meetings from Hon Sec D. N. T. Williams. *G3MDO*.

Eastbourne (SARS)—9 October (" Quiz " Mid-Sussex ARS *v* Southdown ARS at Burgess Hill). Meetings held at the Victoria Hotel, 8 pm, Latimer Road, Eastbourne.

Maidstone (M YMCA ARS)—Meetings held every Tuesday and Friday, 8 pm, at " Y " Sports Centre, Melrose Close, Loose, Maidstone.

Mid-Sussex (M-SRAS)—9 October (" Quiz " Southdown ARS *v* Mid-Sussex ARS at home), 23 October (Demonstration and talk including " Journey into Sound " by members of the Brighton Tape Recording Club. To be confirmed).

Thanet (TRS)—3 October (Bring and Buy Sale), 10 October (Proposed talk by local Tx amateur), 17 October (Visit to UHF meeting at Wye), 24 October (Talk), 31 October (Visit to Margate Telephone Exchange).

Worthing (W & DARC)—Meetings held at the Rose Wilmot Youth Centre, Littlehampton Road, Worthing.

Region 9 RR J. Thorn, G3PQE.

Bristol (Bristol Amateur Radio Society BARC)—Every Monday and Thursday 7.30 pm. Club HQ (G3TAD), University Settlement, Ducie Road, Barton Hill, Bristol 5. *G3WLZ*.

(City & County of Bristol RSGB Group)—7 October (Annual General Film Show, wives, friends and members invited to this Social evening), 27 October (" Impressions of a visit to the USA," by Arthur Milne, G2MI), both 7.30 pm, Becket Hall, St Thomas Street, off Victoria Street, Bristol 1. All visitors to meetings are reminded that monthly the Junk stall is open to bring along and sell your items on commission to the Group, since nearly 100 attend these days it is a good market. *G3COP*.

(University of Bristol Amateur Radio Society)—Potential members are asked to join during PRESCO week at Freshers Squash. The Society holds two calls, G3KAC and G8CXH, and meets on Saturdays, 2.30 pm, Department of Physics, The Royal Fort. *G8ADP*.

Burnham-on-Sea (BOSARS)—Contact *G3GIW*.

Cornwall (CRAC)—2 October, SWEB Clubroom, Pool, Camborne. *G3UCQ*.

(VHF Group)—Third Thursday in each month, 7.30 pm, The People's Palace, Pydor Street, Truro. *G3XC*.

(Falmouth Group)—14, 28 October, Laburnham Drive Mission Hall. *G3OJN*.

(Newquay Group)—1, 15, 29 October, Treviglas School. *G3THT*.

Exeter (EARS)—7 October (" West Country Quiz " with Exeter, Torquay, Plymouth, Saltash, Yeovil, and Taunton Clubs) 7.30 pm, ar the new venue, YMCA, St David's Hill, Exeter. *G3HMY*.

Plymouth (PRC)—7 October (Film Show of RSGB, Radio '67, Mullard Transistor, and comedy), 17 October visit to Saltash to take part in a quiz. Club room (G3PRC), Virginia House, Bretonside, Plymouth. *G3YDU*.

Saltash (S & DARC)—3 October (Talk by Bill Robets), 17 October (Quiz, Club versus Plymouth RC), 31 October (2 metre night), all at Burraton Toc H Hall, Warraton Road, Saltash. *G3XWA*.

South Dorset (SDRS)—4 October (" Linear Integrated Circuits," by Bill Ford), 7.30 pm, Labour Rooms, Dorchester. *G3RZG*.

Torbay (TARS)—25 October (Film Show). Every Tuesday and Friday, Club HQ (G3NJA), Bath Lane, Rear of 94 Belgrave Road, Torquay. The Mobile Rally on 24 August was a great success. *G3NQD*.

Wells (WARS)—No information on activities. *G3MQQ*.

Weston-super-Mare (WSMARS)—Not the first Friday this month 10 October at RAF ARS HQ where as guests are able to enjoy these amenities at Locking RAF Camp. Meetings resume at Westhaven School, Ellesmere Road, Uphill the first Friday in each month from 7 November. *G3GNS*.

Yeovil (YARS)—Wednesdays, 7.30 pm, Park Lodge, The Park, Yeovil. *G3NOF*.

Region 10 RR C. H. Parsons, GW8NP.

Blackwood (ARC)—Fridays, 7 pm, Blanche Cottage, off High Street, Blackwood, Mon *G6BK*.

Barry College of Further Education (ARS)—Society meetings 7 pm on each Thursday. 9 October (Annual General Meeting). Meetings held at the College, Colcot Road, Barry, Glam. *GW3VPB.*
Cardiff (RSGB Group)—13 October, AGM, 7.30 pm, TA Centre, Park St, Cardiff.
East Glamorgan Raynet Group—First Tuesday in each month, 7.30 pm, Cardiff Emergency Services HQ, Womanby Street, Cardiff. *GW3VNO.*
Hoover (ARC)—Monday, 7.30 pm, Hoover Social Club, Hoover Factory, Merthyr. The Club station, *GW3RDB*, is active, and interested visitors are always welcomed to meetings. Secretary is Mr F. E. Tribe.
Pembroke (ARC)—Last Friday in each month, 7.30 pm. Defensible Barracks, Pembroke Dock.
Pontypool (ARC)—Meetings on Tuesdays at 7 pm, Educational Settlement, Rockhill Road, Pontypool. Mon. *GW3JBH.*
Port Talbot (ARC)—Meetings at Trefelin Club and Institute, Port Talbot. Times and dates of meetings are conditioned by the large number of shift workers in the area, and details are available from *GW5VX.*
Rhondda (ARS)—Meetings at Pengelli Hotel, Treorchy, Rhondda, Glam. Details from *GW3PHH.*
Sully and District Short Wave Club—Tuesdays, 7 pm, Annexe Sully Bowls and Social Club, 59 South Road, Sully, Glam. In addition to short-wave interests, the Club also caters for those who are interested in general electronics. *GW3SLA.*
Swansea Telephone Area (ARS)—Meetings held at Telephone Engineering Centre, Gors Road, Town Hill, Swansea, 7.30 pm. Meetings are normally on Tuesdays, but may be subject to change. Secretary M. D. E. Connor, 54 Talley Road, Penlan, Swansea, Glam.
University College Cardiff (ARS)—Students entering College in the new session who are interested in radio will have the advantage of use of a fully equipped shack if qualified, and RAE and Morse classes if not. Please contact the Secretary, c/o Students Union, Dumfries Place, Cardiff.
University College Swansea (ARS)—The Club station will be on the air during FresherWeek and afterwards, call-sign *GW3UWS.* Future meetings will be held in the Students Union Building. New students should contact the Secretary, c/o UCS Radio Society, Engineering Society, Applied Sciences Building, University College Campus, Swansea.

Region 11 RR M. Williams, GW3LCQ.

Conway Valley (CVARC)—16 October, ("Filters and FET's," by Dr J. D. Last, BSc, PhD), usual QTH, 8 pm, Parade Hotel, Llandudno.

Region 12 RR A. W. Smith, GM3AEL.

Aberdeen (AARS)—Fridays, 7.45 pm. 6 Blenheim Lane, Aberdeen. *GM3HGA.* Aberdeen 33838.
Lhanbryde (MFARS)—Mondays 7.30 pm. St Andrews School, Lhanbryde, by Elgin, Morayshire. *GM3UKG.* Clochan 225.
Dundee (RSGB Group)—Thursdays 8 pm, 3 Magdalen Place (off Roseangle), Dundee. *GM3KYI.*
Lerwick Radio Club (Shetland)—Tuesdays and Thursdays, Annsbrae House, Lerwick. *GM3XPQ.* Bixter 249.

Region 13 RR I. W. Sheffield, GM3VEI.

Lothians Radio Society—9 October, two part meeting ("Beginners DXing on Top Band," WIBB tape lecture). 23 October, ("Electronics in Civil Aviation," by *GM3TZS*). Meetings start at 7.30 pm in YMCA, South St Andrews Street, Edinburgh.

Region 14 RR N. G. Cox, GM3MUY.

Ayrshire (Ardeer Recreation Club ARC)—2, 7, 9, 14, 16, 21, 23, 28, 30 October, 7.30 pm, Ardeer Recreation Club, Amateur Radio Section, Stevenston, Ayrshire, details J. F. McCreight, GM3DJS, 10 Auchenharvie Road, Saltcoats, Ayrshire.
Ayrshire (AARG)—26 October, 7.30 pm, ATC HQ, Kilmarnock.
Glasgow University (GURC)—10 October (club night), 24 October (RAEN Glasgow group), 7.30 pm, George Service House, 11 University Gardens, Glasgow, W2.
Greenock (G & DARC)—7, 14, 21, 28 October, 7.30 pm, Watt Library, Union Street, Greenock.
Mid-Lanark (RSGB Group)—17 October, 7.30 pm, YMCA, Brandon Street, Motherwell.

Region 15 RR J. Thompson, GI3ILV.

Belfast (City of Belfast YMCA Radio Club)—Wednesdays and Saturdays, 8 pm, City YMCA (3rd Floor), 12 Wellington Place, Belfast, BT1-6GE. Information from YMCA General Office.

Region 16 RR W. J. Green, G3FBA.

Chelmsford (CARS)—First Tuesday in each month, 7.30 pm, Marconi College, Arbour Lane, Chelmsford. *G3OZF.*
Colchester (CARS)—Each Wednesday at Room 41, North East Essex Technical College, Colchester at 7 pm. New Term 1 October (AGM) 8 October, Hon Sec R. C. Greenleaf, 27 Ernest Road, Wivenhoe, Essex.
Gt Yarmouth (GYRC)—Last Friday in each month 7.30 pm, at 98 South Market Road, Gt Yarmouth. *G3HPR.*
Ipswich (IRC)—29 October (G3FIJ Aerial Lecture), 7.30 pm, Red Cross HQ, Gippeswyk Hall, Gippeswyck Avenue, Ipswich. *G3UJR.*
Maldon Essex (MYCRG)—Every Thursday, 7.30 pm, G3UJR at the Friary, Chequers Lane, Maldon, Essex. *G3LRQ.*
Norwich (NARC)—Mondays, 7.30 pm, The Brickmakers Arms, Sprowston Road, Norwich. Nr Ring Road Roundabout. *G3PTB.*
Southend (SDRS)—Meetings going fortnightly at the Staff Canteen, Ekco Electronics Ltd. *G8BSB.*

Region 17 RR C. Sharpe, G2HIF.

Bournemouth (Wessex ARC)—Meetings on the first Friday and on the Monday following the third Friday in each month, 7.30 pm, Cricketers Arms Hotel, Windham Road, Bournemouth, Hants. *G8AVE.*
Maidenhead (M & DARC)—6 October ("Demonstration of the SB34" by G3VMR), 21 October (Informal). Meetings on the first Monday and third Tuesday of each month 7.30 pm. Victory Hall, Cox Green Lane, Maidenhead, Berks. *G3VMR.*
NW Berks (AERE Harwell, ARC)—Meetings on the third Tuesday of each month, 7.30 pm, Social Club, AERE, Harwell, Berks. *G2HIF.*
Reading (R & DARC)—7 October (Mobile in 1970 by a member of ARMS), 21 October ("CW through the Ages," by G3PWU), 7.30 pm, Victory PH, The Medway, Reading, Berks. *G3TEB.*
Southampton (RSGB Group)—Meetings on the second Saturday of each month, 7 pm, Lanchester Building, University of Southampton. *G3GOY.*

Just one more thing . . .

Many secretaries are forgetting vital details when they send in their information. Please check your copy carefully. Apparently some secretaries are assuming that the copy that they submit on the first of a month will appear in the magazine of that month. Gentlemen, our printers are pretty good but they can't convert copy into a magazine in three days! Notes submitted by 1 October will be included in the November magazine and so on.

It would be helpful if the senders of notices would indicate their exact positions, ie secretaries, Area Representatives, etc. Finally, please do not expect a programme of your club's events for the next six months to let you out of sending further copy. It is not practical for a regional representative to survey a mass of programmes to glean out what is applicable for a particular month. It is up to you to submit your club's events monthly to the RR (never direct to RSGB HQ). Of course, it is a courtesy to let him have your long-term programme as well, as a confirmation. Your co-operation will be greatly appreciated.

MEMBERS' ADS

These advertisements are free to members. The number of words is limited to 32, not including your name (or call-sign) and address. All ads must be clearly written or typed on the Order Form or on a postcard. Each ad must be accompanied by the recent *Radio Communication* wrapper, the address of which must agree with the address on the ad. No trade or business ads can be accepted. The RSGB cannot accept responsibility for errors, for the quality of equipment offered, or guarantee inclusion. Ads must reach RSGB HQ during the period printed on the top of the current order form. Ads which are not printed will *not* be held over, they must be re-submitted. We advise members to enclose a stamped addressed envelope, when replying to ads. For further details of these ads see the current Order Form.

Entry period for Nov. ... 6 Oct. to 10 Oct. Entry period for Dec. ... 7 Nov. to 12 Nov.

TA 32 jnr, £12 ono, Hamgear preselector self-powered £4 ono, carr paid. G3WAO QTHR. Tel GRA 2717.

Bag of 28 xtals, £2, containing 19 2N706's, 50 2G371's, 10 SL701C ic's, various power diodes 50s. A. Dearing, 118 Stainbeck Lane, Leeds. LS7 3QS. Tel 0532-689893.

Tester tms No 1 0–30,000 Hz sep. psu., 100/250 ac or 12V dc unused £10, collect. A. Boughton, 2 York Rd, Kennington, Ashford, Kent.

TW Twomobile rx less 2m converter, ideal for /M or /P if strip, if 4–6 MHz, mod with transistorized stabilizer for 12V dc £11 inc carr. C.Woodley, obo G3OUF. Tel 01–837 8688.

Swap American mags, QST CQ etc 1946–66 for British mags before 1930, two for one. Early wireless books and parts wanted. H. Wenden, K8IKO, 52 East Sth St, Worthington, Ohio 43085, USA.

Xtals FT249, 1907·5, 1922·5, 1927·5, 1962·5, 1981 kHz 7s 6d ea. Various holders 2060, 3099·4, 5200, 5675, 7173·3, 16335 kHz 2/6 ea, 50/150 Joule Elec flash unit £12. W. Fletcher, G3NXT, Holmdale, Martin, Lincoln.

New components, capacitors 15 × 15 butterfly 5s, 34 × 34 butterfly 5s, rf chokes 2·6 MHz, 250 mA 2s, 1·5 MHz 250 mA 1/6 ea. Silvered coils 5 turns ceramic base 2s ea post xtra sae list. J. Harvey, 22 Elm Grove, Bromsgrove, Worcs. Tel Worc 3578.

Headphones with boom mike by Eagle, type HMA209, listed at £9 9s, accept £6 10s, brand new and unused. C. Woodley, G3XPU, Tel 01-837 8688.

NCX5 Mk 2 comp with matching psu and Heathkit ptt mike HDP21 all unmarked and little used £235. BC221 with charts £18, buyer collects. J. Morris, 3 Astley Rd, Bradshaw, Nr Bolton, Lancs. Tel Bolton 52384.

Pye 2m /M QQV03-20A pa stage 4 only £20. Shibaden video recorder, little used £175 (list £500) 19 in monitor also available £60, monitor comp vhf uhf tv rx. P. Cooper, G3CXI, 11 Hardy Road, Bishops Cleeve, Cheltenham, Glos, Tel Bishops Cleeve 3834.

Rx's R107 £8 10s, R209 £9 both vgc. Servograph pen recorder 50 μA sensitivity as new £8 ono. 30 ft sectional aerial with gys £2, carr xtra. H. Brash, GM3RVL, 5 Hillview Drive, Edinburgh, EH12 8QW. Tel 031-334 7152.

Eddystone EC10 battery comm rx, brand new cond few wks old £45 ono. Infra-red binoculars in transit case with psu and light unit £10 plus carr, J. Thexton, G3URE. QTHR.

Free to whoever is willing to pay post, lots of old Practical TVs plus few *Wireless Worlds* and *USA Mags*. D. Fellows, 10 North St, Burwell, Cambs. CB5 0BA.

Paper capacitors 8 μF 1500V working 7s, 8 μF 750V working 5s, new Parmeko c-core 20H 180 mA chokes 12/6 post xtra excess refunded. G3SWH QTHR. Tel 0272-673703.

BCC 25W 4m base station tx, £12. Matching rx, £4. 6 ft Pye 19 in rack (four pillars, self-supporting), £4. Valves M8100 (EF95 sq), EF95, EL91, EC90 (6C4), EB91 (6AL5), EAC91, EF92, 1s 6d each. T. R. Preece G3TRP, 28 Stoneyfield Road, Old Coulsdon, Surrey.

Metered current variable V stabilized power pack It also, pair 117V 50 Hz selsyns, 100 th 35T, RCA fm tuner, Heathkit RG1 built speaker man mod minimitter for parts, sae for detls, many components why, D. Ricker, 97 Ruabon Rd, Wrexham. Tel 0978 4507.

DX100U with hndbk and charts up to 150W table topper vgc £42 ono, Class " D " wavemeter mod for 240 ac £3 15s. A. Walton, 39 Oakdale Dr, Wrose, Shipley, Yorks. Tel Shipley 57490.

National NC121 comm rx with auto transfmr and Eddystone headphones, ideal for swl £30 ono, del. 30 miles when bought. K. Mahaffey, 81 Hayhurst Ave, Middlewich, Cheshire. Tel Middlewich 3218.

DX4OU, VF1U, both perfect bond, spare valves inc 6146, mike key swr bridge (new) all leads etc £38 ono, carr pd, cheaper if coll, cowl gill motor £2 10s carr pd. J. Baker, 86 Max Rd, Liverpool, Lancs. Tel 051-228 1321.

H. Brew 20m ssb tx (after " Cornishman ") with psu, not wking. Exch scope or 4/2m comm rig. R. Fielding G3WDN, QTHR.

Type 78 teleprinter comp with cover, perfect wking order, offers. G3ION, 71 Bassett Green Close, Southampton.

10 yrs SW Mag to 1969, 1st offer over 20s, Vibroplex £2 10s, Advance J2 audio generator £10, Hustler mobile mount £2 10s, Dumont scope £12 fb ssb monitor, var meters, transfmrs chokes etc, sae. R. Broadbent G3AAJ, 94 Herongate Rd, London, E12. Tel 01-989 6741.

Speech compressor pre-amp transistorized with self-contained battery, plugs into mike lead, 1st offer over £5, also TCS 5 slightly modfd £7, Hygain 3el 10m beam £12. S. Kharbanda, G2PU, 39 London Rd, Harston, Cambs. Tel Harston 454.

Hi fi reflex wb loudspeaker, gd cond, dems given £15, Marconi step attenuator dc- 150 MHz, TF1073 case soiled £4, ASB8 70cm with audio stages £4, rx type 33 uhf no gen £3. D. Wilson, G8APS, 177 Dower Rd, Four Oaks, Sutton Coldfield. Tel 021-308 3044.

De luxe Joystick and 3A tuner, half price £4 7s 3d. J. Fletcher, 25 Shay Lane, Halebarns, Altrincham, Cheshire. Tel 061-980 2370.

Moving QTH, clearing shack, sae for list of over 70 items meters, relays, tx, v/capacitors, rotary generators w/d surplus. Lee, G5FH, 17 Knottshall Lane, Warley, Birmingham. Tel 021-552 1338.

Canadian 52 set £7, Grundig TK819 cost £100, slight elec fault £8. Valves: QY4-250 1 kW 100 MHz with base £5, QQV06-40A £1, QQV03-20A 10s, 863 10s, U19 rec 2/6 pair KT66s 10s pair 35T's £1, 832A 10s. R. Powell, G3SEL, Wits End, Lower Odcombe, Yeovil, Somerset. Tel West Coker 712.

50 ft Telomast by Western Electronics collapses to 10 ft, comp with all guys turnbuckles etc, as new, unused, cost £23 will acc. £18 ono. H. Lewis, G3GIQ, 271 Popes Lane, Ealing, London. W5. Tel 567 6389.

Heathkit RSGR54E 180 kc /30 MHz prod/det rfstage S meter anl lattice filt, built in spkr for exch, wanted linear pa or why. G3COI, Foxhills, Orton Lane, Penn, Wolverhampton. Tel Wombourne 2288.

CR100 exc cond, offers. M. Pelham, Tresco House, Ogbourne St, Andrew, Marlborough, Wilts. Tel Ogbourne St George 220.

25 copies of British Interplanetary Society Journal Jan 1952 Jan 1956 plus annual reports for 1951 and 1952 plus Radio Engineering by Roy Norris, offers. R. Castle G6CB, 7 Caxton Rd, Wimbledon, SW19. Tel 542 0432.

AR88D vgc rec recnd black crackle ideal swl set, del arranged, £30 ono. A. Bawden, 232 Exwick Rd, Exeter Devon.

Comp ssb station G2DAF tx 180 W pep, National BC190 ssb rx, with mike, key lp filt and Labgear ant selector c/o unit, in wooden console £90, will consdr separating. A. Papworth, G3WUW, 25 Station Rd, over Cambridge. Tel Swavesey 339.

Lafayette /P valve tester, compact in case for sale £18, new cond. J. Bradford, 17 Brunstane Rd, Edinburgh, GM3MUQ. Tel Portobello 3264.

Telefunken 204E stereo recdr 6 W per channel with 23000 ft recorded tapes £75, would acc 2m Communicator in px also, H/Brew electronic keyer, no paddle £5. P. Kemble G3UYK, QTHR.

Valves 3/- each, ECC34, 6SN7, 6AC7, EF50, 6AG7, 6V6G, 6K8G, 6SA7, 6J5, 12SR7, 12K8, 12SK7, EF80, GV5A, 6140, ECC82, EF91, 10F1, ECL80, 6F13, 6D2, PCC84, PY80, PY81, RL18, 6AK5, 6J4. G. Jeapes, G2XV, 165 Cambridge Rd, Gt Shelford, Cambridge.

EA12 as new £145, 300 W pe 240V generator £20, Copal digital clock £8 10s Avo multiminor in leather case £5, TMK500 meter in leather case £5, 800V 350 mA Woden transfmr £3. K. Wood G3SME, Windrush, Hail Weston, Huntingdonshire.

R107 rx, mint cond, can see wkg 1·2 MHz-17·5 MHz 240V ac vfo anl, any offers welcome above £12. A. Levy, 53 Tamworth Ave, Whitefield, M25 5VH. Tel 061-773 2074.

EC10 latest model ext S meter £40. Joystick and 4A atu £4 10s, pair Eagle 4 transistor Walkie Talkies £4 10s. Juliet 6 trans w/t £6 10s (both 27 MHz). Eagle RF40 field indicator £2 10s. Juliet/P Interceptor main/battery 5 bands inc 2m and aircraft £30. East, 41 Avenue Close, Avenue Rd, NW8. Tel 01-722 7040.

KW77 Mk 6 exc cond, last model made of this rx £75 ono. AR88D hdbk, exc photostat copy, 25s. 13 new assorted valves for CR100 25s. R. Smethers, G3NLY, 20 Bridge Cross Rd, Chase Terrace, Walsall.

Metal rack cabinets 19 in totally enc, 15 in deep 11 in high £2. Ditto but 21½ in high 30s. Buyer coll. HRO xtal filt unit, Genuine spare subassembly, mint, orig wrapping, comp 45s inc post. R. Fenby G3PLS, 4 Broadmead, Hitchin, Herts. Tel Hitchin 52227.

2000-0-2000V 500 mA 2 × 813 bases heater transfmr pi-tank components £5, RV4 £10 buyer coll. S. Harle G3MEA, 10 Everest Court, 259 S Norwood Hill, SE25. Tel 01-653 8211.

Bass reflex cabinet (wb) for 12 in speaker with matching equip cabinet (wb) £7 10s for both. R. Howel G3KRH, 6 Brookland Garth, London NW11. Tel Spe 5039.

Smll model-maker treadle driven lathe on stand, ideal for vhf enthusiast, two chucks, faceplate, drill chuck, cross-slide, accesrs and tools £7 10s, also motor, starter, countershaft and belts. T. Baker, G3XEB, 12 Westland Drive, Brookmans Pk, Hatfield, Herts. Tel PR 54697.

Heathkit SB301E rx with am filt new £181, Vespa Mk 2 tx psu mike speaker new £145 used 20 hrs, the two £220. Del 20 miles. Command rx 28/40 MHz £3, transistor psu 12V to 300V £3, Hunts C/R tester £8. Martin, G6MN. 6 Kedleston Rd, Worksop, Notts.

Pye five band car radio three b/s s/w bands, mw lw sep speaker £10 10s 6d. Matched pair, 6B68G boxes unused for ssb lin 9/6 ea. DCPU for KW2000 £23 10s. D. Byrne, G3KPO, Jersey House, Eye, Peterborough. Tel Eye 351.

Lafayette HA350 with prof top band 18 mnths old, cost £85 acc £55, Vanguard Mk 2 160/10 gd cond £30, del 50 miles. J. Rimmer, G3VSD, 60 Willows Lane, Accrington, Lancs. BB5 ORT.

High power table top tx, Minimitter 120 W am 150 W cw, parallel 807s pa, class B hf bands all psu built in, exc cond, £25 coll. G. Knott, G3VOP QTHR. Tel Vange 2218.

Trio 9R59DE rx mint £29. Minimitter 160m /M whip ant £3, both plus carr. R. Short, G3GNR, 3 Park Meadow, Princes Risborough, Bucks. Buck 5938.

W/s 19, rx in gwc, tx comp but low output. 12V dc psu, mike, variomtr, cables £4 15s. Wavemaster Class D, wking but 4–8 rqs cali'n £4. D. McGarva, GM3YYY, 4a Argyll Sq, Oban, Argyll. Tel Oban 3027 (evening).

KW Vespa new plus psu £90, 888A rec plus plinth s meter £55, Heathkit galv. 32 ft tower £40, Cdr rotator £16, TA33JR beam £20, Shurc mike £3, swr meter £6, coax etc, or comp station £220. G3IWF QTHR.

DX100U and manual £40, Eddystone 750 rx with circ diag £30, buyer coll. T. Harris Jones G3UUL, 38A Prentis Rd (side entrance), Streatham, SW16.

Mosley trap master ant model TA33 jnr £12, del 70 miles. GM8AT 43 Invercauld Rd, Mastrick, Aberdeen, Scotland.

Codar CR70A gd cond £10 plus post. W. Tuttlebee, 87 Wardo Ave, SW6.

Star SR-700A rx £75, KW Vespa Mk 1 plus psu £70, both exc cond, deliver 70 miles London. B. Epps, G3SHQ, 82 St Peters Rd, Burgess Hill, Sussex.

Unmodfd commercial vhf low band rx £1 10s, BSR UA12 autochange record deck £4, BSR "Monardeck" tape deck £3, double beam oscilloscope crt, 10s. Muirhead magslip rx 10s. K. Drinkwater, G3RHR. QTHR. Tel Oglethorpe 262.

4X150 with air system socket £3, post pd, several available. F. Jones, G2AKQ, Heathlands, Woolsbridge Rd, Ashley Heath, Ringwood, Hants. Tel Ringwood 3708.

Fb rx 1475 plus psu £5, double (regulated) 0–300 vdc 125 mA, 6·3V 6 amps plus 6·3V 5 amps £5, also single psu spec as above £2 10s both units metered with 3 ranges, buyer coll. J. Cragg-Sapsford, G8CWU, 78 Babbacombe Rd, Coventry CV3 5PA. Tel Coventry 69684.

Yaesu Musen FL100B tx £85, FR100B rx with all 10m and 100 kc xtals £80, Japanese mech bug key (new) £3, Japanese keyer paddle £2. P. Barry, G3RJS/MM, 47 Gerald Rd, Wollaston, Stourbridge, Worcs.

RA1 Heathkit, gd cond £25, buyer coll or send by BRS. B. Attenborough, G3WKD, 364 Jessop Rd, Stevenage, Herts.

FLDX500 Sommerkamp tx £110. JR500SE Trio rx with Codar Q-multi £55. all new Feb. AR88D £28. W. Morris, G4HU, 34 Birch Ave, Romiley, Stockport, Ches.

Comp station NCX 5 Mk 2 mains psu, Z match, swr bridge, dummy load, key, mike 80–10m Hygain 14 avq with 100 ft coax, all exc cond, del 100 miles, £225, ono. J. Taylor, G3RDT, 4 Queens Court, Kings Parade, Bognor Regis, Sussex. Tel Bognor 5254.

R1155, R126B 10m converter, built in psu and output stage, few other smll mods, all wking, gd cond, offers over £12, buyer coll, pp extra. I. Aicken, 10 Montague Avenue, Ballymena, Co Antrim, N.I.

Labgear top bander tx, Hallicrafters sky challenger rx, Eddystone 870A rx, LM13 frequ meter plus psu, rf field indicator. Offers. R. Matthews, G3SAH, 10 Newfield Drive, Kingswinford, Staffs. Tel Kingswinford 6319.

WANTED

Codar CR70A or sim and Codar PR30, state price and cond. J. Nield, Sonas Mor, Harbury, Leamingson Spa. Tel Harbury 526.

Urgently required mods to convert R220 to cont tuning on 4m and/or 2m. P. Lord, 18 Westfield Road, Woking, Surrey. Tel Woking 62575.

Eddystone 888A EA12 KW201 why. Have flight link superhet radio control deacs, servos charger, Cossor 1035, Pullin 100 test meter, R1155/CR100. A. Robinson, 67 Lincoln Road, Enfield. Tel 363 3363.

Straight Morse key, pref army type D, why. J. Bibby G3YQQ, 167 The Green, Eccleston, Chorley, Lancs. Tel Eccleston 213.

Minimitter X-20 rotary beam and adaption kit to fit on 4ZU minibeam. F. Rose G2DRT, 84 Cock Lane, High Wycombe, Bucks.

Set coils Eddystone 358 rx. A. Boughton, 2 York Rd, Kennington, Ashford, Kent.

KW2000A dc psu. R. Mathews G3SAH, 10 Newfield Drive, Kingswinford, Staffs. Tel Kingswinford 6319.

Case for AR88 offers. Cradduck G3PIE, South Road, Alresford, Hampshire. Tel 2521 (Hampshire).

S/H colour TV for experimenter. J. Stacey, G8BXO, 3 West Park, South Molton, Devon.

/M equip 160–80 Codar or sim buy or part exch LG300 plus cash. W. Pickard G8KP, 46 Thornes Rd, Wakefield. Tel Wkfld 73548.

Loan, for copying, or circuit diag for oscilloscope No. 11, AA predictor Mk 1, OS 1879 GA, Register No ACL520, info appreciated. R. Bennett G3WKU, 66 Clewer Hill Rd, Windsor. Tel Windsor 65415.

For my KW2000A plus ac psu an HW-32A or quality gen coverage rx in px or £175. B. Little G3TLS, 28 Fitzgerald Rd, Bristol 3.

Cover/case for AR88D. Must be fair or gd cond, carr pd. J. Dunnett, 3 York Drive, Freckleton, Preston PR4 1JH, Lancs.

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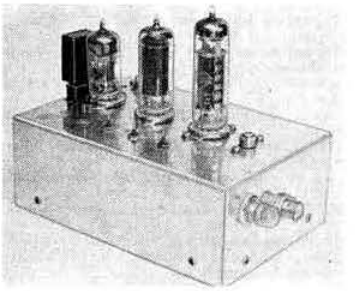

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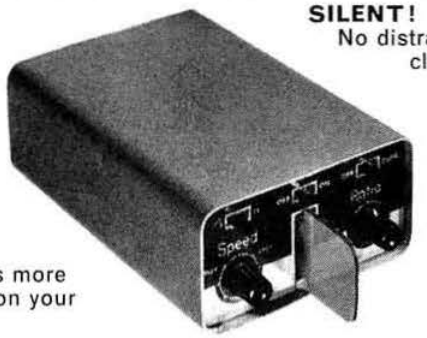

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AN APOLOGY

Due to very heavy demand of time in both shop and service work, the Echelcom 2 2 metre transmitter and companion FET converter have been delayed. The sales literature, for which many of you have written, should be coming through about the same time as you read this apology in the *Radio Communications* Mag. and will be sent as soon as possible. Please forgive the delay.

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The number of members ads sent to HQ each month is increasing at such a rate that some form of limiting on an individual ad would be most desirable. Four pages are at present allocated to Members ads each month. We hardly like to cut down the number of words allowed per ad. Thus we ask all **licensed amateurs** to simply give their **call-sign** and state **QTHR**, instead of giving their address in full. (**QTHR** *means—my address is correct in the current call-book*) In this way we should be able to meet the increasing demand for space. By giving QTHR you will be helping other members to have their ads published. Please also make sure that you print your ad clearly, we just cannot read some ads! Also *clearly* describe the equipment that you have for sale or require without using abbreviations (we put in the abbreviations to our own set style). Of course use abbreviations like W for Watts, V for Volts and so on. Please make your ad as brief as possible, in this way you will be helping us and other members. *Thank you.*

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INDEX TO ADVERTISERS

Radio Society of Great Britain

FOUNDED 1913
INCORPORATED 1926

PATRON H.R.H. THE PRINCE PHILIP,
DUKE OF EDINBURGH, KG

APPLICATION FOR CORPORATE* OR ASSOCIATE* MEMBERSHIP

RADIO SOCIETY OF GREAT BRITAIN,
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LONDON, WC1.
01-837 8688

* I hereby apply for election as a Corporate Member of the Society and enclose a remittance for £2/10/- being the amount of my first annual subscription.

* Being under 21 years of age and not holding a current Amateur Radio Transmitting Licence I hereby apply for election as a Non-Corporate (Associate) Member of the Society and enclose herewith a remittance of £1/5/- being the amount of my first annual subscription.

I, the undersigned, agree that in the event of my election to Membership of the Radio Society of Great Britain, I will be governed by the Memorandum and Articles of Association of the Society and the rules and regulations thereof as they now are or as they may hereafter be altered; and that I will advance the objects of the Society as far as may be in my power; providing that whenever I shall signify in writing to the Society addressed to the Secretary that I am desirous of withdrawing from the Society I shall at the end of one year thereafter after the payment of any arrears which may be due by me at that period to be free from my undertaking to contribute to the assets of the Society in accordance with Clause 8 of the Memorandum of Association of the Society.

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