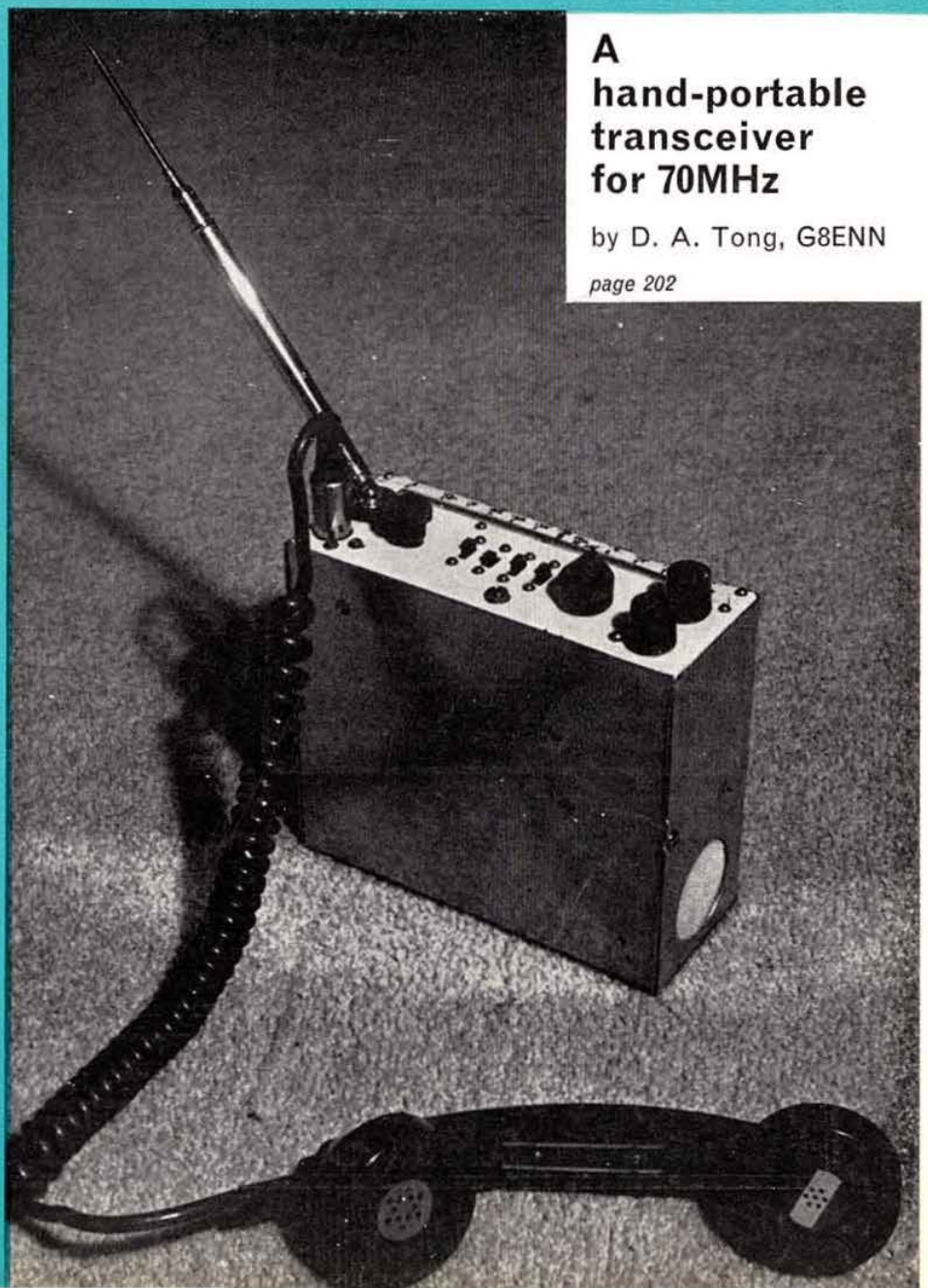
radio communication

April 1972

Journal of the Radio Society of Great Britain



A hand-portable transceiver for 70MHz

by D. A. Tong, G8ENN

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radio communication

Volume 48 No 4 Price 30p

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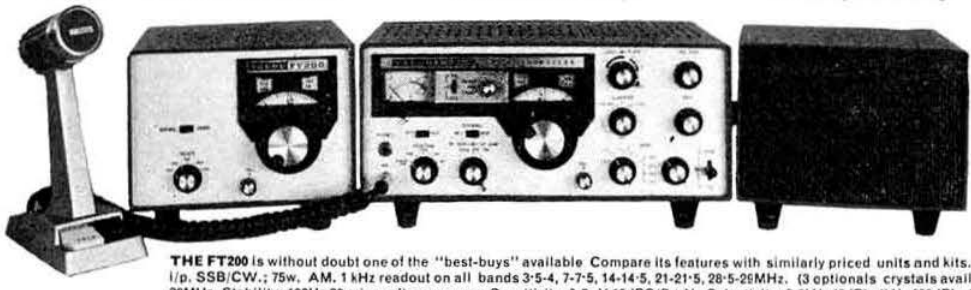
THE FASTEST SERVICE IN THE UK. TRY US AND SEE! Mind you, to be honest, we have had several complaints from customers. One was from a gentleman who received his P60 Verralower 9 hours after we received his order and he complained that he wasn't ready to receive it!

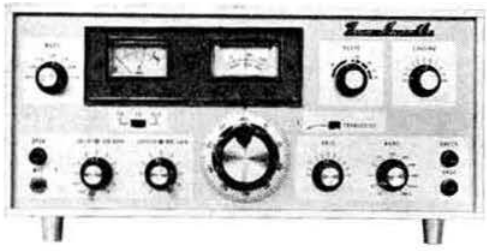
YD844 **FV200 (Ex Stock)** **FT200 (Ex Stock)** **FP200 (Ex Stock)**



★ **WE GUARANTEE ALL ITEMS MARKED EX STOCK ARE AVAILABLE FOR IMMEDIATE DELIVERY**

THE FT200 is without doubt one of the "best-buys" available Compare its features with similarly priced units and kits. SPECIFICATION: 260w. p.e.p. i/p. SSB/CW.; 75w. AM. 1 kHz readout on all bands 3·5-4, 7-7·5, 14-14·5, 21-21·5, 28·5-29MHz. (3 optionals crystals available for 28-28.5, 29-29·5 and 29·5 30MHz. Stability: 100Hz 30 mins. after warm-up. Sensitivity: 0·5μV 10dBS/S+N. Selectivity: 2·3kHz (6dB), 4kHz (60dB). Solid state FET VFO with excellent linearity (like all YAESU VFO's). 25/100 Calibrator. VOX/PTT. Separate DC supply available for mobile use. Clarifier ± 5kHz. Break-in CW keying.

FLDX400 (Ex Stock)



★ **NEW FR400SDX fitted 4m + 160—2m ! (ex stock)**

FRDX400 (Ex Stock)

The FLDX400 Transmitter runs 240w. p.e.p. and is designed to transceive with FR100B or FR400. AM and "break-in" CW keying are fitted. SPECIFICATION: Frequency coverage 3·5-4·1, 6·9-7·5, 13·9-14·5, 20·9-21·5, 27·9-28·5, 28·5-29·1, 28·9-29·5MHz. Selectable USB or LSB. Stability: less than 100Hz/½hr. after warm-up. Sideband suppression 50dB. Carrier suppression better than 50dB. Netting facilities for zero-beating if not switched to "transceive". Provision for listening on transmit frequency as well as the frequency to which the receiver is tuned. ALC fitted to secure effective performance and a "clean" signal. VOX/PTT operation. Relays operate linear amplifier and receiver. Dial read-out to 1kHz.

The FR400SDX (Super De Luxe) receiver is now available fitted with 4m. This model is only available from us and covers 160, 80, 40, 20, 15, 11, 10, 4 and 2m. 4 mechanical filters are fitted for SSB (2·4kHz), AM (5kHz), CW (0·6kHz) and FM (24kHz). Dial read-out to 1kHz from stable VFO. Rejection tuning to notch-out unwanted heterodynes. Clarifier control permits adjustment of SSB/CW received signals when working transceive. VFO select for internal VFO or 4 crystal frequencies. Monitor facility enables transmitted signal to be monitored at all times. Squelch circuitr silences receiver for noise free AM/FM reception. FM discriminator fitted to SDX model. 25/100kHz calibrator. WWV band to check calibrated. 3 step AGC. Built-in noise limiter. Basic FR400 receiver from **£120.** FR400SDX fitted all.

YAESU PRICE LIST. FREE DELIVERY NORMALLY 24 HOURS. 12 MONTHS GUARANTEE.

FT101 fitted 160m	£255.00	FP2AC Ac PSU for FT2F	£25.00	FV101 Remote VFO	£38.00	FP2AC/B AC supply with batteries	£34.00
FT101 transceiver	£240.00	YC-305 Frequency counter	£97.50	FT200 Transceiver	£134.00	YD844 table microphone	£12.00
FL2100 Linear Amplifier	£135.00	YD846 Hand microphone	£5.00	DC200 PSU for FT200	£45.00	FP50DX Low pass filter	£6.60
SP101 Speaker for FT101	£10.00	Fan FT101	£8.00	FR400DX receiver	£120.00	Mobile mount FT101	£5.00
FP200 AC supply for FT200	£38.00	Mobile mount FT200	£4.20	SP400 speaker	£10.00	CW filter FT101, FT401, FT560	£15.00
FV200 Remote VFO for FT200	£38.00	CW filter FR400	£12.50	FL2000B Linear amplifier	£135.00	Crystals	£2.00
FR400SDX Receiver	£160.00	AM filter FR400	£7.50	FL2500 Linear amplifier	£118.00	FM filter FR400	£7.50
FL400 Transmitter	£140.00	FC2 2m converter	£12.00	FV401 Remote VFO	£38.00	FC6 6m converter	£12.00
FT401 Transceiver	£215.00	FM Unit FR400	£7.50	FT2F 2m transceiver	£84.00		
SP401 Speaker	£10.00	FT560	£195.00				

Hours of business: Mon-Fri 9am-5.30pm. Sat 9am-12.30pm.
Midlands agent: Andy Martin, G3UDR, after 6pm on Shipton-on-Stour.
204 Osborne Road, Totton, Hants. Tel: Totton 4930 or 2785. Cable: AERIAL SOUTHAMPTON.

NEW EQUIPMENT—24-hour delivery by Securicor £1 extra

KW ATLANTA	£210.00	TRIO 9R59DS	£57.50	KW 107	£40.00		
KW E-ZEE Match	£15.50	Digital 500	£250.00	KW Dummy Loads	£7.20		

USED EQUIPMENT—3 months guarantee over £45

KW 201 receiver, excellent	£75.00	KW Atlanta, mint	£160.00	Sommerkamp FL100B	£85	Trio, TS500, excellent	£125.00
KW 202 receiver, 6 months old	£110.00	Trio 9R5905, mint	£42.00	Hammarlund SP600	£75.00	Swan, 270, very good	£170.00
KW 2000, very good but 'tatty' p.s.u.	£120.00	Eddystone EA12, 6 months old	£150.00	Heathkit SB401, excellent	£135.00	Swan, 500C, excellent	£199.00
		Sommerkamp FR100B	£85.00	Heathkit SB200, mint	£95.00		

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★ *Largest stock range in the U.K.*
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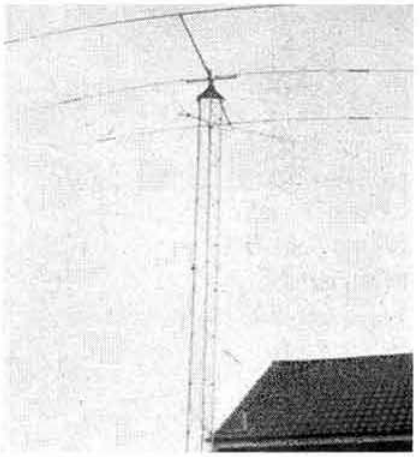
30' HAMTOWER



TELOMAST

These are galvanised steel masts which telescope down to 10'. They can be extended up to 30', 40' or 50' with antennas up to TA33 jnr. size. They can be erected single handed and rotated from ground level:

	Mast only	Mast and Rigging
30	**£14.40**	**£19.50**
40'	**£16.50**	**£25.50**
50'	**£19.50**	**£31.50**

TELETOWERS

The finest value in guyed, galvanised steel towers which telescope down to 25'. Price (carriage paid) 42' **£72.00**, 57' **£93.00**, 79' **£121.00**, 101' **£161.00**.

30' HAMTOWER

A self supporting steel galvanised tower for HF band rotary antennas. Comes in easily erected 10' sections. Price (carriage paid) **£50.15**.

VERSATOWERS

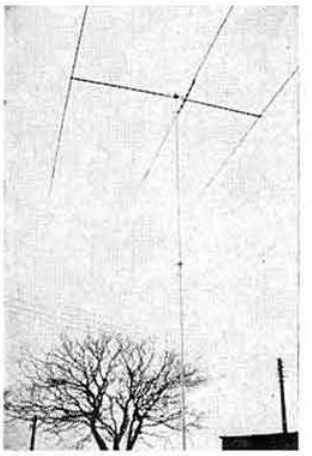
Self supporting telescopic tilt-over galvanised towers for 20', 40', 60' or 80' at **£92.00**, **£121.00**, **£146.00** or **£275.00**. 120' guyed at **£380.00**.

ANTENNAS: Hy Gain, Mosley, J Beam. Ex-stock.

ROTATORS: CDR. Ex-stock.

AR20, **£20.00** (50p); AR22, **£25.00** (65p); TR44, **£40.00** (70p); HAM-M, **£70.00** (75p).

TELEMOST with TA33



J. BEAM (ex-stock, carriage paid)

2/4Y, 2m, 4 ele.	**£2.65**	2/14P, 2m. 14 ele.	**£13.00**	2/12, 2m. 6 over 6	**£6.15**	70/16, 70 cm., 8 over 8	**£5.10**
2/6Y, 6 ele.	**£3.20**	2/10XY, 2m. Cross polarised	**£11.00**	2/16, 2m. 8 over 8	**£7.65**	70/14Y, 70 cm., 14 ele.	**£6.45**
2/8Y, 2m. 8 ele	**£3.80**	2/100V, 2m. Omni/bi-directional	**£6.50**	2HO, 2m. Halo	**£1.30**	70/18P, 70 cm., 18 ele.	**£6.50**
2/10Y, 2m. 10 ele.	**£8.20**	2/8, 2m. 4 over 4	**£4.60**	2/HM, 2m. Halo/mast	**£1.60**	70/MBM/46, 70 cm., 46 ele.	**£9.60**

For £1 extra most antennas, rotators can be delivered by our 24 hour service.

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KW 107 ANTENNA Tuning System

KW 202 RECEIVER, 10-160 metres SSB/AM/CW, with Mechanical Filter, built in 'Q' Multiplier (Peak & Null), 500kHz VFO covering all bands. Two Speed VFO Drive. Excellent Sig/Noise and sensitivity performance. Very attractive (similar in appearance to KW2000B). 100kHz Crystal Calibrator price **£140** carriage extra.

KW 204 TRANSMITTER, 10-160 metres SSB/AM/CW. Successor to the famous KW "Vespa"—Perfectly matches the KW202 Receiver and is similar in appearance. 180 watts p.e.p. from trustworthy 6146's. Built-in Power Supply. Provides "side tone" cw monitoring. A beautiful compact efficient unit. Price **£145** carriage extra.

KW 202 Speaker

2 Great Transceivers

DELIVERY IMMEDIATELY FROM STOCK

KW2000B 10-160 metres SSB TRANSCEIVER: 180 watts PEP 10-160 metres, complete with A.C. P.S.U., VOX P.T.T., I.R.T./I.T.T.

£240 *carriage extra*

KW ATLANTA 10-80 metres *KW Atlanta and A.C. P.S.U.*

£210 *carriage extra*

OR SEPARATE UNITS

Matching **KW1000 LINEAR AMPLIFIER** for KW 204 and KW 2000B—also available. 1200 watt pep max. Pair T160L/572B tubes including 2·5kv Power Unit built-in to KW2000B style cabinet **£135** carriage extra.

KW 101 Standing-Wave-Ratio meter, **£9.25.** **KW 103** SWR/Power meter 0-100 & 0-1000 watts **£12.50*.** **KW 103** with Dummy Load and Coax Lead, **£20.50*.** **KW 107** Antenna Tuning System including E-Z Match, SWR Ind., Dummy Load, Antenna Switch, 5 position, **£40.00*.** Also KW Trap Dipole with twin feeder and 4 other types (only the original Trap from KW is good enough for you). KW E-Z Match ATV, KW Low Pass Filters, KW & HZP Baluns, etc. *Carriage Extra.

KW ELECTRONICS LIMITED

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New Equipment, all of which is EX STOCK.

FT-101 Transceiver **£240**
Fitted top band **£250**
Fitted top band with new P.A. coil **£255**
FT-101 Fan **£8**
FV-101 Remote VFO **£38**
SP-101 Matching speaker **£10**
FT-101 Mobile mount **£5**
FL-2100 matching linear **£135**

FTdx401 Transceiver **£215**
SP-401 Matching speaker **£10**
FV-401 Remote VFO **£38**
FTdx560 Transceiver **£195**
SP-560 Matching speaker **£10**
FV-400 Remote VFO **£38**
FL-2000B linear **£135**
YC-305 30 MHz counter **£97.50**

FT-200 Transceiver **£134**
FP-200 a.c. p.s.u. **£38**
DC-200 d.c. p.s.u. **£45**
FV-200 remote VFO **£38**
FRdx400 S.D. **£160**
FLdx400 Matching Tx **£140**
SP-400 Matching speaker **£10**

Sundry spares for the FRdx400 for those who have not got the Super de Luxe version—CW filter **£12.50**, AM filter **£7.50**, 2m converter **£12**, FM unit **£7.50**, FM filter **£7.50**, 6m converter **£12**, crystals **£2** each.

2m TRANSCEIVERS

Yaesu FT-2F £84 **Inoue IC-20 £94**

Crystals available: 144.36, 144.40, 144.48, 144.60, 144.80, 145.00, 145.20, 145.80.

Apart from sundry spares which go first class mail, we send all equipment by Securicor who almost invariably deliver within 24 hours and, more important, treat the gear gently. There is no extra charge for this service. Also, part of the service is that before despatch, all equipment is thoroughly checked and brought up to spec.

Other new equipment

Plain morse keys, ball bearing pivots **£1**, Katsumi EK-9X electronic keyers **£8.20**, Asahi twin meter SWR meters **£6.80**, Digital voltmeters D.C. 1mV to 1500V brand new and half price at **£60**.

Dummy Load/Wattmeters: please do not confuse these with the cheap and cheerful so-called power meters which are frequency conscious, impedance conscious and of dubious accuracy. These are Wattmeters (a horse of somewhat different colour!), they are neat and compact (approx. 5" × 5" × 10" deep), but MORE important are accurate and MOST important present a substantially constant 50 ohms impedance over the frequency range of 3 MHz to 500 MHz. They are switched to read F.S. 20 or 120W and give useful readings as low as ¼W. The SWR is better than 1:1.2 over the entire range and no serious VHF operator should be without one, particularly at this price **£32**.

Valves. Postage Extra: 6AH6 **80p**, 6AQ5 **75p**, 6BZ6 **40p**, 6CB6A **42p**, 6U8A **80p**, 6CL6 **50p**, 6AN8 **74p**, 6EW6 **75p**, 6EH7 **45p**, 6BM8 **50p**, 6AW8A **£1.15**, 7360 **£2.10**, 12BY7A **70p**, EF183 **45p**, 6GK6 **92p**. 6JS6A/B/C **£1.75**, 6KD6 **£1.75**, 6146B **£2.60**, 6JM6A **£1.25**, 6LQ6 **£2.25**, 572B **£8**.
Special Brand new surplus 6AK5 **Special quality 10p.**
Please include lots for postage on valves—we'll refund any excess.

Antennae

Asahi AS-33. 3-element trap beam for 20, 15 and 10m. Beautifully made, low SWR (better than 1.5:1), handling 2kW p.e.p., with an 8 db gain. Anyone knowing our QTH knows how exposed it is—our AS-33 has withstood severe gales without any trouble. It flops not, neither doth it droop. Its price puts it out of the cheap and cheerful class, but it is our opinion that quality and performance are worth paying for. **£60** carriage paid.
Asahi Echo-8G. 40 to 10m trap vertical. Self-supporting, handles 1kW p.e.p., SWR better than 1.5:1. This vertical can be mounted on a post at ground level, in which case radials are not necessary, although they are always beneficial, or it can be mounted up aloft in which case it can be treated as a ground plane with radials as per instruction sheet. **£17.50** carriage paid.

In addition to the above two most popular aerials, we stock the following:

AS-23 3-element trap beam for 15 and 10m	**£42**	AS-103W Full size 3-element 10m beam	**£18**
AS-21 3-element trap beam for 15m only	**£35**	DP-KB101 40-10m vertical 2kW p.e.p. 3 traps	**£23.50**
AS-203W Full size 3-element 20m beam	**£60**	DP-KB103 80 and 40m vertical 2kW p.e.p. 1 trap	**£25.00**
AS-154W Full size 4-element 15m beam	**£40**	DP-KB104 20, 15 and 10m vertical 2kW p.e.p. 2 traps	**£16.50**
AS-153W Full size 3-element 15m beam	**£32**	DP-KB105 80 to 10m vertical 2kW p.e.p. 4 traps	**£32.50**
AS-104W Full size 4-element 10m beam	**£33**	Carriage by Securicor on the above antennas is free.	

Digital Clocks Copal 222 at **£8.50**, Copal 601 at **£17.50**, both of which are 24 hour, and our own "Digitor" which is 12 hours at **£5.50.** Prices post free.

Microphones Teisco DM501 50k dynamic with PTT capability **£3.** The very popular Yaesu YD846 50k dynamic with PTT **£5.** The Yaesu YD844 50k dynamic desk mike with PTT, lift to talk and locking bar **£12.**

Filters We stock and recommend the well-known Medco L.P. filters 50 or 75 ohms at **£6.50** where the maximum harmonic attenuation is required. These filters will stand at least 1kW of r.f. into the appropriate termination which must be close to 50–75 ohms. Even more effective in the majority of cases of TVI is the high pass filter at **£2.40** post free. You should try this first of all in any TVI problem.

Mobile Antennas We stock the Diamond range of top quality centre-loaded whips, the Diamond helical whips, the G-Whip helical, and the very popular Tavasu. We also stock 2m whips—the Diamond ⅝ at **£9** and the G-Whip ⅝ at **£4.10.** These whips make an excellent aerial for the 2m FM mobiles such as the FT–2F and IC–20 which are appearing in ever increasing numbers. Pity to spoil a neat installation with an ugly aerial. We have an illustrated leaflet on both fixed and mobile antennae—send us a large s.a.e. and we'll fill it.

Crystal Filters. *Post Free ex stock.* We stock the very excellent K.V.G. XF–9B at **£18** complete with both carrier crystals and holders. We also have the XF–9M C.W. filter with carrier crystal and holder at **£16,** along with the XF–9C (3.75 kHz) and XF–9D (5.0 kHz) A.M. filters at **£16.** Also, the Yaesu filters used in all their different models are available from stock, both crystal and mechanical.

Connectors, post free: PL259 **35p,** SO239 **35p,** reducers **10p,** line connectors **80p.**

Coax: UR43 **8p** per yard UR67 **22p** per yard. This is brand new current manufacture straight from the factory—hence the very low price.

Coming Events One or two new items from the factory worth mentioning. Yaesu have for years been manufacturing a low priced pair, the FL and FR–50B, which like all Yaesu equipment is extremely good value for money. In particular, we feel the Rx fills a gap in its price class at **£52.** Obviously at this price it lacks some of the performance of the FRdx400, but I'm quite sure you will not find anything as good at anywhere near this price.

A brand new Yaesu product is the FT–75 low priced QRP transceiver. It is not much bigger than an FT–2F in size and hence can fit neatly into the smallest of cars. Two separate p.s.u.'s are available—one for A.C. and one for 12V D.C. 20W p.e.p. All transistor except 12DQ6 P.A. All band 80 to 10m xtal controlled (VXO) **£80** p.s.u.'s **£20** each.

A brand new 2m F.M. rig—the FT2 Auto. Performance similar to FT–2F but with automatic scanning Rx **£129.**

Please note that we are not pushing the above new items—merely mentioning them out of interest. We never start to push anything until we have thoroughly tested it, smashed it, bashed it and generally made quite, quite sure it is value for money. Makes us seem a bit slow off the mark, I know, but we do like to be right and know for sure we are right. It's for your protection, you know!

Second-hand equipment. All mint, fully checked, serviced where necessary and complete with manual. Each one carries our comprehensive guarantee. Please note that carriage (**£1.75**) by Securicor is extra on all second-hand gear.

Lafayette HA–500 80–10 Amateur Bands only, double conversion **£30.**

KW202 virtually new **£110** considerable saving on list price of **£140.**

Lafayette HA–350 still a best buy in the Amateur Band Rx line. The Kokusai filter makes it a first class SSB Rx **£50.**

FR–100B, again a best buy in its price class. This is a good one **£70.** Another with top band **£75.**

FL–200B, several in stock at **£70–£80** depending on just how mint it is. Incidentally, has anyone ever heard a **bad** FL–200B?

Transceivers

National NCX–5 Mk 2 and p.s.u. I suppose that somewhere there are a few who appreciate how good a Mk 2 is. **£175.**

National NC200 and p.s.u. Horse of a different colour, but it is in mint cond, the performance both Rx and Tx is excellent, and I honestly don't think you'll get anything better at the price. All bands 80–10, 200W p.e.p. **£95.**

Anyone seen the new SB–36 digital readout to 100 Hz, 500W p.e.p. rig just out on the U.S. market? We have something that looks awfully like it for just **£250.**

National NCX–3 and p.s.u. 80, 40 and 20m 200W p.e.p. Excellent cond. A well-known and respected rig. **£85.**

FE Super 600. All bands 80–10, 200W p.e.p., VOX, PTT, MOX, RIT and in fact all the gubbins in FB shape at **£100.**

KW200 and p.s.u. This is a mint late model with G-line cabinet. All bands 160 to 10m, 90W p.e.p. All this and top band too. **£120.**

KW2000A and p.s.u. Several of these popular rigs in stock **£130** to **£150** according to how they look or behave.

Heathkit HW100 and p.s.u. Immaculate. A virtually new rig 180W p.e.p. All bands 80 to 10 for **£105.**

Heathkit SB101 and p.s.u. This one is fitted CW filter and could be mistaken for brand new **£155.**

Swan 500 and p.s.u. A very nice one indeed. **£165.**

We are always interested in trading-in good gear or will buy it from you. This includes lab. type test gear. Faulty gear—again we're interested because our Service Dept. has no trouble in bringing faulty equipment up to spec. Please note, however, that there is a difference between faulty equipment (on which our Service Dept. thrives!) and tatty equipment which we would not want at any price. Talking of our Service Dept., we can usually fix your rig up pretty quickly—as often as not while you wait if it's urgent (and it always is!). But please 'phone us before coming so that we can get organized. If we're too far away, why not contact one of our Agents who may be able to help you.

V.H.F. enthusiasts Do you live in Birmingham, Liverpool, Manchester, Leeds or similar big city? Read on! As you know, in London and the South 2m FM has caught on well and truly and we are selling FT–2F's like hot cakes. Initially, though, we had an awful job to sell them—nobody wanted to know! Same in the North—nobody wants to know. In order to stimulate northern sales and get a foot in the door as it were, we make the following offer. The first ten members of a club in a large city who join together to form a 2m FM net get FT–2F's for **£50** each. This offer is necessarily limited both in time and scope because we make a very handsome loss on each sale, so don't leave it too long, it's a chance that you'll never get again. Mind you, we're not so daft, because once the first ten are in use in an area, they start to sell and sell fast!

Rallies The first major rally of the season is at Drayton Manor Park, Tamworth on 16th April. This rally ranks among the top few, so don't miss! See you there!

LOWE ELECTRONICS, 119 Cavendish Road, Matlock, Derbyshire. DE4 3HE. Tel. Matlock 2817 or 2430 (9 a.m.–9 p.m.) Bill G3UBO, Alan G3MME. Hours: Tuesday to Saturday 9–5.30 (closed for lunch 1–2 and all day Monday).

Service and sales (evenings and weekends only): John G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex. Tel. Ringmer 812071. Sim GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. Tel. 041–771 0364.

Service only (evenings and weekends): Dave Dryden, G3BKQ, 205 Main Street, Thornton, Leics. Alan Bartlett, GWYSA, 35 Pen-y-Waun, Efail Isaf, Nr. Pontypridd, Glam. Peter Ward, G3XWX, 47 Radstock Avenue, Ward End, Birmingham, B36 8HD.

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INCORPORATED 1926

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Current Comment

A brief trip of some 30 minutes across the North Sea brings the visitor to Holland, a relatively small, densely populated country whose hospitality is second to none. The seat of government of the country is at The Hague, a pleasant city still containing much in the Dutch tradition, where the old and new still manage a peaceful co-existence. Just a few minutes away by car or bus lies the resort of Scheveningen where the visitor will find modern hotels and magnificent beaches.

It is in one of the older hotels, used by the Dutch for family holidays until the motor car became fashionable, that the IARU Region 1 Conference will commence on Monday 15 May 1972. Here delegates from the national amateur radio societies of Austria (OeVSV), Belgium (UBA), Bulgaria (CRCB), Czechoslovakia (CRCC), Denmark (EDR), Finland (SRAL), France (REF), German Federal Republic (DARC), Ghana (GARS), Hungary (MRAS), Italy (ARI), Liberia (LRAA), Luxembourg (RL), Netherlands (VERON), Nigeria (NARS), Norway (NRRL), Poland (PZK), Portugal (REP), Spain (URE), Sweden (SSA), Switzerland (USKA), United Kingdom (RSGB), USSR (RSF) and Yugoslavia (SRJ), will meet to consider agendas of business that promise little time to enjoy the sea air.

The work of the conference is divided among three committees: Committee A, administrative and operational, deals with matters affecting the hf bands up to 30MHz together with administrative and procedural items; Committee B, the vhf committee, as its name implies, considers matters affecting frequencies above 30MHz, while Committee C, finance and credentials, is responsible for approval of the financial affairs of the Region 1 organization for the succeeding three years. Committee A attracts the largest attendance, some 50 delegates are anticipated; Committee B has fewer members, while Committee C is limited in number to some 10 persons.

The business is far ranging, and agenda items have been grouped together to provide central points for discussion and decision. Band plans, both hf and vhf; beacons, hf and vhf; contests; repeaters; propagation research; microwave standards; reciprocal licensing; interference, and foxhunting are some of the headings covering a number of items of business. With many thoughtful contributions coming from a number of societies it is difficult to single out any particular conference papers for special mention. However, no one will disagree with attention being directed to a paper from REF (F8SH), containing the results of much work on vhf propagation, and also to a submission from MRAS (HA8WH) outlining ways of improving the harmonic attenuation of hf transmitters.

The RSGB has submitted several valuable papers, among them being contributions from the Scientific Studies Committee dealing with amateur work in connection with propagation research (G3LTP) and further thoughts on the worldwide network of 28MHz beacon stations (G3DME). Colin Thomas, G3PSM, the Society's Intruder Watch organizer and the Region 1 co-ordinator, has written a paper dealing with the past and future of the intruder watch, an activity in which the RSGB has led the world of amateur radio. G3PSM will personally introduce his paper and in off-duty hours endeavour to spread the idea of a complete European participation in intruder watch activities. The RSGB is responsible for the allocation of beacon frequencies in vhf bands and the Society's VHF Manager, G3FZL, has made further proposals to deal with this work in the future. G3RPE has suggested the adoption of microwave standards, while the Society's President and leader of the RSGB delegation, G3GVV, stresses the need for a continual increase in the membership of national societies and makes suggestions for the achievement of this object.

One of the truly vital matters to come before the conference is the preparation for the next conference of the International Telecommunication Union. The results of the 1971 Space Conference were disappointing for the amateur service, but the most ominous threat came from the comments of the delegations opposed to amateur radio. A maritime conference is to be held in 1974 and there exists the possibility of a World Administrative Radio Conference in the period 1978-80. At a WARC *all* amateur bands will come under scrutiny and now is the time to make preparations on a national and international basis. Many national delegations came to the Space Conference with their brief already clearly defined and it required considerable argument to obtain any alteration in these previously determined positions. What must be done is to ensure that before the next conference the national positions are favourable to the amateur service.

Following the Region 1 Conference there is to be a further informal meeting involving the representatives of IARU Headquarters (ARRL) and Region 2. This meeting will ensure that there will be full worldwide co-operation in matters affecting the amateur service.

Returning to what is a domestic matter within Region 1, it is surely unique for an organization to have *reduced* its subscriptions during the last decade. This happened at the 1969 Brussels Conference when the contribution was amended from 75 to 60 Swiss centimes per licensed member of each national society. Under the guidance of an able treasurer, PA0DD, and despite heavy expenditure at the Space Conference, the funds of Region 1 are completely adequate and no increase is expected to be proposed. As part of the policy of encouraging amateur radio in Africa, Region 1 has recently supplied equipment for the headquarters stations of the Radio Society of East Africa (Nairobi) and the Liberian Radio Amateurs' Association (Monrovia), and is prepared and able to provide further assistance where this is desirable in the interests of amateur radio.

Since the Region 1 organization was formed in 1950 it has expanded to the present figure of 37 member societies. In this time the RSGB has played a prominent part in its work and at each conference. This contribution continues to be both essential and significant.

G2BVN

QTC AMATEUR RADIO NEWS

RSGB lecture at the IEE

An audience of nearly 100 members attended the lecture on 22 February at the IEE when Mr B. O. Cooke, Chief Engineer of Eddystone Radio Ltd, described modern techniques and the development of high stability receivers. Mr R. M. Carroll, Managing Director of Eddystone, was also present and took part in a discussion which developed after the lecture. A display of modern Eddystone equipment attracted much attention and not a little envy from the members present. One of the points made by Mr Carroll was that, at the present time, Eddystone do not intend to re-enter the amateur radio market. RSGB President, Mr R. J. Hughes, G3GVV, voiced the pleasure and the thanks of the members who attended.

"The postal threat to magazines"

This is the title of a booklet published by the Periodical Publishers Association Ltd dealing with the latest round of increases in postal charges. The booklet shows the discrimination exercised against magazines which by 6 March 1972 had suffered a 100 per cent increase in postal charges in 12 months against a national average of under 40 per cent. It is pointed out that magazines are an essential source of information for both professional and leisure activities. Further, they make a substantial contribution to our national balance of payments in addition to advertising UK goods overseas. In the same category could be listed several RSGB publications which are sold in large numbers in Europe and North America.

The booklet gives the following figures as an example of the nature of the postal increases:

Cost prior to February 1971 increases:	£71,000
Cost after February 1971 increases:	£109,000
	(= 54 per cent increase)
Cost after March 1972 increases:	£137,000
	(= 26 per cent increase)
Overseas postal rates increases in July 1971	£7,500
	(= 85 per cent increase)

For *Radio Communication* the latest increase means an extra 1p per mailing for each UK member or, in round figures, £150 per month. This, combined with cuts in postal services, means that once again we are getting less for a considerable increase in expenditure.

Satcoms disaster system

The International Telecommunication Union has made a proposal that a satellite communications system should be set up to provide aid following natural disasters such as earthquakes and floods. The ITU proposes the setting up of an organization in Geneva from where the coverage using two geostationary satellites over the Equator would be world-wide. Communications links required with this scheme include walkie-talkie radios, medium distance multi-channel voice links and a mobile earth station. All this equipment would be air transportable with self-contained power sources.

GB2IW

This callsign has been issued to the RSGB for use by the Intruder Watch, and is used primarily for the purpose of receiving reports of intruders on the exclusive amateur bands, and the exchange of IW information.

Current times of activity on the lower frequencies are 1200gmt Saturdays on 7,085kHz, and 1200gmt Sundays on 3,740kHz ssb. Stations wishing to arrange skeds on ssb or cw are invited to contact the Intruder Watch Organizer, Colin J. Thomas, G3PSM.

Overseas societies are also invited to arrange skeds on the higher frequency bands.

Pye Ranger circuit diagrams

In connection with the article "Converting the Pye Ranger for 2m" (based on the 2002) in the November 1967 issue of *Radio Communication*, reproductions of circuitry applicable to the 2202 using a QQVO3-2OA pa are still available from the RSGB at an inclusive cost of 25p. Reprints of the original 6-page article can also be supplied at a cost of 45p, including postage.

Callbooks

Additions to the extensive range of publications handled by the RSGB are the two volumes of the Radio Amateur Callbook listing stations in the USA and the rest of the world respectively. The new arrangement for the publication of these callbooks is that only one full volume is published in each year, this being the winter edition. Periodical supplements are available to the purchasers of the callbook, at a small charge, which will keep the information up to date until the appearance of the next full volume.

Copies of the winter 1971 edition of both callbooks are available from Society headquarters. The cost of these is: USA volume, £3.75, Rest of the world, £2.95, both post paid. The callbooks are available to personal callers less the post and packing charge.

Changes of address

Members are asked to note that changes of address must be notified at least four weeks before the date of despatch of *Radio Communication* if they are to be effective for the next issue. The wrappers are addressed during the month preceding the date of issue and changes must be received in good time to allow records to be altered.

Replacement component catalogue

Clayridge Electronics Ltd, the Stoke Newington specialist distributors for replacement radio and television electronic components, have just issued a new edition of their stock catalogue. The range of components now available includes capacitors, resistors, potentiometers, fuses, power supplies, packaged circuit modules, rectifiers, diodes, transistors, solders, together with tools and accessories for the tv service engineer.

Readers who have not yet received a copy direct should contact the C.E.L. Sales Department, tel 01-254 6260 or write to C.E.L., 2 Stoke Newington High Street, London N16 7PL.

Can you help?

Mr T. R. Sanderson, c/o ESTEC, Noordwijk, Holland, would repay any cost incurred in obtaining a circuit diagram of the Microcell oscilloscope Type 400.

B • •

A hand-portable transceiver for 70MHz

by D. A. TONG, BSc, PhD, G8ENN*

Introduction

A vfo for the 4m band has already been described in a previous article [1], and the present article describes the remaining parts of a 4m transceiver which incorporated the vfo. It was intended that, despite its relatively small size (6¼in by 5½in by 2½in including batteries, whip aerial and loudspeaker), the transceiver should involve as few performance compromises as possible apart from the obvious one of low output power from the transmitter because of the use of small batteries. The receiver has excellent sensitivity and selectivity and the noise limiter is good enough for mobile use. A sensitive squelch circuit is provided and the modulator incorporates a speech clipper so that the low output power is fully utilized. Solid-state switching is used for the send-receive function and this allows a single-make contact on the microphone to be used as a push-to-talk switch. The development of the unit began almost five years ago and continued very intermittently due to other commitments and this explains why more use was not made of integrated circuits. Naturally during this period much has been learned and if a new transceiver were to be started now some changes would be made in design. Nevertheless it is felt that the circuit details may be of general interest and the lessons learned will be pointed out where appropriate.

Due to the complexity of the circuitry it is unlikely that anyone would wish to duplicate it exactly, and since this type of equipment is suitable for construction by experienced constructors only, exact layout details are considered superfluous.

In case anyone should wonder why the holder of a G8 callsign should also own a 4m transceiver, the explanation is that the author, when unlicensed, had always been attracted by the potential of 4m but having completed the transceiver it appeared that the level of activity on the band did not warrant the expenditure of time and effort in passing the morse test in order to use it. The activity on the band does of course vary from locality to locality and the decision may have been the result of an accident of geography. In the hope that the licensing regulations may alter, the transceiver now awaits on the shelf its moment of glory. However, many field tests have been made with the co-operation of members of the 4m Raynet group in the Glasgow area to whom the author is greatly indebted.

Receiver

The receiver is a double conversion superhet using a first local oscillator crystal controlled at 54·875MHz and a tunable second oscillator covering 16·59 to 17·19MHz. The first i.f. uses a bandpass coupler to avoid the need for a ganged tuning capacitor and the second i.f. uses a total of five ceramic resonators and one i.f. transformer. Selectivity is excellent and sufficient to show that some nets are not really nets!

Both oscillators are located in a die-cast box (4¼in by 2⅜in by 1¼in) with the rest of the transmitter vfo. The remainder of the receiver circuitry, up to the audio preamplifier, occupies one double-sided printed circuit board measuring 2⅜in by 3⅜in which mounts onto the bottom of the vfo box. The circuit is given in Fig 1.

The neutralized cascode rf stage uses two TIS34 junction-gate FETs, TR1 and TR2. Adjustment is uncritical provided normal care is taken in laying out the circuit. In particular the output of TR1 should not be able to "see" the input. The prototype did not oscillate under any conditions. The neutralizing capacitor is adjusted for optimum signal-to-noise ratio, and in practice this adjustment seems to coincide with that of maximum gain so that the circuit can be tuned up for maximum front-end noise initially. A bandpass filter (L3 and L4) is used at 70MHz between the rf stage and the first mixer (TR3), the latter being a further TIS34 with gate injection from the crystal oscillator in the "oscillator box". A bandpass filter (L5 and L6) at the first i.f. (16·1 to 16·8MHz) then feeds the second mixer (TR4) which uses source injection from the vfo buffer.

The i.f. amplifier at 455kHz is conventional and uses Clevite transfilters as selective impedance-transforming devices. Since these operate in an overtone mode, the response at 227kHz must be suppressed and this is the function of the fundamental mode transfilters which decouple the source of TR4 and the emitter of TR5.

Further selectivity is provided by the tuned transformer which drives the detectors. Because of the high gain over the three stages, reasonably careful laying out is necessary and the input to the amplifier should be as far from the output as practicable, a linear layout being preferred. Since only one tuning adjustment is present, the i.f. alignment is trivial.

Reverse agc for the first two i.f. stages is obtained from diode D9 fed directly from the collector of TR7 and since an inverted power supply configuration is used [1], decoupling has to be provided to stop signals at the intermediate frequency from being impressed onto the ht line.

The fet rf stages require a separate agc detector since in order to reduce the rf gain the agc voltage must go more negative than the ht supply. D2 and D3, wired as a voltage doubler, provide this agc. Delay is obtained by setting the no-signal agc voltage midway between the supply rails. Thus before any reduction in gain of the rf stage can occur the output of the voltage doubler must rise above 5V.

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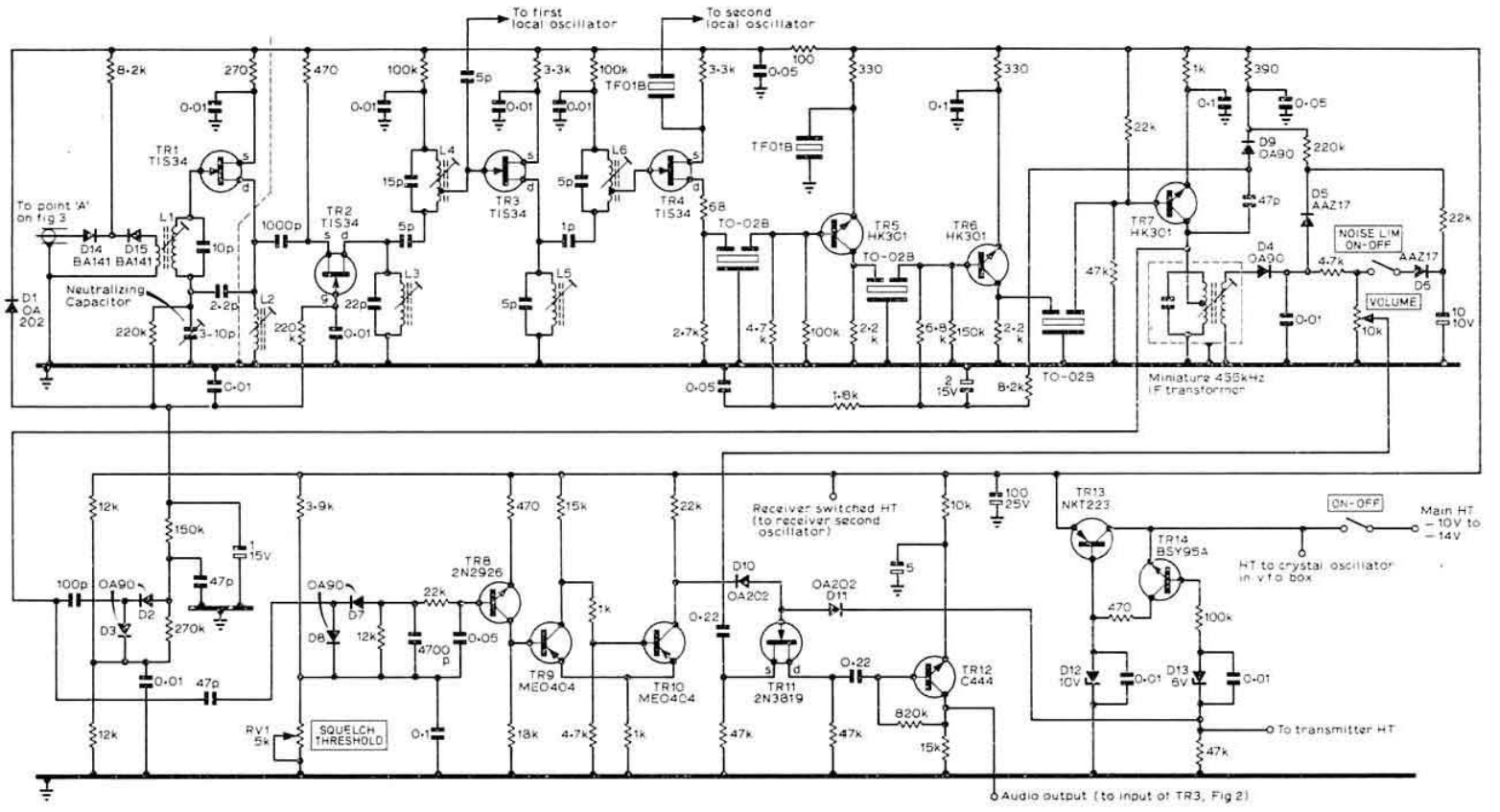

Fig 1. Complete circuit diagram of the receiver section of the transceiver, except for the local oscillators which were described in [1]. The first oscillator is crystal controlled at 54·875MHz in the prototype, and the second oscillator tunes between 16·59 and 17·19MHz

Notes to accompany Fig 1

(1) All decoupling capacitors are low-voltage disc ceramics.

(2) Low-value capacitors are low-voltage polystyrene.

(3) The transistors used were : TR1, TR2, TR3, TR4—TIS 34 (Texas Instruments); TR5, TR6 TR7—HK301; TR8,—2N2926; TR9, TR10—ME0404; TR11—2N3819; TR12—C444; TR13—NKT223; TR14—BSY95A. None of these devices are particularly critical and similar types should be quite suitable. The HK301 and ME0404 are made by Microelectronics Ltd and suitable replacements would be BC109 and BCY70 respectively.

(4) Coil data

L1—9 turns with a 2½-turn link winding.
L2—9 turns.
L3—6½ turns.
L4—6½ turns tapped two turns from hot end.
L5—34in of 32swg close wound.
L6—34in of 32swg close wound and tapped 10in from hot end.
All coils wound on ¼in o/d Aladdin formers and use appropriate ferrite slugs. Suitable wire for L1, 2, 3, 4 is 22swg tinned or enamelled copper, but the exact gauge is unimportant.

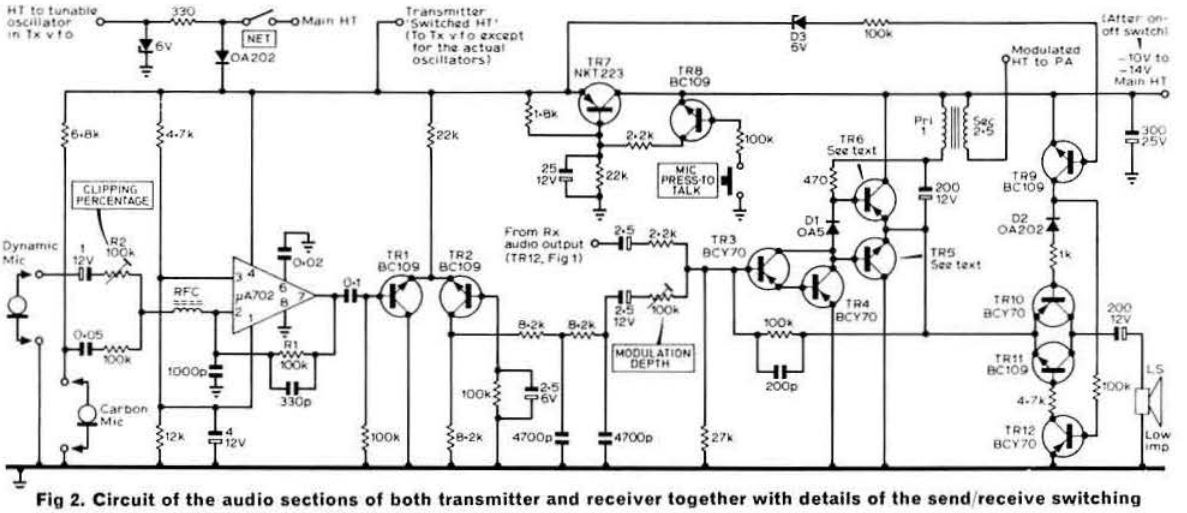

Fig 2. Circuit of the audio sections of both transmitter and receiver together with details of the send/receive switching

Diode D1 ensures that the gate of TR1 is not forward biased.

AM detection is carried out conventionally using diode D4 which is slightly forward-biased for low distortion. D6 acts as a shunt noise limiter and the function of D5 is to compensate for the knee voltage of the shunt diode. In this way an excellent self-following characteristic is obtained right down to the receiver noise level. The performance of the noise limiter on motor car ignition noise is excellent and the detailed operation of the circuit has been described previously [2, 3].

Squelch is one of those refinements which seems to arouse violent passions in different people; some feel it is useless, others swear by it. The author is one of the latter type and therefore feels that the inclusion of four extra transistors (TR8, 9, 10, 11) was well worth while. For example, the receiver can be left permanently tuned to the 70·260MHz calling channel with no annoyance caused by background noise. Squelch sensitivity is such, however, that even the weakest signal will remove the muting. Squelch is, of course, only necessary on a high gain receiver with good agc and since some operators object to such receivers on the grounds that in the absence of signals they sound like super-regenerative devices, this probably accounts for the divergence of opinion on the question of squelch. It is worth pointing out, however, that high gain and good agc are very desirable indeed in a truly portable transceiver not least because one's hands are frequently needed for such serious purposes as clinging onto a rock and cannot be spared for continual knob-twiddling. The same argument applies to the desirability of push-to-talk facilities on the microphone because then the radio can be tucked out of harm's way.

The squelch gate in the present receiver [4] is a fet, TR11, and this gives rapid action with an absence of clicks. In order to avoid the annoying condition of squelch being only "half-on", a Schmitt trigger circuit with negligible hysteresis (TR8, 9, 10) is used to switch the fet. Input to the Schmitt is the sum of a rectified signal from the i.f. output stage (TR7), using a further voltage doubler (D7, 8), and a voltage from the threshold potentiometer (RV1). Temperature drift of the threshold setting is negligible and voltage drift is eliminated through the use of stabilized ht to the complete receiver circuit. The stabilizer comprises an emitter follower (TR13) whose base is held at the breakdown potential of D12 (10V), provided that TR14 is conducting. When the transmitter is not energized, TR14 base is returned to the positive line and the receiver is on. When ht is applied to the transmitter, however, TR14 ceases to conduct and the receiver switches off. It is also arranged that the squelch gate is open-circuited during transmissions so that the receiver volume control is disconnected from the input to the modulator. D10 and D11 ensure that the two sources of gating signal for TR11 do not interact.

Breakdown diodes are notorious generators of high-frequency noise and, if conducting during the receive mode, must always be bypassed to rf as shown. If this is not done, much time can be wasted in trying to find out why the receiver's signal-to-noise ratio is so poor.

Diodes D14 and D15 at the receiver input are used to isolate the receiver from the transmitter during transmission. Thus, when the receiver ht falls to zero, one or other diode will always remain reverse-biased during each rf cycle from the transmitter. When receiving, enough current passes through each diode to ensure a low impedance to rf. It is necessary to use diodes with low series resistance such as the high-Q varactor diodes (BA141) shown in Fig 1. Attempts to use other diodes such as the ubiquitous 1N914, 0A202, etc, were disappointing. Best of all would probably be pin-diodes or even BA143 rf switching diodes but neither have been tried by the author. The circuit shown causes a barely discernible reduction in signal-to-noise ratio. Its effect on the cross-modulation properties of the receiver when used on a crowded band has not been checked due to the absence of a crowded band. It has, however, since been adopted by another local amateur for use on the 2m band with apparent success [5].

Switching and audio

The modulator is also used as receiver output stage and therefore it is necessary to disconnect the loudspeaker when transmitting. It is not a simple matter to do this with semiconductor devices since the impedance of the switch in its

conducting state must be small compared to that of the loudspeaker. The switch used was the result of much experimentation and works satisfactorily [6]. Referring now to Fig 2, TR10 and TR11 act as common collector stages. When TR9 and TR12 are both conducting, current passes through the emitter-base junctions of both TR10 and TR11, thereby connecting the loudspeaker to the modulator. The peak currents which can be fed to the loudspeaker are limited by the base currents supplied to TR10 and TR11, and this therefore sets a limit to the audio power available on receive. While not entirely adequate for comfortable use in a noisy car it is adequate for most other purposes.

The base-to-emitter reverse breakdown voltage ratings for TR10 and TR11 should ideally exceed half the supply voltage, otherwise peaks of audio get through to the loudspeaker when transmitting. Unfortunately most silicon planar devices have breakdown voltages of around 6 to 8V and thus a faint sidetone appears in the loudspeaker. This does give, however, a useful indication that all is well. TR3, 4, 5, 6 comprise a conventional complementary audio power amplifier and in fact the output pair (TR5, 6) were retrieved from an old Newmarket PC5 module. No doubt the Mullard AC187 and AC188 complementary pair would be a good substitute.

Input to TR3 comes from either the audio squelch gate or a speech clipper (TR1, 2) when transmitting. A pair of shunt silicon diodes connected "back-to-back" also make a good clipper in this application, but since the supply voltage will vary during battery life it is desirable that the clipping level should adjust itself in proportion, then a more constant modulation depth is maintained. The long-tailed pair clipper has this property. Post-clipper filtering is carried out by two RC sections.

Speech amplification is provided by a μA702 operational amplifier, with its closed loop gain determined by the ratio $\frac{R1}{R2}$. A carbon microphone can also be used as shown. With the rf filtering shown, no trouble from rf in the modulator was experienced. The μA702 is useful here since its earthed metal can gives good screening.

The switching of ht lines is a relatively simple thing to achieve and is carried out here by TR7 acting as an emitter follower and as an active smoothing device. Thus decoupled ht is applied to the base of TR7 by a potential divider and the low current required by the base allows a far larger RC product to be used than if the resistor were directly in the ht path to the decoupled stages. TR8 acts as a switch and is controlled by the microphone pressel switch. When TR8 goes open circuit (when changing from transmit to receive) it is necessary that the smoothed ht line drops rapidly to give a rapid change-over. It is the function of the 1·8kΩ resistor between base and emitter of TR7 to ensure this. Because of their lower saturation voltages germanium transistors are preferable for positions such as TR7 but space limitations may preclude their use.

It is worth noting that it is unnecessary to switch the ht to the rf power stages, since with Class B or C transistor amplifiers only leakage current flows when the rf drive is removed. In turn this means that no load is presented to the modulation transformer and therefore it may be permanently connected to the audio amplifier.

Now that monolithic audio power amplifiers are readily available it would probably be worth using separate audio amplifiers for receiver and transmitter.

The function of D3 may not be immediately obvious. Since the emitter of TR7 only reaches approximately 90 per cent of the ht supply voltage, to which TR9 emitter is connected, TR9 could not turn off in the absence of D3. D3, however, stops any current flowing to TR9 base until the switched ht falls to less than 12–6V.

Transmitter

The mixer-vfo, which was described in [1], produces an output of only a few milliwatts. A Class A cascode amplifier is therefore used to bring the output to a level suitable for a driver stage, and the circuit is shown in Fig 3. TR13 and TR14 are connected in series to ht and are biased into Class A by the two diodes, D4 and D5. Biasing of this type makes the gain of the stage largely independent of temperature and supply voltage. The driver stage, TR15, is directly coupled to the output of TR14 and operates in Class B. Complementary coupling of this type is extremely simple with Class B rf amplifiers and also has the advantage that one or more rf chokes can be eliminated. The pnp driver stage (TR15) is then directly coupled to the output stage which uses an npn transistor, the BLY33 (TR16). A conventional pi-tank output network is used to match the pa to the aerial.

The method of isolating the transmitter from the aerial relies on the high impedance of a silicon diode for voltages less than about one half. The diode concerned, D6, passes only the leakage current of TR14 when in the receive mode and this current is insufficient to appreciably reduce the very high impedance of the diode. When transmitting, on the other hand, the full ht current for the pa passes through D6 and its impedance is low compared to the 75Ω aerial impedance. Again there is a problem in the choice of diode for D6 but the readily available OA202 performs satisfactorily at the power levels used in this design. For higher power outputs a diode of larger current rating would be necessary.

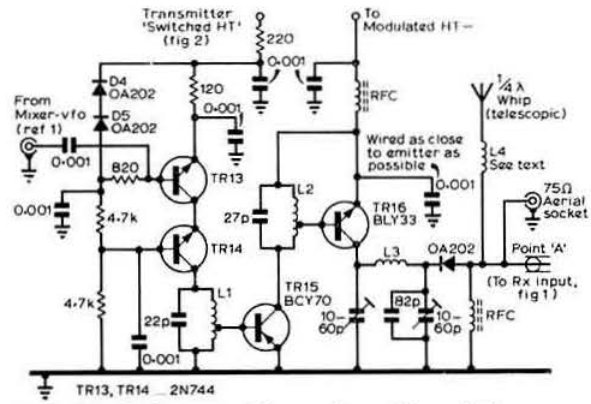

Fig 3. Circuit of the remaining sections of the radio frequency parts of the transmitter; the mixer-vfo which drives the circuit was described in [1]. The amplifier gives an output of around 0·5W for an input of several milliwatts.

Notes to accompany Fig 3

(1) RF chokes consist of two turns of enamelled wire on a Mullard ferrite bead type FX1115.

(2) Coil data. Wire for L1, 2 as for L1, 2, 3, 4 in Fig 1
L1—5½ turns tapped 2 from the earthy end.
L2—6½ turns tapped 1 from the earthy end.
(Formers for L1, L2 as for Fig 1).
L3—4 turns, 18swg, ⅛in dia self-supporting.
L4—see text.

but such a diode would have a larger junction capacitance and it might become necessary to tune this out with a parallel inductance (isolated to dc by a capacitor).

Because of the non-linearity of the junction-capacitance versus voltage curve for semiconductor diodes, one might anticipate some increase in receiver intermodulation using a system of this kind, but this has not been the case so far. Similarly it appears that the current through the diode when transmitting is always enough to ensure high conduction in the diode; if the technique is used at higher power levels, however, it would be wise to check for possible harmonic outputs.

Although the amplifier circuit described above can be made to function satisfactorily, it proved to be somewhat prone to spurious parasitic oscillations, the best test for the presence of these being the proximity of a television receiver. With hindsight it appears to the author that the circuit would be easier to "tame" if the emitter of the pa were to be directly earthed, ie if a pnp output device were used. This would mean abandoning the benefits of complementary coupling. For an unmodulated amplifier the system shown would be less temperamental than was the case here.

Concerning the choice of components, by far the best rf chokes for this kind of application are those made by winding two or three turns of 22swg enamelled wire onto the Mullard lossy ferrite beads Type FX1115. The driver transistor specified in Fig 3, the BCY70, although having a f_T of around 300MHz, is designed for audio purposes and has a rather high output capacitance. The SGS V405, for example, would be better. Decoupling capacitors should be low-inductance disc ceramics of not more than 1,000pF, and it is essential that the overall inductance in the path between TR16 emitter and earth be as low as possible.

A point which is important in portable equipment is the problem of matching both a 75Ω feeder and a quarter-wave whip aerial to the transmitter output. A quarter-wave whip has a characteristic impedance which is appreciably below 75Ω so that the pa output should ideally be retuned when changing one from the other. Unfortunately it is not practicable to do this in miniaturized equipment because panel space is not available for luxuries like meters, nor is it desirable from the aspect of operating convenience. The solution adopted here is to load the whip slightly with a small inductor (L4) connected between its base and the tank circuit. The one used by the author had three turns, $\frac{3}{16}$in diameter, air cored. In a smaller 2m transceiver built by the author, a similar result is obtained by making the whip about $\frac{1}{4}\lambda$ in length rather than one quarter. Unfortunately telescopic aerials long enough to allow this at 4m seem hard to find.

The alignment procedure is to tune the transmitter for maximum output commensurate with a good modulation characteristic, using a 75Ω dummy load, or a dipole with feeder, and with the whip retracted. The whip is then extended, the other load removed, and the loading coil adjusted for best results. It cannot be overemphasized that it is essential to tune a transistor output stage for best modulation rather than for maximum unmodulated output. The reason for this becomes obvious when the rectified rf voltage across a dummy load is observed on an oscilloscope. The correct output from a transmitter which is 100 per cent modulated is sketched in Fig 4(a), where E_0 represents the rectified output voltage with no modulation and $2E_0$ is the voltage at modulation peaks. Ideally, therefore, the peak power should be four times the quiescent power. Frequently,

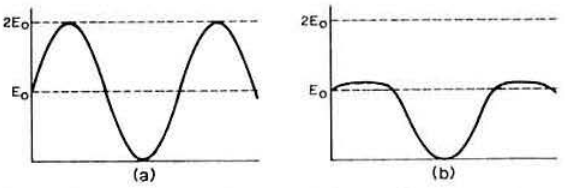

Fig 4. The waveform in (*a*) represents the rectified output from a fully modulated a.m. transmitter in the ideal case. Waveform (*b*) shows the flat-topping which tends to occur in transistorized vhf power amplifiers if they are tuned up for maximum output when unmodulated.

however, if a solid-state transmitter is tuned up solely for maximum output the rectified rf output looks more like that shown in Fig 4(b); positive going parts of the modulation waveform being very much attenuated. Under these conditions one has the phenomenon of "downward modulation", the explanation being that during modulation the average power output is actually less than its value in the absence of modulation. When the input and output tuned circuits of such a pa are adjusted it is found that the peak output remains fairly constant over a range of settings and in order to get a reasonably linear modulation characteristic one has to accept a significantly reduced quiescent power.

It should be clear, however, that this is no hardship at all, and indeed that the converse is true. It is the amplitude of the fundamental modulation waveform appearing at the detector in a receiver which determines the effectiveness of a transmitter, and an output such as Fig 4(b) is obviously wasting much of the available power in generating harmonics of the audio waveform. Thus not only is the "talk power" diminished and the modulation distorted, but the power that should have gone into desired audio sidebands is radiated as so-called "splatter" on either side of the carrier.

In the author's opinion this is the explanation of the "transistor transmitter sound" which has given such devices a bad reputation in some quarters. It remains to be emphasized that excellent modulation linearity can be achieved, but only if the transmitter adjustment is carried out with care and understanding.

A suitable dummy load for carrying out tuning adjustments is shown in Fig 5.

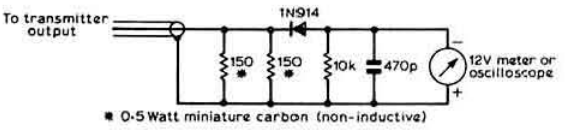

Fig 5. A rectifier and dummy load circuit which is useful for observing the waveforms shown in Fig 4 and for tuning-up purposes

Construction

Details of the printed circuit technique used were given in [1]. A general view of the construction of the transceiver is given in Fig 7. The mechanical basis for the whole assembly is the aluminium die-cast box which houses the oscillators and transmitter vfo. Onto this rigid base is mounted the front panel, and the printed circuit carrying the receiver is bolted to the outside large face of the box. In this way the lid of the box can be removed at any time without disturbing the receiver. An aluminium L-section is bolted to one end of the

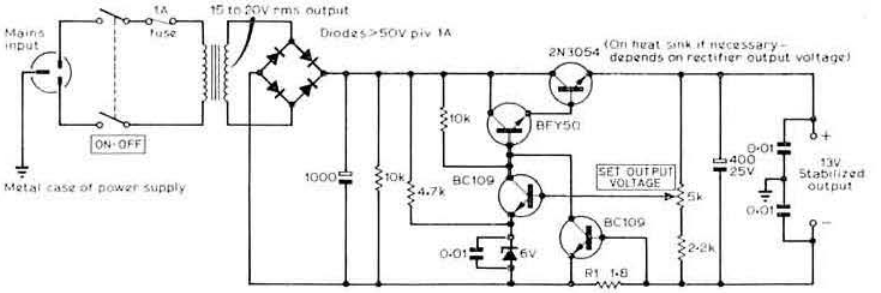

Fig 6. Circuit of a stabilized power supply suitable for powering the transceiver from the mains. The short-circuit current is limited to a value determined by R1. A very wide latitude exists in the choice of transistor types

box and the transmitter printed circuit is carried on two cross-pieces which are in turn carried by the L-section. This gives an assembly which is rigid but which renders all parts of the circuitry quite easily accessible.

The outer case consists of only three pieces including the front panel. The latter, because of all the wiring to controls, is not easily detachable but both other pieces are readily removed. A baseplate fastens flat against the lid; using two of the bolts which also fix the lid of the die-cast box; the top of the outer case, together with the two side panels and the rear panel comprise one easily removed piece. In order to remove it one need only slacken five screws. Captive nuts for these screws are glued with Araldite to the baseplate and the front panel.

A slide-rule type dial was used for the receiver tuning and this is calibrated in frequency. Any drift in the receiver (or transmitter) is less than the receiver bandwidth, and since no bfo is fitted this means that in effect the receiver does not drift and an accurate dial calibration is worthwhile. No dial was provided for the transmitter since normally one nets on to a frequency selected on the receiver tuning dial.

As a general point concerning the mechanical layout of hand-portable equipment, it is essential if minimum overall size is to be achieved to plan around the particular power

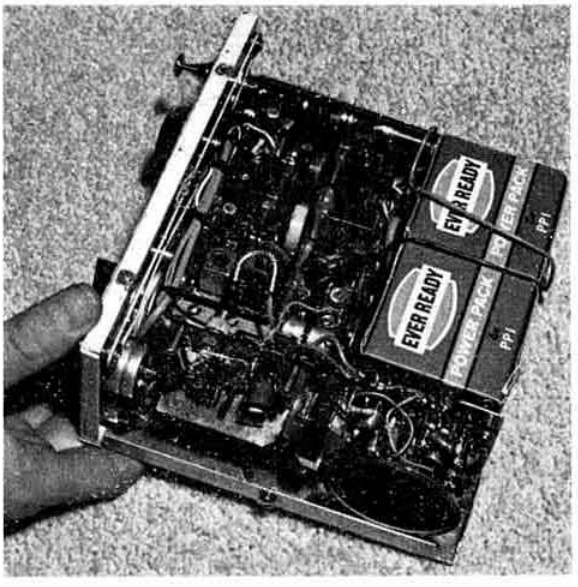

Fig 7 General view of the construction

source which is to be used since this represents the largest fraction of the overall volume. In this case two PP1 6V dry batteries were used and this determined both the width and the height of the metal case. Batteries of this type are most unsatisfactory for this application, however, since their voltage drops very quickly if currents appropriate to a transmitter are taken. Moreover, the internal resistance increases throughout life and this means that valuable space must be taken up inside the case by an electrolytic capacitor connected across the supply. Furthermore, the circuitry must be designed to operate correctly with a range of supply voltage as great as from 13 to 9V if full value is to be obtained from each battery pack.

Despite their initial cost of around £7 on the surplus market, a 13V, 900mAh Deac accumulator is an excellent investment if much portable work is intended. With a lifetime of at least 200 recharge cycles, this represents a vast saving compared with the cost of dry batteries of similar size. Moreover, by trickle-charging, new battery performance is always obtained, and much higher currents can be taken allowing higher power outputs to be obtained. An advantage which only becomes apparent when a rechargable power source has been used for a while is the tremendous operating freedom which they impart. One need no longer carefully reserve the battery power for conventional portable operation but one can operate the equipment from anywhere in the house or garden without the encumbrance of a mains cable and power supply. The author hastens to add that the delights of cordless freedom have been personally savoured using similar equipment for the 2m band [7], not on the forbidden 4m band!

When a whip aerial is used on a portable transmitter it is often worthwhile to decouple the wires from the microphone using 470pF disc ceramics directly at the microphone socket. Otherwise trouble is likely through re-radiation of the transmitter output back into the case, especially if the aerial is not very well matched, as may well happen with certain positions of the aerial relative to surrounding objects.

Neat joints can be obtained in an aluminium cover through the use of an epoxy resin adhesive such as Araldite. The aluminium must first be scrupulously cleaned, for example with Brillo pads followed by thorough rinsing. Following the application of the Araldite one can either wait 24h for it to cure at room temperature, or 30min at 150°C will give a permanent bond. Remember, however, that when heated the viscosity of the resin is much reduced and it will tend to run initially. After curing, the Araldite can be filed and spray painted. Araldite is also very useful for cementing nuts onto the insides of a chassis or case. A tap is necessary to clean the threads after baking.

Mains power supply

A stabilized power supply suitable for powering the transceiver is shown in Fig 6. The circuit is conventional and protection is provided against short circuits at the output; the maximum short-circuit current is limited to about 500mA and depends on the value of R1. The larger R1, the lower the current.

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Further information on the 20MHz digital frequency meter DFM1

by I. D. BROWN, G3TVU,* and

S. L. NORMAN, G8BDO

THE authors would like to thank G3OKA for his constructive comments in the December 1971 *Radio Communication*. The following points may be of further use to prospective builders of digital frequency meters.

Time standard oscillator

By adjusting a 10MHz crystal oscillator to give a 1Hz beat with a broadcast 10MHz frequency standard, an accuracy of 1 part in 10^7 will be obtained (ignoring any errors in the broadcast standard, which are very small indeed). Similarly adjusting a 100kHz crystal oscillator so that its 100th harmonic at 10MHz produces a 1Hz beat with the standard will also produce an accuracy of 1 part in 10^7 or 0·1 parts per million (ppm).

Thus for frequency measurement the actual time standard source frequency is of no concern, it is its accuracy in parts per million which determines the ultimate accuracy of the instrument in which it is used.

Drift

The frequency drift of a crystal oscillator with temperature is dependent on the cut of the quartz element used and on the method of mounting the element. Crystals of 10MHz fundamental will in general be AT cut, operating in a thickness shear mode. For a temperature of −20°C to +70°C a typical frequency variation of 0·01 per cent may be expected, ie 100ppm. For a 40°C temperature change, 25 to 10ppm changes in frequency are obtained from various specification crystals. These crystals are available in metal cans (eg HC6U) and evacuated glass envelopes (B7G or with flexible leads).

In general the glass encapsulated crystals exhibit a lower temperature coefficient. The temperature coefficients given above cannot be scaled, as crystals may have a straight line positive or negative coefficient or parabolic curves giving zero coefficient at some elevated temperature for oven control (eg 60°C).

Crystals of 100kHz are available in a variety of cuts. Firstly, X and X-5° cuts, where the crystal vibrates in a longitudinal mode giving 8ppm variation for 40°C temperature range. Secondly, GT cut vibrating in a longitudinal mode to give ±0·05ppm per °C over 10°C, ie 1ppm maximum excursion for 10°C temperature range. Finally, DT cut crystals vibrating in a face shear mode to produce 7·5ppm for 40°C temperature range.

It can be seen that selection of a crystal for a particular function requires a lot of browsing through data sheets, and the above information was condensed from the STC data book on quartz crystals, which also gives expected ageing rates for the specific crystals.

Decade counters dividers

The first decade counter 3P3 in the DFM1 frequency meter was specified as a 7490, as at the time of writing the 50MHz 74196 chip was not advertised on the amateur market. Recently, G8BDO queried Texas Instruments on the availability of 74H90 and 74S90 devices. It would appear that these are not projected as the 7490 is an old device, now superseded by more complex and versatile dividers. The present 7490 does, however, occupy a smaller silicon area than before, which infers a higher speed of operation.

The authors are at present considering a 50MHz prescaler, including input interface. The following table gives an idea of prices and frequency limits of logic circuits available at this time, based on providing a divide by ten function only—no input interface included.

Manufacturer	Devices required	Speed typical (MHz)	Speed min. (MHz)	Price (£)
Texas Instruments	7490	18	10	1.25
National Semi-conductors	7490	25	18	1.25
Texas Instruments	74H00 + 2 off 74H73	30	25	4.40
	74H00 + 2 off 74H103	50	40	4.96
	74S00 + 2 off 74S112	125	80	13.75
Motorola MECL II	4 off MC1013	85	70	6.56
	3 off MC1013 + MC1027	120	100	8.88
Motorola MECL III	4 off MC 1670S	350	300	64.00
Plessey	SP632 B		400	49.80
	SP631 B		500	58.70
	SP630 B		600	65.70

The Plessey dividers operate down to 40MHz sine wave, limited by the input rise time, but will operate down to dc with a square wave input having a rise time better than 25ns. It is also pointed out that with the MECL III and SP630 series dividers, strip line techniques are required in construction.

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Crystals for Carphones—and other things

Reproduced from the May 1971 issue of Amateur Radio, *journal of the Wireless Institute of Australia, by courtesy of the editor. References to the 6m (52MHz) band relate to Australia where it is allocated for amateur use.*

by DAVID RANKIN, VK3QV*

IN the last 10 years the ready availability of commercially obsolete vhf mobile transceivers has given rise to a new phase of amateur radio—the use of the a.m. and fm net frequencies with the subsequent development of vhf/uhf repeaters within the amateur bands.

One of the elementary requirements for the successful operation of this type of equipment was that all the transmitters and receivers be tuned to the same frequency within close limits. Simple as it sounds, this was something alien to the methods of the vhf amateur of the 'fifties and early 'sixties. Operators usually picked a crystal in the 8MHz. range, and whatever frequency it multiplied out to within the 2m band became "their frequency" something to be guarded jealously. There was seldom any real thought given to achieving operation on a predetermined frequency to, say, within 0·005 per cent.

Carphones

The appearance of cheap vhf mobile transceivers—now usually known as "Carphones" after the name used commercially by one of the leading manufacturers—changed amateur techniques because of the necessity for all units to be on the same frequency. With these Carphones, the receiver as well as the transmitter was crystal locked and no trimming controls were provided for the operator. Early thoughts were that if the same frequencies were required at the aerial, then use the same crystal frequencies in all the receivers and also the same in all the transmitters—surely the frequency marked on the crystal holder must be right. However, this philosophy was not borne out in practice, particularly where different model sets were involved. Some other factors must then be considered to explain these differences.

Crystal frequency

The simplified equivalent circuit of a crystal is easily found in such well known texts as the RSGB *Handbook* [1] or the ARRL *Handbook* [2]. Suffice to say here that for the case of parallel resonance, the frequency of operation is dependent upon the total value of capacitance appearing across the terminals of the crystal while it is operating. In other words, the operating frequency depends upon the effective dynamic capacitance presented to the crystal.

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Table 1 shows the variations in frequency obtained for different values of load (effective dynamic) capacitance and the corresponding series resonant frequency. These figures were taken on standard HC6/U plated crystals at 4MHz, 10MHz and 45MHz. The first two crystals were fundamental types—the 45MHz was a third overtone. The variations measured can only be taken as a guide, as the differences may be different for crystal units produced by other manufacturers.

Table 1. Variations in frequency of HC-6/U style crystal units (plated) due to changes in circuit loading

	Measured frequency (kHz)		
Circuit loading	**Nominal 4,055·556**	**Nominal 10,285·71**	**Nominal 45,228·0**
10pF	4,056·976	10,289·31	45,231·12
20pF	4,056·094	10,287·10	45,229·73
29.3pF	4,055·556	not measured	not measured
29·8pF	not measured	10,285·71	not measured
30pF	4,055·526	10,285·69	45,229·28
40pF	4,055·199	10,284·90	45,229·02
50pF	4,054·988	10,284·38	45,228·90
60pF	4,054·838	10,284·02	45,228·74
100pF	4,054·518	10,283·25	not measured
Series resonance	4,053·960	10,281·91	45,228·22

Notes.—1. At 30pF circuit load, the 4MHz crystal is 30Hz low of nominal frequency. Thus, the crystal has an adjustment tolerance of better than 0·0008 per cent (8ppm).
2. The 10MHz crystal is 20Hz low of nominal frequency with a 30pF load and thus has an adjustment tolerance of better then 0·0002 per cent (2ppm).
3. The measured series resonant frequency of the 45MHz crystal is 220Hz above the nominal, and thus has an adjustment tolerance of better than 5ppm.

Two points worth comment arise from consideration of the figures in Table 1.

1. The fundamental crystals measured were manufactured to suit a load capacitance of 30pF. Refer to the third column of Table 2. The overtone crystal measured was manufactured for use at series resonance. While none of the crystals oscillated precisely at nominal frequency (ie the required frequency on 30pF) they are closest to nominal with this 30pF load condition and series resonance, respectively. The degree by which they vary from nominal frequency when terminated into the correct circuit condition is part of the adjustment tolerance and the total amount of this permitted variation is usually quoted as a plus or minus so much percentage. Alternatively, a "parts per million" or a "Hz per MHz" figure can be used. The "parts per million" phrase is frequently abbreviated to ppm. Table 3 gives some commonly accepted figures used for adjustment tolerances

Table 2. An illustration of the degree of deviation from nominal frequency of HC-6/U style plated crystal with varying load capacitances

Circuit loading	Measured frequency	Deviation from nominal frequency	
		At 4055·556kHz	At 146MHz
10pF	4,056·976kHz	+1,420Hz	+51·1kHz
20pF	4,056·094kHz	+ 538Hz	+19·4kHz
29·3pF	4,055·556kHz	nil	nil
30pF	4,055·526kHz	— 30Hz	— 1·1kHz
40pF	4,055·199kHz	— 357Hz	—12·9kHz
50pF	4,054·988kHz	— 568Hz	—20·5kHz
60pF	4,054·838kHz	— 718Hz	—25·9kHz
100pF	4,054·518kHz	—1,038Hz	—37·4kHz
Series resonance	4,053·960kHz	—1,596Hz	—57·5kHz

The figures are taken for the 4MHz crystal given in Table 1. Note particularly how variations are emphasized at aerial frequency (146·0MHz) when any error is multiplied 36 times.

and states the fairly simple relationship between the three methods of quoting tolerance.

2. The variation in frequency between extreme values of load capacitance is so great that in the usual oscillator circuit it becomes impractical to accommodate the changes required in load. Table 2 shows the frequency deviation from nominal for a typical 4MHz HC6/U plated crystal, and since the unit has been calibrated for a 30pF load, it could not be made to operate on correct frequency in a series resonant circuit unless that circuit was modified away from the series resonant condition. Again, in the case of small values of load capacitance, the strays in the circuit, particularly if switching is involved, may be greater than the load capacitance for which the crystal is designed. In this case, also, the crystal could not be made to oscillate on nominal frequency. Thus, in some multi-channel transceivers there are smaller values of fixed capacitance associated with the crystal oscillator than in the corresponding single channel model—the rest of the capacitance is made up of wiring capacitance in the leads to the switch, and capacitance in the switch itself. This approach of reduced fixed capacitors ensures that the crystals suitable for operation in the multi-channel models are also satisfactory in the single-channel versions.

Adjustment tolerance

In effect, the adjustment tolerance is an allowance given to a manufacturer who cannot be expected to produce devices that are "spot on". Resistors, capacitors, coils, etc all have tolerances associated with their nominal values, and so also must crystals. However, in the case of a crystal unit, the user can do something about the situation. The nominal frequency can be produced by an appropriate value of load capacitance. Some thought given to the figures in Table 1 should make this clear. At some value of capacitance between 29 and 30pF, both the 4MHz and 10MHz crystals oscillate on nominal frequency. In practice, if a small trimmer is wired into the oscillator circuit, the load can be varied up or down, so that output on the precise nominal frequency can be achieved.

Load capacitance

Experience has shown that the best compromise for load capacitance for fundamental crystals is 30pF for frequencies up to 10 or 12MHz. Initially, the USA adopted a value of 32pF which is somewhat academic, but the latest issues of the US MIL specifications have changed to the 30pF value.

Thus, it is reasonable to expect that most Carphones with **unmodified** crystal oscillators require fundamental crystals calibrated for 30pF operation. This is true for equipment such as the AWA MR6 and MR10 series and early Vinten equipment, but is not true for the Pye "Victor", "Premier" or "Overland" series. In these latter equipments, even the transmitter crystals need to be calibrated for series resonant operation; the receiver crystals are of the overtone type and require series resonance calibration, which is the recommended condition for overtone units.

Reference to Tables 1 and 2 will show that "30pF". crystals will be nowhere near the required frequency if operated at series resonance in a "Victor", for example, and particularly after an 18 or 36 times multiplication, the aerial frequency can be tens of kilohertz away from the proper channel.

Other manufacturers have used load capacitance values of 20pF, 25pF and even 40pF, and here the situation may not be so serious. "30pF crystals" will not be quite so far off frequency and it may even be possible to pad them to frequency by modifying the oscillator—a most unrewarding and frustrating task in most instances, however. The main point, then, is that it behoves the user to make sure that he has crystals to suit his equipment. If, however, the crystals do not come out on the required frequency, then before mentally or otherwise abusing the manufacturer, the user should check his specifications and see that he has ordered the correct capacitive load.

Other things

Another area where one needs to be precise about crystal load conditions is the oscillator crystals for modern ssb receivers of the Collins, Yaesu or Drake class where frequency readout to 1kHz is available. A third case where precision in specification is required is where vhf/uhf crystal-locked converters are used in conjunction with such receivers.

SSB receivers

To achieve 1kHz readout economically on a number of amateur bands, modern ssb receivers are of the double (at least) conversion superhet design, where the first local oscillator is crystal locked and the second local oscillator is tunable. If the various crystals used for the different bands in the first oscillator are not specified precisely, the dial calibration will not hold from band to band.

These receivers usually have movable pointers—fidicuaries—or some similar scheme to take up small differences of the order of 1 or 2kHz that will occur from band to band because of the adjustment tolerances on the individual crystals. If the crystals are not specified precisely, the differences from band to band may be beyond the corrective range of the fidicuary, in which case one of the main assets of the receiver is lost. On the other hand, if trimming facilities are provided the adjustment tolerances may be tuned out, and then the dial calibration can be made to hold from band to band within 100 or 200Hz at least.

For the real enthusiast, there is nothing like switching on the 100kHz calibrator and the bfo and tuning zero beat on one of the 100kHz marker signals, and then "clunking" the band switch from one band to another, and finding zero bea being maintained on all bands. What joy!

Table 3. A comparison showing the relationship between three ways of quoting tolerances on the frequency of a crystal, and also showing what these mean in terms of hertz or kilohertz at 52 and 144MHz

Percentage	Parts per million ppm	Hz per MHz	Actual variation at 52MHz	Actual variation at 146MHz
±0·01	±100	±100	±5·2kHz	±14·6kHz
±0·005	± 50	± 50	±2·6kHz	± 7·3kHz
±0·0015	± 15	± 15	±780Hz	± 2.19kHz
±0·001	± 10	± 10	±520Hz	± 1.46kHz
±0·0005	± 5	± 5	±260Hz	±730Hz

Actual variation (in hertz) equals actual frequency (in megahertz) multiplied by ppm. Actual variation (in kilohertz) equals actual frequency (in megahertz) multiplied by (ppm divided by 1,000).

VHF/UHF converters

With the main receiver thus aligned, it should also become a joy to operate it as a vhf/uhf tunable i.f. Any modern converter worthy of the name is crystal locked, and thus the frequency of this locking crystal becomes important if the main receiver dial is to become in turn direct reading on the vhf or uhf band concerned. A fairly simple way to check the converter crystal is as follows, and let us take simple examples to illustrate the approach.

Consider a 6m converter that has an i.f. of 6 to 8MHz, ie 52MHz is to come up on 6MHz on the receiver dial. Choose a marker signal such that a harmonic will appear on both 6 and 52 MHz exactly. In the interests of as strong a harmonic as possible at the higher frequency, use the highest possible marker frequency. For the 6m converter, 2MHz is the highest possible figure that will divide evenly into both 6 and 52MHz. Ensure that the receiver calibration is correct at 6MHz in the normal way (WWV, in-built calibrator, etc), and then zero beat the third harmonic of 2MHz marker to the corrected 6MHz calibration. Having ensured that the 2MHz frequency is correct (within ±100Hz should be easily achieved), switch off the receiver calibrator and put the vhf/uhf converter into operation and look for the 26th harmonic of 2MHz marker.

Table 4. Examples of a marker crystal frequency suitable for zeroing a vhf/uhf converter to assure direct frequency readout on the tunable i.f

VHF band (MHz)	Tunable i.f. (MHz)	Converter injection frequency (MHz)	suggested marker frequency	Remarks
52 to 54	14 to 16	38	2MHz	7th harmonic on 14MHz 26th harmonic on 52MHz
144 to 148	6 to 10	46 × 3 = 138	6MHz	Fundamental on 6MHz 24th harmonic on 144MHz
144 to 148	28 to 32	38·66 × 3 or 58 × 2 = 116	4MHz	7th harmonic on 28MHz 36th harmonic on 144MHz
432 to 436	27 to 31	101·25 × 4 = 405	9MHz	3rd harmonic on 27MHz 48th harmonic on 432MHz

Note that the examples chosen are to illustrate this point and are not necessarily recommended as good vhf/uhf receiver practice.

Provided that the levels of the third harmonic into the main receiver and the 26th harmonic into the converter are adjusted appropriately, a beat note may be observed between these two signals at 6MHz on the dial. This, of course, is on the assumption that the converter crystal is oscillating close to its nominal frequency. In some cases this crystal may be so far off frequency that two distinct signals are heard around 6MHz. The difference between the two signals will be caused by the converter crystal being off nominal frequency, and thus trimming it should bring the two signals into zero beat, provided, of course, that the converter crystal has been specified to suit the oscillator circuit in use. Once zero beat has been achieved the 6MHz dial calibration becomes 52 MHz as far as the overall receiver system is concerned.

Other examples are given in Table 4. Some thought on the subject will show that since all the popular vhf/uhf bands start with even number frequencies, then, provided the chosen i.f. begins with an even number, a 2MHz marker signal would always provide the correct harmonics.

The principal problem arising with this scheme is the relative strengths of the marker signal at the i.f. and the vhf/uhf. The widely differing order of harmonics will have widely differing signal strengths—the higher the order of the harmonics, the weaker it will be—and thus, in practice, some method of enhancing a particular harmonic may be required. Otherwise the weaker harmonic will be swamped by the stronger and any beat note may not be detected aurally. A diode frequency multiplier, followed by appropriate tuned circuits, is one possible solution.

Conclusion

Where optimum performance of Carphones is required, or the full potential of direct frequency readout on modern hf and vhf/uhf receiving systems is to be realized, then careful attention must be paid to the specifications for the frequency determining crystals. Oscillator circuits in such equipment should not be modified unless the user is fully aware of **all** the implications such modifications may have. Where the circuits are standard, reference to the manufacturers' handbook should help the user to specify fully the crystals correctly.

Digital circuitry and techniques are starting to appear in amateur literature, and it is probably only a question of time before the "average" receiver comes equipped with digital readout of frequency. The resolution will be mainly limited by the number of readout tubes and gating times used, but fine resolution will be useless without corresponding accuracy —the frequency accuracy of the crystals in the system. Thus, the requirement for care in the specification of the operating conditions for the crystal looks like it is with us to stay, and in fact the degree of precision will increase as more exotic devices become available.

Bibliography

1. *Radio Communication Handbook*, 4th edition 1968, RSGB chapter 1, page 32.
2. *The Radio Amateur's Handbook*. 44th edition 1967, ARRL (USA), chapter 2, page 52.
3. D. H. Rankin, "Overtone Operation of Quartz Crystals", *Amateur Radio*, March 1967, page 2; May 1967, page 5.

Keeping track of OSCAR

(Part 4)

by W. BROWNING,
MIAA, MIMI, FMI, G2AOX*

(Parts 1, 2 and 3 in this series were published in the January 1966, February 1966 and June 1968 issues of Radio Communication, *respectively)*

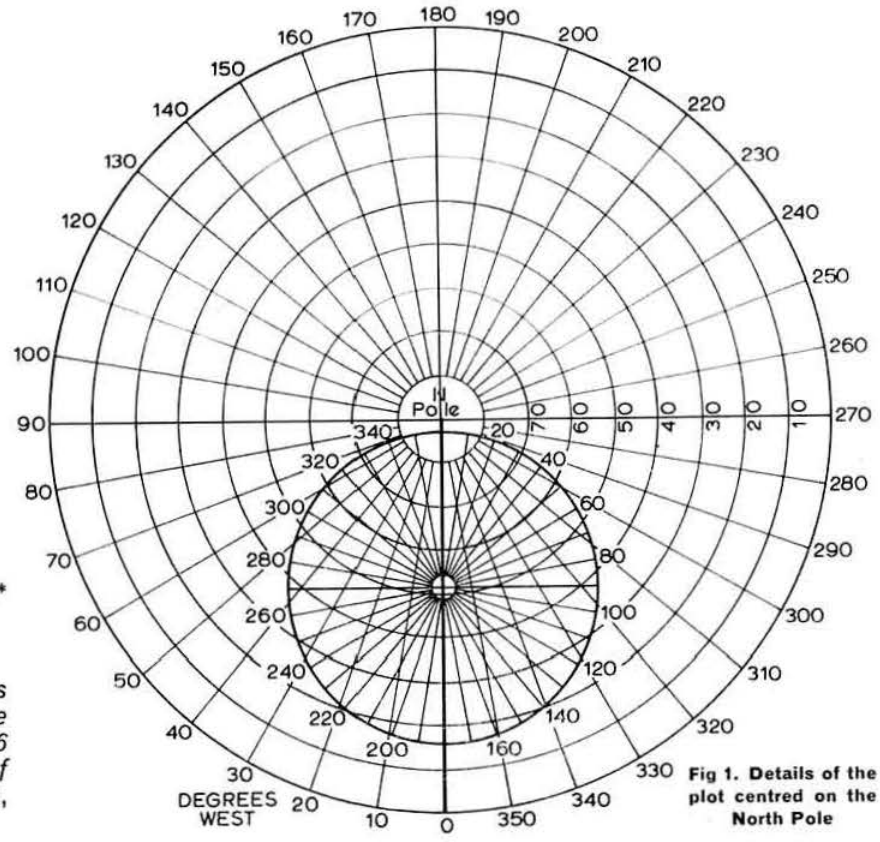

Fig 1. Details of the plot centred on the North Pole

IT is possible that OSCAR 6 may go into orbit in the spring/summer of 1972. This will be a repeater type, receiving and re-transmitting signals, and so enabling dx contacts to be made between continents by those stations with the necessary equipment and with suitable aerial arrays pointing in the right direction at the correct time.

This article gives details of a stereographic plotting board developed by the author over the last seven years and now brought down to its utmost simplicity, coupled with sufficient accuracy, for any station to be "spot on" time and position and beam heading on any near circular orbit, and to plan and easily see when and where dx contacts can be expected and made.

Baseboard plot

The plot is a stereographic polar projection of the northern hemisphere with linear spacing. It can be drawn on ordinary drawing paper, stout Bristol board or, better still, signwriter's white-faced hardboard, but if paper is used it must be firmly fixed to a stout board.

Referring to Fig 1 it will be seen that the centre is the North Pole, each circle represents lines of latitude, and the "spokes" are lines of longitude. It is recommended that the spacing between each circle is 1in (making the outer one, the Equator, 18in in diameter). The heavy line down from the centre to the bottom marked 0° is the Greenwich meridian; the figures around the Equator are degrees west of Greenwich, while those along the 270° meridian are degrees north of the Equator.

The compass rose must be centred on the station position (the one shown is centred on London), pointing direct to the North Pole with the angles in degrees in a clockwise direction from 0° at the North Pole. This will then give a "true" beam heading, but if the beam indicator has been aligned by a magnetic compass this will indicate a position 6½° to 12° west of true north and due allowance must be made to correct this on the indicator. The magnetic variation chart (Fig 3) shows the figures applicable to Western Europe. On the recommended scale of 1in separation between the circles, a circle with a radius of 1·45in drawn from the compass centre will represent a distance of 1,000 statute miles, and if others are also drawn at 1,500, 2,000 and 2,500 statute miles the effective range of reception can easily be read off.

If the compass rose is drawn in red, it makes easier reading near the centre of location, with less confusion with the black lines on the main plot.

The cursor

A cursor in the shape of an arc of a circle must then be made from a length of 16swg galvanized iron wire or similar, this being stiff enough to retain its correct shape—this pivots

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around the North Pole. Fig 2 shows this item, and to obtain the correct curve it is only necessary to know the inclination angle and the orbit period. OSCAR 5 was 101·6° inclination and 115min period—this period gives a track separation of 28·8° (115 divided by 4) for one complete orbit. As this plot only covers half of an orbit, the relative movement of the earth in that time is 14·4°.

Cover the plot with tracing paper firmly pinned down. Mark the Equator arc at the top and bottom, and make mark "A" at 0° exactly on the Equator—then another mark "B" at the inclination angle of 101·6° to the left of the North Pole, and a final mark at 194·4° (180 + 14·4) to the right of the top outer circle, mark "C". For orbits up to 90° inclination the arc will always pass to the right of the North Pole, and the top mark "C" will be at 180° minus half the track separation. The over 90° inclination (retrograde) orbits mean that it is necessary to carry on counting from the North Pole (90°) upwards, so the top side of the 80° ring is also 100°, and the 70° ring becomes 110°.

There can only be one radius that will produce an arc to pass through any three points. Join points A and B with a straight line, also points B and C; bisect these and produce perpendiculars to them, and where these two lines cross is the centre of the circle. Draw the arc from this point about half an inch longer at each end than points A and C. Also on the tracing, mark the North Pole centre and use this tracing to bend the wire to the correct shape. Screw a 4BA csk screw firmly up through the North Pole centre of the plotting board to act as the centre bearing, which with a thick washer nearest the board and two knurled terminal nuts will enable the cursor to be rotated with suitable friction and locked when necessary. Make up the "dog's leg" type centre link of the same 16swg wire, the eye to be a good fit on the 4BA screw, and of the correct length to get point B at the correct position, and solder together. The reason for the dog's leg is to enable an adjustment of a few degrees to be made, if necessary, by stretching or compressing. The two light tension wires (20swg TC) can then be soldered to the centre link as near the pivot as possible. These should be well stretched and straight.

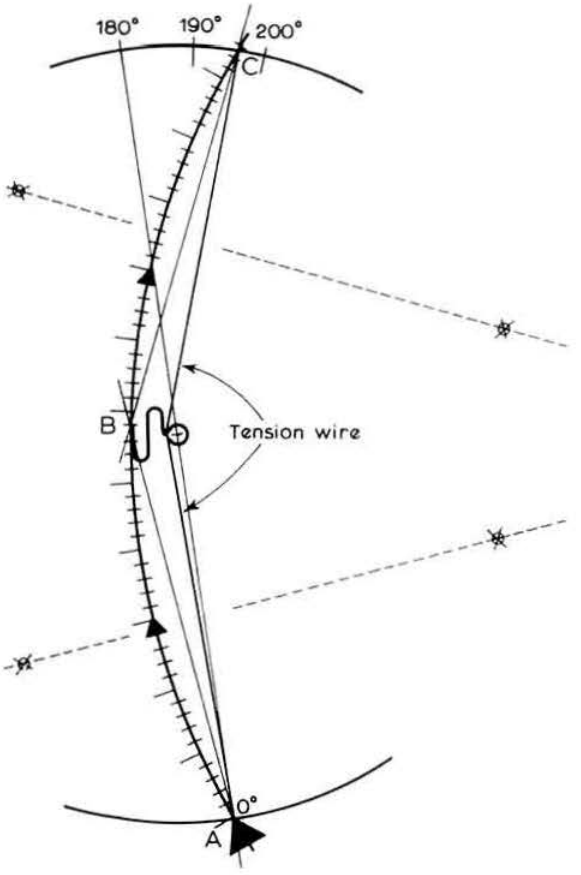


Fig 2. Details of the cursor

The main arc wire can then be carefully curved round to an arc of slightly larger radius than wanted, and then pulled into correct position by the tension wires near the ends and, when correct, soldered. This leaves the main arc wire in tension, and it will not alter in a long period of time. Check by attaching to the plotting board centre pivot—bottom end on 0°, centre at 1·16in to the left of the North Pole (on a 1in circle separation plot) and the top at 194·4°, and while locked in this position, start at the bottom exactly where it crosses the outer ring (Equator) and mark it with half the period in minutes all the way up to the top crossing. OSCAR 5 period was 115min, and so from 0° at the bottom to 194·4° at the top should be divided into 57½ equal spaces. Small 1mm strips of black plastic tape can be cut and wrapped around at each mark, and it is recommended that each 5th mark should be a contrasting colour to expedite counting. Also cut three plastic arrows, the point of the first one exactly at the point where the arc crosses the equator ring, the next on the 15min mark and the last on the 40min mark. These serve as a constant check on the direction of travel of the satellite.

Operation

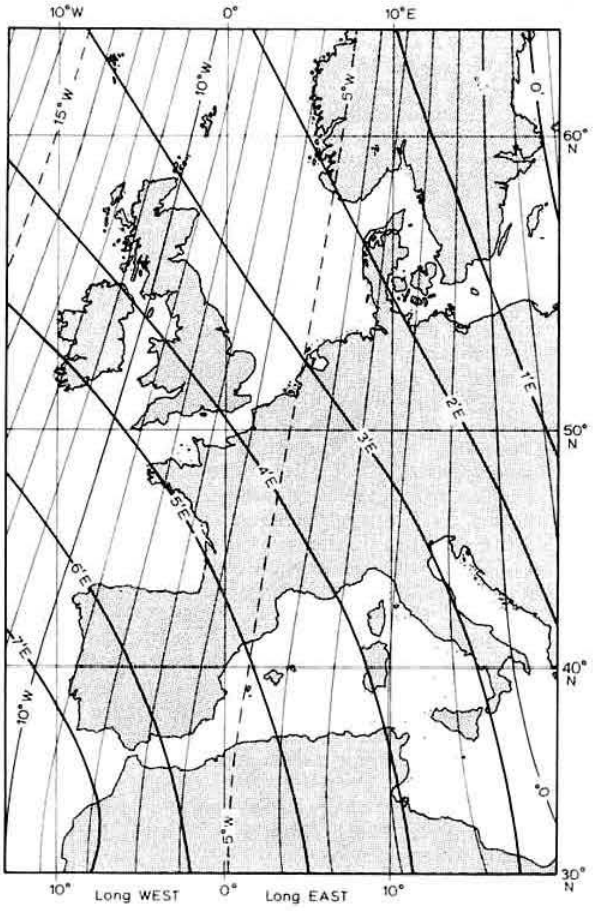
In the future, all predictions will only be given at the time (gmt) and the position (degrees west) of the south to north Equator crossing, and the relative orbit number, with the period, inclination and track separation, and with this information quite long-term accurate predictions can be made. As an example, the following figures for one 24-hour period of OSCAR 5 are listed, it merely being necessary to add the period and track separation for each consecutive orbit.

Period 115·08min Inclination 101·6° Track separation 28·77°

S-N EQUATOR CROSSING

Orbit No	GMT	Degrees W	Direction
158	0144·3	160·8	
159	0339·4	189·6	N-S
160	0534·5	218·4	
161	0729·6	247·2	
162	0924·7	275·9	E-W
163	1119·8	304·7	
164	1314·9	333·5	
165	1509·9	002·2	S-N
166	1705·0	031·0	
167	1900·1	059·8	
168	2055·2	088·6	Out of range
169	2250·3	117·4	

For calculating orbit numbers, orbit No 1 always starts at the first S-N Equator crossing, and not from the launching site. A word of warning about these continuous additions, which may save trouble and errors: TIME (gmt) is



Reproduced from BA chart No 5375 with the sanction of the Controller, HM Stationery Office and of the Hydrographer of the Navy.

Fig 3. Magnetic variation chart

The thin lines across the chart are isogonic lines (lines of equal variation) which pass through all places where the variation of the magnetic compass is the same. Note that the lines do not run to or point to the magnetic North Pole.

The magnetic variation is subject to a small movement, which for the UK is decreasing annually by approximately 3½'. This means that the compass needle is gradually year by year being attracted less from the magnetic meridian by about 1° every 17 years.

The heavy lines indicate the positions where the annual decrease in the variation is as noted on these lines—ie the line running through the Orkney Isles and Amsterdam is marked 3', this being the annual decrease.

always given in hours, minutes and decimals of a minute and POSITION as degrees and decimals of degree west of the Greenwich meridian; the period for one complete orbit is, however, always given in minutes and decimals of a minute. As the OSCAR period was 115·08min, this means 0155·08 to be added to the last gmt and not 115·08.

Set the bottom arrow of the cursor at the S-N Equator crossing bearing, and you have the path of the satellite laid out and whether it is within range of your station. If within range, count up the minutes that will elapse from the S-N crossing time until it comes within range of the compass rose; set the beam at the angle indicated by the compass rose, and minute by minute rotate the beam to follow its path until it goes out of range. After each orbit it is only necessary to rotate the cursor clockwise by the amount of the track separation to be all set up for the next one. Remember to always work from the starting arrow towards the compass ring; a N-S orbit such as No 158 at 160·8°W will be first heard some 32min after the S-N Equator crossing time, whereas No 165 at 002·2°W will be first heard only 6min after the crossing time. If a careful record of the positions of first and last heard on all orbits is kept, after a few days it will be possible to draw on the plot your exact hearing range—this may not be an exact circle owing to possible screening in some direction, or exceptionally good reception in another.

Those stations wishing to work dx should mark on the plot the exact location of major capital cities. A circle should be drawn in the compass rose that is the maximum range from your station (OSCAR 5 was 2,100 statute miles from the author's QTH) and draw a similar radius circle from the dx station wanted. As an example, a circle drawn from New York will show that there is an overlap for a short period, and so dx is possible then. A S-N Equator crossing of 022°W would be ideal, as the satellite would be in range from New York and London from 14 to 22min after the S-N Equator crossing time, with a beam heading from London starting from 270° up to 320°, and a rotation speed clockwise of approx 6°/min.

The following table for maximum communication distance via a satellite (Station 1—Satellite—Station 2) may be of use to predict ahead and make arrangements. Heights and distances are in statute miles, orbit periods in minutes.

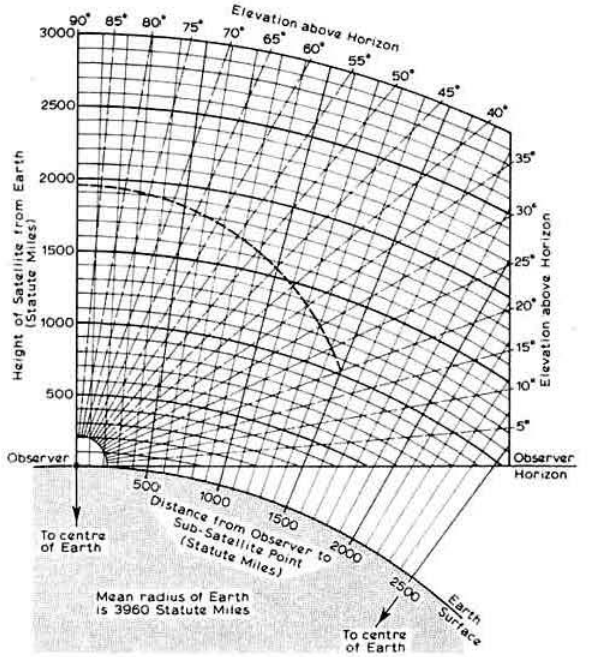


Fig 4. Satellite elevation and range chart

Satellite height	Orbit period	Max comm distance
100	87·5	1400
200	90·8	1900
300	94·2	2400
400	97·5	2750
500	100·8	3100
600	104·2	3400
700	107·5	3750
800	110·3	4100
900	114·2	4350
1000	117·5	4600

Those stations using motorized beam elevation as well as rotation can easily calculate the correct elevation angle at any point of the orbit that is within range. Having set up the cursor for the orbit required, take any point on the cursor that is within the compass ring and note the distance of this point from the centre (station point), measured by the distance rings previously described. The height of the satellite will be known from the issued predictions, and as an example, call this 1,000 statute miles and the point selected comes exactly over the 1,500 miles circle. Then from the chart Fig 4, from the 1,000-mile height figure on the left-hand scale follow the arc round until it cuts the 1,500-mile radial line up from the bottom scale; reading from this point across to the right along the dashed line shows an elevation angle of 20° read on the right-hand scale. Now by drawing an arc, centred on the observer point back up to the left-hand scale, shown as a bold dashed line, this will give the slant range (actual distance of satellite from station), which in this case is 1,950 statute miles. It is suggested that if, say, three or five positions are plotted, one being the point of nearest approach as maximum elevation, and the points of times of first and last hearings easily discerned as the satellite comes up and goes down over the horizon, maximum efficiency coverage will be obtained.

A further use of this chart is as a check on the efficiency of the station receiver, as the exact distance away at the time of first and last hearing compared with the horizon crossing will show, and as shown by the following example of the author's records of the first orbit of OSCAR 5.

Satellite height 930 statute miles

S-N Equator crossing prediction	1237gmt at 324° W	
To come in range at 2,500 miles add time to this point	8	
AOS should be	1245	Beam heading 120°
Actually first heard	1244·4 =	2,600 miles
Out of range at 2,500 miles add time to this point from S-N Equator crossing	29	
LOS should be at 2,500 miles	1306	Beam heading 340°
Actually last heard	1305 =	2,250 miles

This shows that reception is very good towards the SE but slightly poorer when beaming towards NNW, which was previously known.

The elevation angles on this orbit were:

At 2,000 miles range	8·0°
,, 1,500 ,, ,,	17·5°
,, 1,000 ,, ,,	32·0°
,, 650 ,, ,,	65·0° Nearest approach

The Intruder Watch

by C. J. THOMAS, G3PSM*

RSGB Intruder Watch organizer

THE publication in the November 1971 *Radio Communication* of the "Summary of Intruders—Region 1" which covered the first six months of 1971 resulted in an encouraging number of enquiries and an increase in the number of watchkeepers. Consequently it has been decided to publish further summaries for as long as the interest is shown.

The current summary shows an increase in the number of reported intruders. This does not necessarily mean an actual increase in intruder activity, but rather that the increase in the number of watchkeepers has enabled a more thorough coverage of the bands.

The situation existing on 40m remains static with the continued presence of Radio Cairo, Radio Peking and Radio Tirana plus the attendant Moscow jammers. On 20m there is a slight increase in numbers over the previous period, but already some of these stations have moved. On 15m the situation is also fairly static with many diplomatic stations again using this band during the period. It is anticipated that some of these stations will be found at the top end of 20m during the next period. Some concentration of effort has shown that 10m is far from flat, especially during the morning period with the skip into central and eastern USSR. As a result of this effort a large number of harmonic and parasitic emissions have been heard on the band.

As a result of direct representation by the RSGB to the administrations concerned, pledges have been made by spokesmen of the Ceylon Broadcasting Corporation and of Iran National Airlines to avoid using the frequencies of 21,445kHz and 14,005kHz, respectively.

The summary below shows the situation as it stood at the end of 1971. With your help this list could be considerably smaller by the end of 1972.

* 65 Charlton Drive, High Green, Sheffield S30 4PA.

Summary of Intruders — Region 1

1/7/71 — 31/12/71

Figure prefix to emission symbol denotes average bandwidth

Freq	Emm	Date	Calls	Country of Origin	Comments
7,010	6A3	XX71	Radio Peking	China	ABC
7,024	1F1	0771	—	USSR	Printer
		1071	—	USSR	
7,025	6A3	XX71	Radio Peking	China	BC
7,035	6A3	XX71	Radio Peking	China	ABC
7,050	6A3	XX71	Radio Cairo	Egypt	ABC
7,052	1F1	0771	—	USSR	Printer
7,058M	6A3	XX71	Radio Peking	China	ABC
7.060	1F1	1171	—	USSR	Printer
7,062M	6A3	XX71	Radio Tirana	Albania	ABC
7,064	6A3	XX71	Radio Iran	Iran	BC
7,065	6A3	0771	Radio Peking	China	
		1071			
7,075	6A3	XX71	Voice of the Arabs	Egypt	BC

Freq	Emm	Date	Calls	Country of Origin	Comments
7,080	6A3	0771 0871 0971	Radio Peking	China	BC
7,090	6A3	XX71	Radio Tirana	Albania	ABC
7,095	6A3	XX71	Radio Peking	China	ABC
14,005	3A3	1171 1271	L. Marques	Mozam-bique	Scramble speech
14,010	1F1	0971	QRA DE DBZ3	DDR	Spurious 14,410kHz ABC
14,015	1F1	0771	UWV	USSR	Printer
14,024	1F1	1271	—	USSR	Printer
14,032	2F1	0771	RBU54 DE RBI30	USSR	AB. Printer
14,064	1F1	0771 0871	UTS DE UQR3	USSR	B. Printer and morse
14,074	1F1	0771	—	USSR	B. Printer
14,075	1A1	0771	(Changed daily)	USSR	BC. Four-character calls
14,088	1F1	0971	—	USSR	Printer
14,104	1F1	0771 0871 0971	—	USSR	ABC. Four-character calls
14,136	1F1	0971	—	USSR	Printer
14,148	1A1	0771	(Changed daily)	USSR	AC. Four-character calls
14,150	1F1	0771 1171	—	USSR	Printer
14,168	1F1	0771 0871 0971	—	USSR	Printer
14,177	1A1	1171	(Changed daily)	USSR	Four-character calls
14,184	2F6	XX71	—	USSR	Printer/morse
14,191	1F1	XX71	—	USSR	Printer
14,203	1A1	0771 0871 1171	9RS68 DE 9PP	Zaire	French plain text
14,205	1A1	0771 0871	(Changed daily)	USSR	Four-character calls
14,216	1F1	0771 0971 1171	—	USSR	ABC. Printer
14,225	1F1	0771	—	USSR	ABC. Printer
14,227	1A1	1071	(Changed daily)	USSR	Four-character calls
14,235	1A1	0771 0871 1071 1171	(Changed daily)	USSR	Four-character calls
14,240	1F1	0771 1271	—	USSR	Printer
14,256	1F1	0971 1071	—	USSR	Printer
14,272	1F1	0771 0871	—	USSR	Printer
14,275	1A1	0771 0871	(Changed daily)	USSR	ABC. Four-character calls
14,312	10A3	0871	RadioMadagascar	Malagasy	
14,336	1F1	0771 0871	BZP54	China	New China Press
21,003	1A1	0971 1071	FKK4	France	—
21,005	1A1	0771	OMZ DE 3K5	Czecho-slovakia	C. Diplomatic
21,005M	1A1	0771 0871 0971 1071	HGX21 DE HGX38	Hungary	C. Diplomatic
21,020	1F1	1271	ZAY3	Albania	2f 10,510kHz
21,048	1A1	1071	AKL, GRU, G2I	—	
21,070	1A1	0770	CSF49 DE CSF30	Portugal	
21,076	1A1	0771 0871 0971 1071	BQZ61	—	

Freq	Emm	Date	Calls	Country of Origin	Comments
21,088	5A7	0971	—	—	Multiplex
21,092	1A1	1071	CXD	—	Diplomatic
21,095M	1A1	XX71	K2I	—	C. Diplomatic
21,095	1A1	1171	BVG	—	
21,098M	1A1	XX71	PZF	—	C. Diplomatic
21,100	1A1	0971 1071	RLF	—	
21,100	1A1	XX71	JDY	—	Diplomatic
21,100	1A1	XX71	MIY	—	C. Diplomatic
21,100	1A1	1071	XFI	—	Diplomatic
21,100	1A1	0771 0871	OJG	—	Diplomatic
21,100	1A1	0971	VFR	—	Diplomatic
21,105	1A1	0771 0971 1071	ZGA	—	C. Diplomatic
21,105M	1A1	XX71	HZUA, HZUK, (HZU6)	Saudi Arabia	
21,110M	1A1	0771 0971 1071	C4S	—	C. Diplomatic
21,110M	1A1	0771 1071	JOT	—	C. Diplomatic
21,110M	1A1	0771 0871 0971 1171	XDE	—	C. Diplomatic
21,123	1A1	0771	SFA, SGA, TFZ	Turkey	Diplomatic
21,125	1A1	0771 0971 1071	(Changed periodically)	USSR	BC
21,128	1F1	1171 1271	RLS DE RWV78	USSR	BC. Morse and printer
21,144	1A1	0771 0971 1071	UCAP, UHEH, UHFV, UMHK, RZL	USSR	C
21,170	1A1	1171 1271	RUZU DE ULV	USSR	BC. Morse and printer
21,181	8A7	0771	—	—	Multiplex
21,192	2F1	1271	RUF DE RKD48	USSR	Morse
21,194	1A1	XX71	J3R	Italy	BC. Diplomatic
21,200	1A1	1171	(Changed daily)	USSR	Four-character calls
21,215	1A1	0971	ARA DE RBNF	USSR	A. ICAO
21,302	1A1	0971 1171 1271	CQ DE UDB/URD	USSR	Spurious
21,305	1A1	0771	BBX22	China	
21,345	1A1	1171 1271	BIM41	China	
21,350	1A1	1171	OMZ DE 1A7	Czecho-slovakia	Diplomatic
28,152	1A1	1171	(Daily changing)	USSR	2f 14076
28,300	1F1	1271	(Daily changing)	USSR	2f 14,150
28,323	1F1	1271	—	USSR	Printer
28,350 28,460 28,480	10A3	1271	Radio Moscow	USSR	Spurious
28,520	10A3	1171 1271	Radio Moscow	USSR	4f 7,130kHz
28,600	10A3	1171 1271	Radio Moscow	USSR	Spurious
28,635	10A3	1171	Radio Moscow	USSR	Spurious
28,665	10A3	1271	Radio Moscow	USSR	Spurious
28,710	10A3	1171	Radio Moscow	USSR	Spurious
28,965	10A3	1271	Radio Moscow	USSR	Spurious

Note: Radio Regulation 218 permits the use of 14,250-14,350kHz by the fixed service within the USSR.

Comments: A — Intruder heard during first half of 1970.
B — Intruder heard during latter half of 1970.
C — Intruder heard during first half of 1971.
M — Suffix to frequency indicates mean frequency.
XX — Intruder active throughout complete six-month period covered.
HX — Intruder active intermittently throughout 24 hours.

A 9MHz crystal filter for amateur ssb

by P. J. HORWOOD, G3FRB

THE subject of this review, SEI filter type QC1246AX, was supplied by Salford Electrical Instruments Ltd, and is one of a new range likely to be of great interest to the amateur; it costs £15.80. Filters for 5·2MHz and 10·7MHz are also available and it is hoped to review other filters in this range at a later date.

Measured performance

Reference frequency 9 MHz

Passband (−6dB)	+ 1·26kHz − 1·25kHz	Total 2·51kHz
Stop-band (−60dB)	+ 1·98kHz − 2·24kHz	Total 4·22kHz

Insertion loss 3dB.

The passband is essentially monotonic and there is negligible ripple when the recommended termination impedances of 500Ω in shunt with 30pF are used.

Measurement methods

The measurement of crystal filter skirt responses is difficult even when highly-screened test jigs are used. Stray capacitances across the filter and common earth impedances can worsen the measured response by as much as 20dB.

The test equipment used for this review had a potential range of 120dB but no jig was available for this size of filter, the response levelling out at approximately −75dB. This is, however, a very acceptable level, particularly if it can be maintained when the filter is mounted in an exciter.

Measurements made with other filters in-situ in transmitters have shown that skirt responses can be seriously degraded if all efforts are not made to achieve good input/output screening and good earthing of the case.

In practice, −60dB skirts are satisfactory, providing there are no spurious responses which rise significantly above the skirt level within ±100kHz or so of the centre frequency.

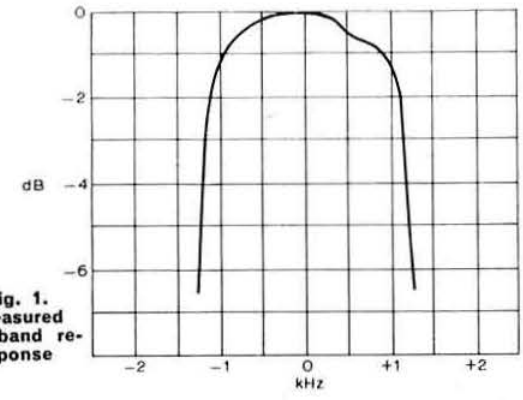


Fig. 1. Measured passband response

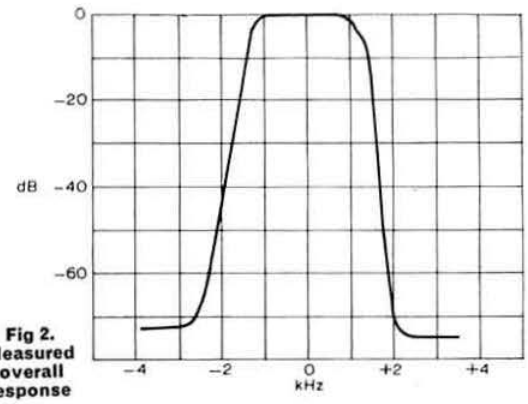


Fig 2. Measured overall response

The SEI filter was excellent in this respect; no spurious responses were found between zero frequency and 20MHz.

The filter in use

The SEI filter is symmetrical and may be used for usb or lsb working with an appropriate carrier crystal. The classic position on the response curve for the carrier frequency is 20dB down either slope. The measured frequencies for this particular sample were +1·55kHz and −1·44kHz.

For example, for usb operation the carrier frequency should be 9MHz minus 1·44kHz, 8,998·56kHz. This gives an usb passband (−6dB) of approximately 200Hz to 2,700Hz, a very satisfactory speech bandwidth.

Summary

The SEI QC1246AX is an excellent filter. Small, hermetically sealed, it has a working temperature range of −30 to +80°C. Maximum input power is 10mW. Its medium impedance would suit it to both valve and transistor circuitry. It will meet Services bump, shock and vibration specifications. The 6BA mounting studs and the terminations are on a 0·1in grid to suit printed circuit or Vero-board mounting. It measures 36·07mm by 26·67mm by 19·05mm.

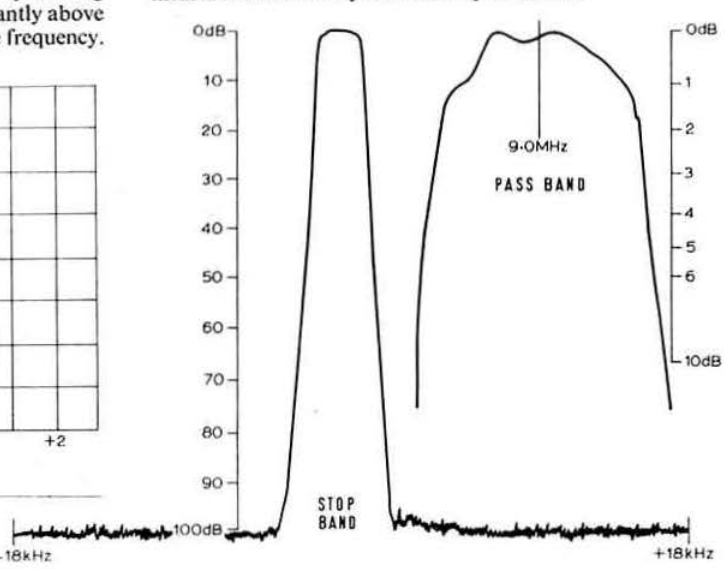


Fig 3. Manufacturer's published responses

EQUIPMENT REVIEW

by R. F. STEVENS, G2BVN

The RCS Type 501 timer/counter

UNTIL comparatively recently counters were generally found in small numbers in research laboratories and occupying considerable bench space. With the rapid developments in display devices and integrated circuits the counter has become a tool in daily use, found in great numbers, being small in size and readily portable. The availability and price of components has meant that these instruments are now within the range of equipment that one might expect to see in a modern amateur radio station. It is to be anticipated that with progress in techniques and component manufacturing, present prices will drop and more of these instruments will become available in the amateur radio price bracket.

Electronic features

The Type 501 counter/timer is a portable instrument designed for general purpose use. It has facilities for measurement of frequency, time, period, frequency ratio and random counting. The display is by eight cold cathode numicator tubes. The function in which most interest will be displayed by amateur station operators is the measurement of frequency. In this mode the instrument measures the frequency of the input applied to the BNC socket in terms of the internal clock oscillator. The accuracy of the reading is that of the clock oscillator plus/minus one count. The 1MHz crystal controlled oscillator uses an electronically controlled crystal oven with a stated stability of 2 parts in 10^8 per day after five hours from switch-on. The short term stability after 10 minutes from switch-on is 1 part in 10^6 of the final frequency.

The frequency range of the counter is 4Hz to 32MHz, the latter being a guaranteed figure. The high frequency limit of the instrument submitted for review extended to 42MHz. The maximum sensitivity is 10mV with overload protection up to ± 100V surge. Input impedance is 10kΩ in parallel with 20pF.

Mechanical features

The counter is housed in a lightweight vinyl-covered aluminium case with a combined handle and tilt bracket. Mode selection is by push buttons on the front panel, each with the function clearly marked. An input lead fitted with a 50Ω BNC plug is supplied.

The size of the instrument is largely determined by the number of numicator tubes and the dimensions of the power supply components. The printed circuit boards employed are of the glass fibre, roller tinned type, and the layout facilitates service, if this should be required. Fig 2 shows the internal layout of the equipment.

Amateur station use

The frequency measurement mode of the instrument will undoubtedly form the major function in an amateur station. The counter can be used both during normal station operating and also for servicing and test purposes. For frequency measurement during transmission periods it is only necessary to couple a very small amount of rf into the counter and this

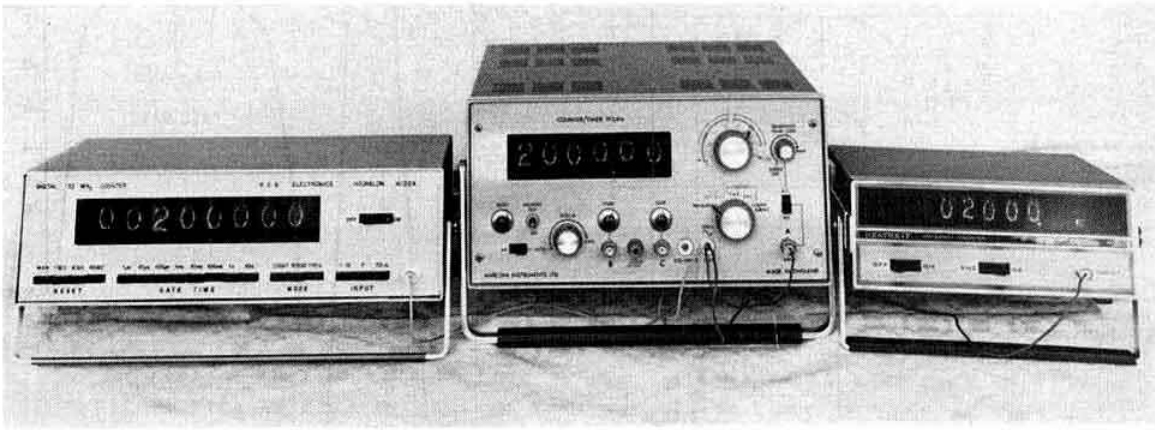


Fig 1. The RCS Type 501 counter/timer (left) shown with the Marconi Instruments counter/timer Type TF2414 (centre) and the Heathkit counter Type IB101. The frequency being measured is 2MHz

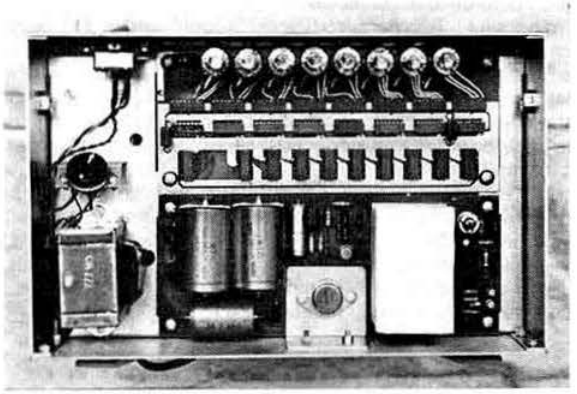


Fig 2. Internal top chassis view of the counter. The stabilized power supply components are shown on the right-hand side and at the rear. The eight numicator tubes are parallel to the front panel with numerous ICs directly behind. At the back of the chassis the crystal oven is encased in heat insulant material

can readily be accomplished by a few picofarads at a convenient take-off point. In most station layouts this will be possible at the aerial matching unit.

Frequency measurement during reception periods unfortunately presents additional complications. In the transmit mode of the station equipment the oscillators in the transmitter are mixed continuously to produce the output frequency which can be read directly on the counter. In order to measure the incoming frequency to which the receiver is tuned it is necessary to couple three signals from the receiver to the counter. These are the from (i) the hf oscillator, (ii) the vfo, and (iii) the bfo. The methods of achieving this are beyond the scope of this review and the references [1] and [2] provide further information.

The RCS Type 501 counter/timer

Frequency range: 4Hz to 32MHz.

Dimensions: 12in wide, 3½in high, 8in deep.

Weight: 6lbs.

Price: £160.

Obtainable from: RCS Electronics Ltd, National Works, Bath Road, Hounslow, Middlesex Tel: 01-572 0933

Final comments

The counter comes with an instruction manual that provides full information on the methods of use for the various modes but gives no circuitry or servicing assistance. No specific guarantee is given with the instrument but the makers state that any faults occurring during the normal life of the equipment and attributable to faulty components or manufacture will be rectified without charge. If any work is carried out by other than the manufacturer then all repairs will be chargeable.

The RCS Type 501 counter/timer will make a worthwhile addition to any amateur station and reflects the latest trends in the art of frequency measurement.

References

[1] "A frequency counter for the amateur station." K. Macleish, W1EO. *QST* October 1970.

[2] "The Rec Counter." K. Macleish, W7TX, H. O. Pattison and R. C. Hejhall, K7QWR. *QST* May 1971.

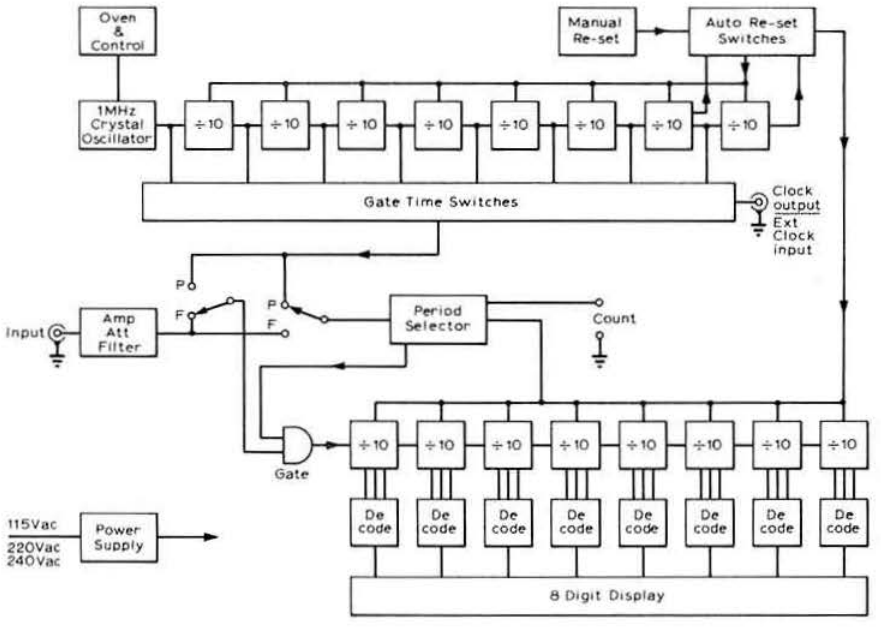


Fig 3. Block diagram of the counter

Printed circuits for the amateur

by F. W. HENSHAW, G8BBO *

FROM time to time various articles have appeared in radio journals outlining ways to produce that "one off" printed circuit for the project in hand, and it is the object of this article to review some of the methods open to the constructor without having to use expensive equipment.

Among the many methods available the author has selected a few which can be used on the bathroom shelf with success. These are:

(1) Painting the circuit pattern direct onto the laminate.
(2) Sticking tape direct onto the laminate.
(3) Use of dry transfer symbols.
(4) Using adhesive backed copper strips and ready etched patterns.
(5) Photo mechanical system.

To start it is necessary to transform the theoretical circuit into the required layout. This may be done by normal drawing methods until a suitable configuration is reached. A method favoured by the author is to use cardboard models of the components shuffled around until a practical layout is reached. Then overlay a piece of tracing paper and draw in the conductor lines. This is subsequently used to transfer the pattern onto the laminate.

Enlarging slightly on the various methods, the salient points may be considered for subsequent evaluation as to which is best for the particular project.

(1) Painting direct onto the laminate
The pattern can be transferred to the laminate by using carbon paper and the master drawing of the layout. Most types of paints or varnishes are suitable for blocking in the parts of the copper which is to remain as the circuit. Motor car touch-in paint is very useful due to its quick drying properties, and it can subsequently be removed with acetone or the relevant thinners.

(2) Sticking tape direct onto laminate
Tapes and roundels cut from very thin acetate film with adhesive backing are available from various sources. Again, by using the master drawing for positioning, use the tapes and shapes to mask off the areas which are to remain as the circuit. Care must be taken to be sure that any overlaps are thoroughly stuck down so that in the subsequent etching operation, liquid will not creep under the edges. Tapes cut from paper are not suitable due to moisture absorption.

(3) Dry transfer method
Sheets of dry transfer symbols are available from most drawing office suppliers, and the method of application is well known. This system is basically the same as the tape method.

(4) Using adhesive backed copper strip or patterns
This system is different in that unclad laminate is used as the base material. The pattern is stuck directly onto it and the joints soldered, thereby giving a circuit without any etching process.

* 26 Randals Hill, Stevenage, Herts.

(5) Photo mechanical method
To operate this system, certain extra equipment is necessary, and would probably only be used if a number of identical circuits were required. Firstly, the master drawing of the layout must be converted to a photographic negative of the correct size. Normal copper-clad laminate is coated with a light-sensitive emulsion which is now available in aerosol cans, and the negative is placed and held in intimate contact with the coated surface and subjected to ultra violet light (photo-flood lamps can be used with somewhat lesser efficiency). After exposure, the coated laminate is developed with the appropriate solution, also available in aerosol cans. This will produce an acid resistant pattern on the laminate consistent with the required configuration.

Etching

Having produced the acid resistant stencil by whichever method is most suitable, it is then necessary to get rid of the unwanted copper; this does not, of course, apply to Method 4. There are a number of etchants used commercially, but the author suggests, firstly, ferric chloride or, secondly, ammonium persulphate.

Ferric chloride crystals are readily available from larger chemists and can be made up simply by adding 6oz of ferric chloride to half a pint of water and stirring until dissolved.

Ammonium persulphate is a little more trouble, in that it is necessary to use a catalyst (eg mercuric chloride) and it does not store well; also, it needs to be operated at elevated temperatures. Pour sufficient solution into a plastic dish and place the prepared laminate pattern uppermost in the dish. With constant agitation, etching should be complete in 15-20 min; temperature will control this to a certain extent. When etching is complete, the stencil may be removed with the appropriate solvent, or the tape removed, and the circuit cleaned up with any domestic scouring powder. Dry thoroughly, drill the holes and cut to size.

At this point it is appropriate to draw attention to safety measures. Any etching solution is potentially hazardous. IT IS A CORROSIVE. Wear rubber gloves and old clothes. In the event of splashing the skin, wash very thoroughly with plenty of soap and water.

Summary

It will be seen that Method 1 gives a very cheap board, and the track definition will be as good as your capabilities as an artist.

Method 2 will give a better definition but is, of course, more expensive due to the tapes being more costly than a tin of paint.

Method 3 will produce a reasonable definition and is not too expensive.

Method 4 produces a perfect track definition, but will be somewhat more expensive.

Method 5 produces a commercial standard board, but would probably only be used if a number of identical boards are required.

* * *

The author will be pleased to help in the case of any difficulties (sae, please).

A switched "Z"-match aerial unit

by R. A. Butterworth, G8BI*

IT could be said without much fear of argument that the "aerial match", "Z"-match, call it what you will, together with an swr bridge, has done a great deal to help radio amateurs to get a more efficient transfer of rf from their transmitters into the odd bits of wire they throw up and call aerials. The extra tuned circuit is, of course, a fringe benefit to help to keep those nasty harmonics down.

The following refers to a commercially built unit but there may be something of interest for those who have built their own. As supplied, it is a one-aerial-at-a-time unit. It has to be "un-parked" from wherever it is stored, and feeders juggled with, and it becomes tedious if one only wants to check the activity or compare one aerial against another. By the addition of a low-loss switch and two coaxial sockets, these snags can be averted and the following advantages obtained:

(*a*) both aerials are permanently connected;
(*b*) any type of feeder or long wire can be used, and
(*c*) change-over from one to the other aerial is just a click of a switch.

Modification of the E–Z-match

The following components are required:
one low-capacitance low-loss ceramic, four-pole, three-way switch;
four ceramic miniature stand-off insulators;
a length of $\frac{1}{4}$in diameter rod;
a small universal coupler;
two insulated Belling coaxial sockets, and
2ft of 14 swg tinned copper wire.

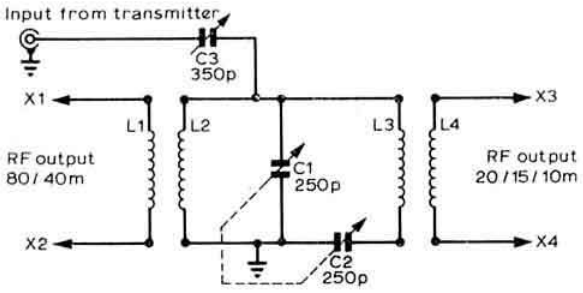
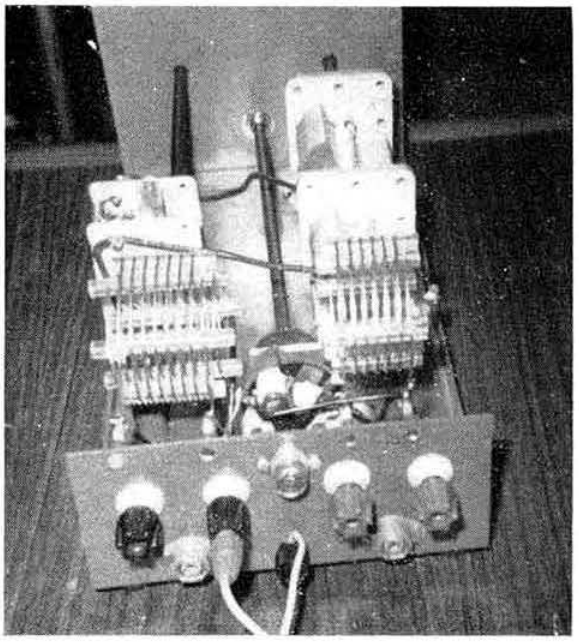


Fig 1. Basic circuit of "Z"-match unit



Rear view of unit showing back pane arrangement

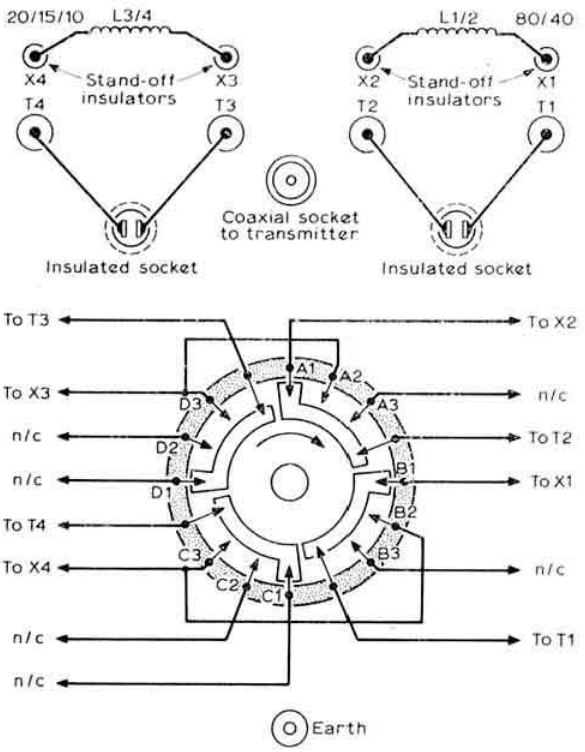


Fig 2. Back panel layout, above, and switch wafer connections

* 20 Ravenfield Road, Welwyn Garden City, Herts.

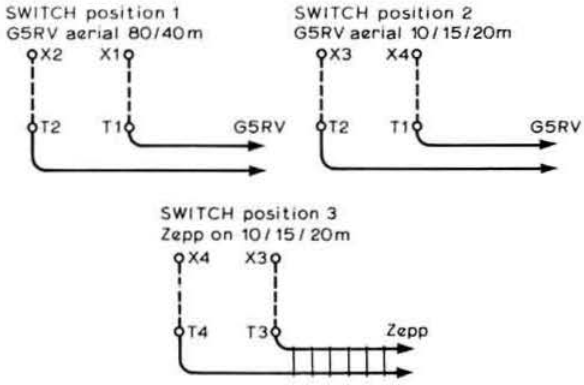


Fig 3. Circuit connections with each switch position

It is suggested that the following procedure is used:

(1) Mount the ceramic stand-offs on the back panel, adjacent to the two coil assemblies, so that the coils can be mounted on them instead of on the screw terminals.

(2) Drill the back panel with clearance holes so that the two insulated type coaxial sockets can be mounted below and central to each pair of screw terminals.

(3) Carefully unsolder the coil assemblies from the screw terminals (L1 and L4) and re-connect to the stand-offs so that the original position of the coils is maintained.

(4) Make up a simple "L" bracket of $\frac{1}{8}$in aluminium to mount the switch as near as possible to the back panel and central to the coils so as to get the shortest possible leads between coils, switch and stand-offs. Use the "L" bracket as a template to mark out the position of the hole in the front panel before mounting the switch assembly on the chassis.

(5) Reference to Fig 2 should make the wiring-up clear. The two coaxial sockets are, of course, wired in parallel to the screw-type terminals which, incidentally, are combined 4mm sockets. Good solder joints are essential, so use a medium soldering iron.

(6) The final operation is the fitting of the extension shaft, flexible coupler and front panel knob. Because of the length of the extension shaft it is essential to fit a $\frac{1}{4}$in panel bush to the front panel for good support.

The switch has three positions marked HIGH, LOW and X which with the two aerials used by the author gives:

"L": 80 and 40 on the 5RV.

"H": 20, 15 and 10 on the 5RV.

"X": 20, 15 and 10 on a double extended Zepp.

Obviously any type of aerial can be used and selected at the simple turn of the switch. The addition of the coaxial sockets simplifies connection of the cable by means of the usual plug instead of inefficient splayed-out ends. The author's unit has been in use now for two years and such tests that have been made show that there is little or no insertion loss.

A scaffold tilt-over

by A. M. FRASER, GM3AXX*

WITH the almost universal acceptance of the commercial 180W transceiver, one of the few constructional pleasures left to the average amateur lies in the field of aerials. At the author's previous location, a 35ft telegraph pole, plus a 12ft dural extension, supported the rotary beam and the end of a long-wire aerial. Though outside aerials were forbidden, the author got away with it—no doubt due to the presence of some 20 similar poles scattered about the immediate vicinity.

However, at his new location in a small village the telephone lines are in underground ducts, so that a lone telegraph pole would doubtless arouse considerable curiosity. It was essential to design and build a slim inconspicuous mast which could be raised or lowered by one person in approximately 30 seconds with little effort. Furthermore, for the first four or five months, the author planned to do just that at each operating period, thus bewildering and baffling any village official who might stray near "Chez 3AXX".

Photo 1. The base-section assembly

* 58 Rigghead, Stewarton, Ayrshire

Photo 2. The base-section embedded in concrete. Note the pivot and locking clamps in position

For £10 and a few pence a scaffolding company some 16 miles away delivered the following items:

(*a*) two 6ft and two 18in lengths of 2in galvanized steel scaffold pole;

(*b*) one 20ft length of 2in thick-wall alloy tube;

(*c*) six right-angle clamps.

The 6ft and 18in sections of pole were assembled, using four of the clamps. This assembly was taken down to the blacksmith, who obligingly welded on a rectangular base-plate of metal scrap. The lower half of the structure was then given a couple of coats of paint, Photo 1.

Next, a hole some 2ft deep was dug at the appointed spot, and the assembly placed therein, Photo 2. Once it had been established that the 6ft base sections were truly vertical, the hole was filled with a mixture of concrete and rocks, and left to set for three or four days.

Finally, the centre part of the top horizontal section was given a smear of grease, and the two remaining clamps fastened centrally on the two horizontal sections. The top clamp was only tightened slightly, as it acts as the pivot, while the lower clamp locks the mast in the vertical position.

To finish the job, two laboratory corks soaked in petroleum jelly were placed in the top of the vertical base sections to prevent them filling up with water during inclement weather, and the nut on the locking clamp was converted into a butterfly nut—this saves the necessity of a spanner each time the mast is raised or lowered.

One word of warning! If you build the tilt-over to the dimensions given, do not fit a 30 or 40ft vertical section. Because the pivot is barely 4ft from the base of the mast, you will find that not only will it take a superhuman effort to raise the mast, but unless you keep a very tight grip of things when lowering, you will be projected violently up into the air.

At present, the mast holds up the apex of a shortened inverted-V aerial. Due to limitations of space, each arm of the V is 46ft long, and the remaining 20ft is made up of 20ft of open-wire feeder. As the foot of the open-wire feeder presents a low impedance on 3·5MHz, it is attached to co-axial cable which runs from the foot of the mast to the transmitter. Originally, the feeder (open-wire) was made about 22ft long and trimmed, inch by inch, until the swr was low over the band. No doubt a balun between the foot of the open-wire feeder and the coaxial cable would improve the symmetry of the radiation pattern.

To operate the aerial on 7, 14, 21 and 28MHz, a parallel-tuned circuit tuner would be required between the bottom of the open-wire feeder and the coaxial cable, as the lower end of the open-wire feeder presents a high impedance at these frequencies, and this could be accommodated in a plastic box at the foot of the mast.

The mast has been in use for several months, and like most simple devices, has proved entirely satisfactory.

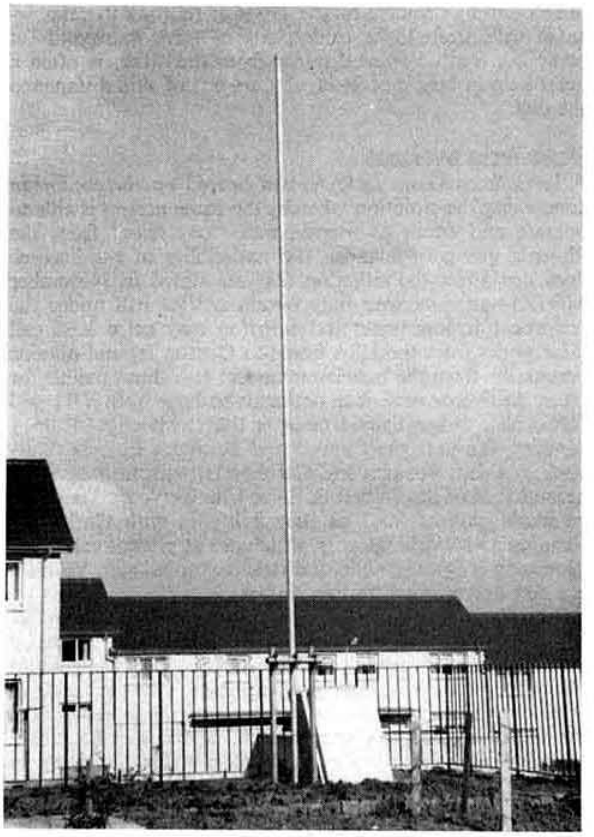


Photo 3. The scaffold tilt-over completed

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

STRONG views are held by many concerning the increasingly common practice of making lists of callers who wish to work rare (and even not so rare) dx stations. Having recently listened to the results of such a procedure when XU1AA appeared on 14MHz your scribe decided that there must be better ways of spending an evening! Comparatively few stations actually made contact and blood pressures and tempers rose to dangerous levels. The reason why this particular session of activity from Phnom Penh was being conducted in this manner is not known, but it *does* seem that there is some justification for the making of lists under certain circumstances which are as follows: (1) the dx operator has language difficulties, (2) his equipment compels him to operate in transceive, (3) he is inexperienced and unable to deal with pile-ups, and (4) where he has a weak signal, local signals are strong, and a free-for-all is therefore out of the question (this applies especially to the dx segment of 80m). Chaos can sometimes be averted if the list of would-be callers is made on a frequency some distance removed from that of the dx and by firmness by the latter in refusing to acknowledge calls from those calling out of turn. A second list compiler, located some distance from the other, is often a great help in hearing callers who are out of skip distance to the first.

News from overseas

A letter from Dan, VR1AA, has cleared up the confusion concerning the situation whereby the same person is able to operate and count as two separate "countries" from the Phoenix group of islands. The nationality of the licensee does not affect the situation (as was stated in November *MOTA*)—an American may obtain a VR1 call under the reciprocal arrangements and a Briton may get a KB6 call if he works from the USA base (on Canton Is) and obtains permission from the base commander! It is thus possible for either British or American nationals to have both VR1 and KB6 calls. Other Pacific news is that with effect from 1 January this year the Central and Southern Line Is (Starbuck, Malden, Vostock and Caroline Is, with their outliers) became part of the Gilbert & Ellice Island colony. They will be made part of VR3 as they will join with Christmas, Fanning and Washington Is, which are at present called the Line Islands District under a district commissioner. VR1AD is a new operator on Tarawa, Gilbert Is.

Ron Smith, VP8LK/G3SVW, left Adelaide Is on 27 February for the UK and his place has been taken by VP8MU (who has no G call). Ron's KW2000B has gone to VP8ME on S Orkney, but he was hoping to visit the Falkland Is on the way home and may have been on the air from there for three weeks or so during March. G3NOM, who kindly provided this news, wishes to apologize for the delay in replying to VP8LK and VP8LE QSLs which has been due to lack of receipt of log information due to conditions and work pressure. VP8LK will be back in the UK on 15 May and all outstanding cards will be despatched soon afterwards.

DX news

Pandora's Box DX Net meets daily on 14,277kHz at about 0400 and sometimes moves to 14,300kHz at 0600. KH6HIF (or another KH6) acts as net controller and this assembly often contains many stations from the rarer Pacific islands (KB6, KJ6, VR4, YJ8, 5W1 etc). European stations are advised to beam their signals over the *south* pole.

FR7ZU should be on Europa Is at the present time using the callsign FR7ZU/E and loading his FTDX500 with dipoles. QSLs go via F9MS. There is a second station on Amsterdam Is—this is FB8ZA (F6BCN) who was also FY7AC, and he has a Swan 350 transceiver and 14MHz doublet aerial.

There seem to be many changes among the operators on the Pacific islands, with VR1AB, ZK2AF and 5W1AR known to have closed down. VR1AC will remain active until September, and ZK1MA should have a better signal soon as a five-band transmitter with ac power supply is en route to him to replace his HW32. A "ZM7AH" has been heard and worked from the USA but seems to be of doubtful authenticity. ZL4NH, who acts as QSL manager for VR4BS, VR4DI and YJ8DC, has a regular schedule with them on 14,270–14,280kHz at 0800 on Sundays and contacts are possible after the logs have been passed over.

JT0AE is very active on cw and hopes to have ssb equipment in the near future. The operator is OK1IAI and he will be in Ulan Bator for three years. BV2AB, who has been

Minekazu Sugiyama, JH1LKH, a very active 160m dxer since 1968 has worked W7DL/7, VK, VS6, KH6, VK9GN, CR9 etc and now has a total of nine countries on the band using 10W input. (*Photo/News via W1BB*)

* 10 Knightlow Road, Birmingham B17 8QB.

worked on 14MHz ssb, was formerly TJ1AZ and is operating from the USA Embassy on Taiwan.

5X5NA is sending out special QSL cards to those who contact him on five bands—at the time of writing, G3KWK was believed to be the only UK station to have applied.

AC5TY is now using a more correct callsign—A51TY, the ITU prefix allocation being A5. Yonten has a two-element fixed beam which is said to be pointing south.

Bob White, W1CW, of ARRL DXCC, has confirmed the fact that cards from VE7IR/XU are now being accepted for DXCC credit. Those awaiting QSLs from XU1AA should be receiving them soon, delay in sending them out having been due to printing problems. VE7IR says that he is not personally attempting to get on the air from Burma, but that there are several Burmese nationals who are trying to persuade their authorities to relax the ban on amateur radio.

The English School Radio Club in Nicosia (5B4ES) has been given a six-months licence and has been told that there is a good chance that this will be renewed.

More strange USA prefixes have been listed—WS3VOA was a special callsign celebrating the 30th anniversary of the VOA, and WJ4AZF will be used between 25 and 30 April from the Norfolk (Va) Azalea Festival, by the Virginia Century Club.

Scott's QSL Services (WA5HUR) is holding applications for FM7WU QSLs and sending out notes saying that no logs have been received for nearly two years.

Top Band news

G2JL reports that the "VK3ARS" he worked proved to be a pirate, but he has received QSLs from VK3CZ, VK6HD and VK6NK. The last named says that he has worked GM3WDF GM3YCB, G3RPB, OK1ATP, HB9NL, as well as 2JL and some others. This year was apparently not as good in VK6, and 6NK hopes for some GW, GI, GC and GD activity next season; he uses a home-built receiver and the transmitter feeds a 60ft top-loaded vertical aerial.

W2BP has received licences for the French territories he will be visiting in April and also the call VP2MAD. He is going to Grenada instead of PJ7 and the expedition is now scheduled to start on 10 April (see March *MOTA*).

Dxpeditions

W9IGW, K9KNW and K5QHS hope to be on San Felix Is (CE0X) by 8 April and to stay there for four days during which time they will operate on all bands 3·5 to 28MHz on cw and ssb. Their callsign will be W9IGW/CE0X, and QSLs go via K3RLY.

Six Atlanta, Ga, amateurs plan to operate from Navassa Is using the callsign KC4DX, commencing at 2300 on 12 May. They intend to use the following frequencies: 3,530, 7,030, 14,030, 21,030 and 28,505kHz (cw), and 3,905, 7,255, 14,280, 21,355 and 28,605kHz (ssb). Activity will be continuous until 1300 on 15 May, and they have announced that they will try to work stations on their own frequencies as much as possible! QSLs go to W4GKF or to the address in *QTH Corner* (please enclose sae and two IRCs).

VK5XK will be on Norfolk Is (VK9) between 4 and 22 April and will have a small cw transmitter with him. His callsign will be VK5XK/VK9.

K3RLY says that there is a possibility that there may be some activity from Fanning Is (VR3) for about one week during May.

Martin Wills, G3ZZS, runs this neat set-up on the hf and vhf bands

The Mellish Reef expedition by KH6GLU and VK3JW is now scheduled to take place in late May or early June, and is expected to last for six days. A list of frequencies given in *DX News Sheet* is as follows: 3,515, 7,015, 14,015, 21,015, and 28,015kHz on cw; and 3,650, 7,090, 14,190, 21,300 and 28,600kHz on ssb. Calling frequencies will be announced and it is intended to listen for transceiver callers for a period on every hour. This trip is heavily dependent on contributions received by the end of February, and is expected to cost about £2,000.

The 50th Anniversary of the USSR

Stations using special callsigns including the figures 50 have been on the air since 23 February and will continue to be active until 7 June. Those in the series UA50A–UA50E, UB50A–UB50E, UC50A–UC50E, UF50A–UF50E, UI50A–UI50E, and UL50A–UL50E have been on before 5 April and those still to come are as follows: 5 to 12 April, UD50A–UD50E; 12 to 19 April, UP50A–UP50E; 19 to 26 April, UO50A–UO50E; 26 April to 3 May, UQ50A–UQ50E; 3 to 10 May, UM50A–UM50E; 10 to 17 May, UJ50A–UJ50E; 17 to 24 May, UG50A–UG50E; 24 to 31 May, UH50A–UH50E, and 31 May to 7 June, UR50A–UR50E. It is understood that special awards are to be issued in conjunction with these stations and it is hoped to publish details next month.

"QSL Managers' Directory"

The 1972 76-page edition of this most useful publication by W6GSV is now available from Geoff Watts, 62 Belmore Rd, Norwich, NOR 72 T; price £1.50. This includes the supply of quarterly supplements. The directory lists QSL managers for 3,500 stations and gives their full QTHs.

The Exeter contest group—G3WYX

Readers will have noted the fact that this group have achieved the unusual distinction (for a UK station) of being top multi-operator single-transmitter entrants in the

The station of G3WYX, the Exeter Amateur Radio Contest Group, with G3RUV at the operating position (see text)

1971 CQ WPX SSB contest. The group consists of G3s HTA, RUV, RUX and TJW, who have joint ownership of a 22ft caravan fully equipped with radio gear and all mod cons. This is located on a farm 16 miles from Exeter and towed to a high pitch for contest weekends. One item of equipment is a device which shows a red light if an operator has not transmitted for 60s! Their 80ft telescopic mast was designed and made by G3TJW.

Contests

The PACC Contest

1200 29 April to 1800 30 April.

All bands 1·8 to 28MHz. Phone and cw—but cross-mode/cross-band QSOs not allowed. Each QSO with the Netherlands counts three points—two for receiving the control number and one more for receiving the "R" on the transmitted number. Each station may be worked only once per band either on phone or cw. The multiplier is the number of provinces per band worked (= 88 maximum). Stations exchange RS/T plus QSO number (starting from 001), and PA stations will indicate their province. Logs should show: date and time, station worked, province, if multiplier, number transmitted, number received and points. Post before 30 June to Mr L.v.d. Nadort, PA0LOU, Contest Manager, Bospolderstraat 15, Nieuwerkerk a/d IJsel, Netherlands, and enclose a signed statement that local amateur radio regulations have been observed. Listeners may enter and log: date and time, PA/PI/PE station heard, code group given by that station, band, station being worked, and points (one per PA/PI/PE station heard). UK entrants in the 1971 event were **GC2LU** (1,147 points) and **G4ACQ** (858 points).

Overlooking Coot Pond in the historic parish of St George, Bermuda, is the new 300-room Holiday Inn, where the winners of the 1972 Bermuda Contest will stay

In the **1971 Welsh 80m Contest**, morning section winners were **G3OIB, G3WAI** and **GW4AMV** (receiving section, **A6148**), and evening section leaders **G3VLX, G3ZZJ** and **GW3MZY** (receiving section, **A. Hall**). The Sully & District Short Wave Club hope to repeat the event this year and details will be given later.

The Helvetia XXII Contest

1500 15 April to 1700 16 April.

All bands 1·8 to 28MHz. The same station may be worked once on each band for QSO and multiplier credit. Stations exchange RS/T and QSO number (starting from 001) and Swiss stations give two letters which indicate their canton. Each QSO counts three points and the multiplier is the sum of cantons worked on each band (a possible 22). Mail logs before 16 May to: Al F. Egli, HB9AAA, USKA Traffic Mgr, Box 17, 2500 Bienne 4, Switzerland.

Full details of UK scores in the **1971 CQ WW WPX SSB Contest** have been received and are as follows:

G3WJN	All band	361,103 points
GC3YIZ	,, ,,	130,937 ,,
G3YBH	,, ,,	105,523 ,,
G2AJB	,, ,,	55,937 ,,
G3WPO/A	28MHz	74,600 ,,
G3KWK	,,	35,244 ,,
G3YWI	21MHz	62,216 ,,
G3FXB	14MHz	627,705 ,,
G3NSY	,,	52,200 ,,
G3MWZ	,,	6,960 ,,

In the multi-operator, single transmitter category were **G3WYX** (2,120,885 points), G5YC (1,096,305), G3FVA 463,980), G3ZBI (90,744) and G3ZEN (52,282 points). Summary sheets for the 1972 contest are available from G3FKM (sae, please) but no log forms have been received to date.

Awards

The DDFM Award

The details of this award published in January *MOTA* were copied from an out-of-date source and the requirements were made rather less exacting as from March 1969. The award may now be obtained by producing confirmation of contacting at least 20 departments on any single band, and stickers are issued for each additional 10 confirmed. An "excellence" sticker is given for all 95 departments worked. Stickers for the old DDFM are still available.

The NRB Award

Issued by the Central Radio Club of Bulgaria on receipt of a list and QSL cards obtained as a result of contacts with five LZ1 and five LZ2 stations on 3·5MHz and the same number on 7MHz (20 in all). Applicants outside Europe may count QSOs on any bands. Contacts must have been since 1 January 1965. Send the QSLs, list, and eight IRCs to: Central Radio Club, PO Box 830, Sofia, Bulgaria.

QTH Corner

W9IGW/CE0	via K3RLY (see KS4BH).
FB8ZA	via F6BFA, Marcel Blaise, 61 Rue Sully, 78 Rosny-sur-Seine, France.
FP8FU	Box 248, St Pierre et Miquelon
FR7ZU/E	via F9MS, C. Ronsiaux, 63 Rue Voltaire, 92 Suresnes, France.
WA6FSC/HC8	via VE6AKV, D. McKeon, 7612 23rd St SE, Calgary, Alberta, Canada.
JD1ACF	JA1OAF, A. Suzuki, 2-19-21 Takaban, Meguro, Tokyo, Japan.
JT0AE	Z. Vratnik, J. Fucika 596/23, Stod, Czechoslovakia.
JY8JK	via G3LQP, 56 Combe Rd, Tilehurst, Reading, Berks.
KC4DX	PO Box 11555, Atlanta, Ga, 30305, USA.
KJ6CW	USCG Loran Stn, Johnston Atoll, APO San Francisco, Calif, 96395, USA.
KS4BH	via K3RLY, PO Box 125, Simpsonville, Md, 21159, USA.
TI9C	via TI2CAP, C. A. Paez, c/o PO Box 2412, San Jose, Costa Rica.
TT8AC	BP 438, Ft Lamy, Tchad.
VK5XK/VK9	A. Hewitt, 31 Ivey St. Ottoway, SA 5013, Australia.
VK9JW/M	J. W. Martin, PO Box 239, Bairnsdale, Vic, 3875, Australia.
VP2MA	via VE3BZY, R.E.Hobson, RR1, Sharon, Ont, Canada.
VP2ME	via WA5FWC, 2013 Melissa St, Arlington, Texas, 76010, USA.
VQ9DM, VQ9NEW	via Box 234, Mahe, Seychelles Is.
YJ8BD	Box 26, Vila, New Hebrides.
YK1OK	Jena Bubenicek, PO Box 35, Damascus, Syria.
ZK1MA	via W6KNH, 42 Donald Drive, Orinda, Calif, 96563, USA.
LA8YB/4W	via LA3BI, Benediktsvei 17, 1347 Hosle, Norway.
5W1AM	via W7YBX, R.Linkous, 563247thAv. SW, Seattle, Wash, 98116, USA
9Y4AET	via G4AET, J. H. Stewart, 29 Ashurst Drive, Goring by Sea, Sussex.

RSGB QSL Bureau, Bromley, Kent, BR2 7NH.

The DPF Award

January *MOTA* also misquoted the rules for this—only 16 of the 17 French provinces need have been worked.

The Tulipland Award

For confirmed QSOs with stations within a 40km radius of Spalding (Lincs) since 1 January 1970, 100 "points" are required for the basic award and stickers are issued for further 20 point increments. QSOs on the hf bands (1·8 to 28MHz) count 10, and on vhf 20 points (30 to stations outside UK). Contacts during May count double. Send certified list of QSLs, plus 25p, to: Den Hoult, G4OO, Chespool House, Gosberton Risegate, Nr Spalding, Lincs.

The White Rose Award

The White Rose Radio Society (G3XEP) wishes readers to know that this award is still being issued. It is in three classes for contacts with Yorkshire stations: Class 3—(UK) 10, (Europe) 5, and (DX) 3; Class 2—20, 10 and 4; and Class 1—30, 15 and 5 contacts respectively. Applicants in Yorkshire need five additional contacts. Send log data to: S. Bottomley, G3YFP, 90 Oatland Court, Leeds, LS7 1SE, plus 25p or equivalent. Listeners may also apply.

The CN8 Award

Communications addressed to BP 2060, Casablanca, concerning this award have been returned to sender.

The Alaskan DX Club Award

No reply is received to letters addressed to Anchorage RC at PO Box 211, Anchorage, and readers are advised not to send QSLs.

Odds and ends

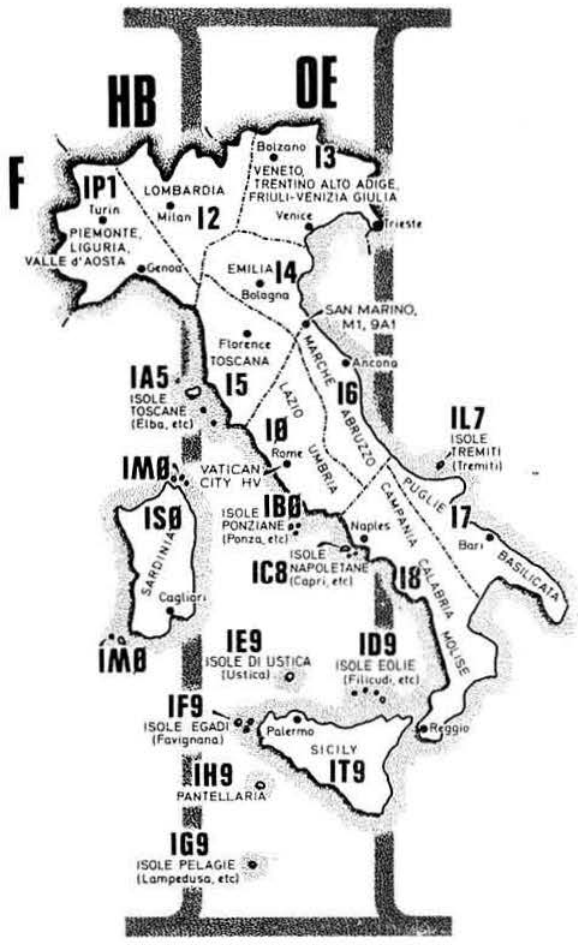
G4AFX reports that his callsign is being repeatedly pirated. He says that he never operates /A or /P, does not use 3·5 or 7MHz ,and in fact uses 14MHz exclusively.

G8KB regrets that he is unable to QSL contacts with TA3OZ (for whom he assumed the duties of QSL manager for Europe from 2 August 1970) except for the short period between this date and 2 October 1970, and excluding contest contacts which Erdy undertook to QSL himself. No other logs have been received.

Jorge Branco, very active a few years ago as CR6GO, is now living in Paris. Although he has the callsign F0GO, Jorge has no equipment at present and only gets on the air occasionally from friends' stations.

G3ZZI has had his callsign pirated as "G3ZZI/MM"—especially around the end of May 1971. G3ZMU, who is only active on cw and ssb, is being pirated on 80m a.m., and G3ZZD has a "double" on 14MHz ssb. G2HKU is receiving many cards made out to G3HKU, which shows how careless many stations are in logging callsigns!

Morgan Godwin, W4WFL/1, of ARRL will be in Europe between 31 March and 23 April and has already been given the callsigns C31EF, F0AEE/FC, HB9XJA, HB0XJA, PA9RA, W4WFL/DL and W4WFL/LX, but calls for use in the UK, Austria and Belgium have not been received at time of writing. QSLs for all these activities should be sent only to BM/W4WFL, London WC1.



Italian call areas

Band reports

The past month has seen a quite dramatic improvement in conditions on 28MHz where signals from the western USA and Canada have been much in evidence on a number of afternoons. The spring openings via the North Pole path to the Pacific in the mornings on 14MHz seem to have started earlier than usual, although it is still worthwhile rotating a beam at this time of the day to see on which path signals are arriving as they sometimes arrive from the south. On the whole the hf bands seem to be better than at this time last year, while the lf part of the spectrum shows a considerable fall off.

Many thanks to the following for information supplied in compiling this part of *MOTA*: G2BJY, G3AAE, GC3GPL, G3KYF, G3UKH, G3UYM, G3YHB, G3ZZD, G5JL, G6GH, BRS2098, BRS17567, BRS25429, BRS30231, BRS31301 and A7056.

Callsigns listed in italics were those of stations on cw, others were on ssb.

3·5MHz. 0100 CT2AO. **0200** ZF1GC, *YN1CW*, 3V8BB. **0500** *WA6AHN*, *W6RR*. **0700** *CT3AS*, VP2LAT, DL3ZM/YV5, 8P6DR. **0800** ZL4s GA, IE, 4X4OS. **1800** *ZS6AW*. **2100** EQ2JH, OX3JW, TA1BC, TA1SK/4X. **2200** *6W8AL*. **2300** *JY1*, PJ2CW, TL8SW, 5A3TB, 6Y5MJ, 9K2BQ.

7MHz. 0500 *ZD8XR*. **0600** *PYs*, *YV1AD*. **0700** *CT2BJ*, *JX6CW*, *VE8BA*, *ZLs*. **0800** *JA8GBE/1*, *XE1IIJ*, *ZLs*.

14MHz. 0000 TR8MC, 9M2s CP, DQ. **0100** CR3KD, FB8XX. **0700** *CE9AR*, *CR5AJ*, KC4AAA, KS6s *CG*, DV, VK4AD/KS6, KX6DA, UA0ZAA (Kamchatka), VR4BS, W6/W7s, YJ8DS, ZK1CD, 5W1AM. **0800** JD1ACH, KG6SW, KL7s, VK9KA. **0900** *JD1ACF*, VKs/ZLs, 4W1AF. **1200** VP2KF. **1300** CR8AG, *VS6FE*. **1400** VK9XX, VUs. **1500** YA1WX. **1600** VQ9R. **1700** XU1AA, ZS2MI, 4S7s AB, PB. **1800** KH6BB, ZLs, 3D6AB, 5R8AP, 9J2PM (QSL via WA7ECK). **1900** FR7ZG, ZD7SD. **2000** FY7YG, WA6FSC/HC8, TY1ABO, VP2SAB (QSL via WB8HZG), VP2GAE (QSL via K3NEZ), VP8HZ. **2100** HK0BKX, HS3ACZ, TR8MC, VQ9R, 9Q5ITU. **2300** G3MUL/CE3, TN8AV, ZD7BB, 5V7GE.

21MHz. 0700 *EP2PR*. **0800** *JY6FC*. **0900** JAs, *UA0YT* (Zone 23), *VU2BN*. **1000** *KG6JAR*, ZD8BR (QSL via W6EJT). **1100** CR8AK, JD1ABZ, KG6ALV, VS6CY. **1200** HP1KC, JY9FC, YS1CCK. **1300** VP7NS. **1400** FR7AB VP2MY, 9H1T (Gozo). **1500** TJ1BB, 9H3B. **1600** VQ9R. **1700** TJ1AR, *VP2LAT*, W6/W7s, W7TNA/MM (*Chamaru* at Dominica on 27 Feb) **1800** FM7AJ, 7P8AD (QSL via VE2JH). **1900** HK0BKX.

28MHz. 0800 JAs, UA0s, 4W1AF. **0900** VK6s, *XW8BP*, 9K2BQ, 9M2DQ. **1000** DU1EJ, EQ2KH, VK9XX. **1100** FG7TG, FL8HM, ZSs. **1200** CR4BS, CX6AM, JY8JK, VU2JM, 5Z4MU. **1300** *TR8CQ*, VE8RCS, YB1AN, 9K2CA. **1400** OX3DL, TJ1BB, VP7CG, 3B6CG, 3D6AD. **1500** *KV4CK*, VP8HJ, 5X5NK. **1600** OA4OS, TG9YN, 8R1G, 9L1VW. **1700** EA9EJ, VQ9R, W6/W7s, ZD8RR, ZF1GC. **1800** CP1EU, CT2BC, WA5ZWO/AM (On a jumbo jet between Los Angeles and Denver), ZS3JJ, 5H3MV. **1900** G3MUL/CE3, VP2MY, VP8MM.

Very many thanks to all contributors, and to the following for items obtained from their publications: The **DXers Magazine** (*W4BPD*), **NARS Newsletter** (*5N2ABG*), **Long Skip** (*Nick Sawchuck*), **CARS Newsletter** (*ZC4RS*), the **West Coast DX Bulletin** (*WA6AUD*), the **Ex-G Radio Club Bulletin** (*W3HQO*), **DX'press** (*PA0INA/PA0TO*), **DX News Sheet** (*Geoff Watts*), the **29 DX Club Newsleteer** (*VK6PG*), and **QUAX** (*G3DME*).

Please send all items for **May** issue to **reach G3FKM** not later than **5 April** and for **June** not later than **8 May.**

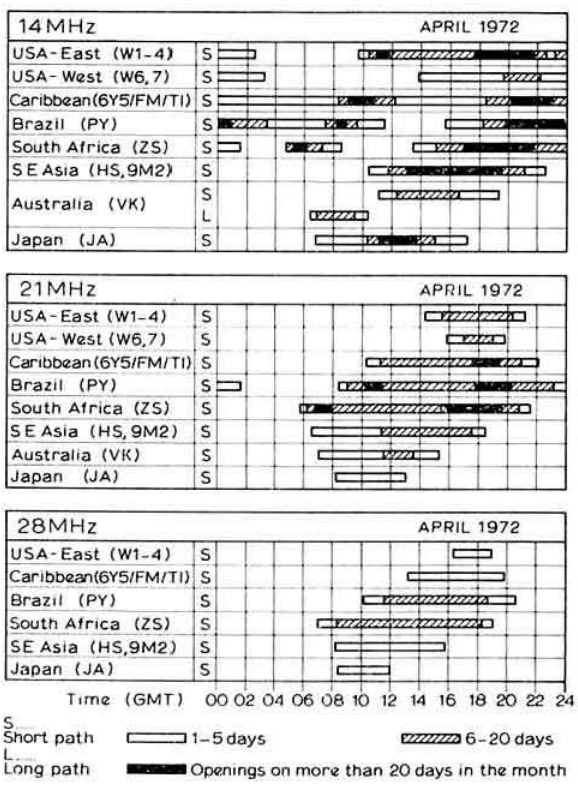
Propagation Predictions

The change from winter to summer conditions occurs during April and existing poor conditions on **28MHz** and **21MHz** will worsen even more. Only on favourable days will traffic with Africa and South America be possible on **28MHz.** Short skip traffic with Europe will begin in May and liven up this band. These adverse conditions will also affect **21MHz**, limiting contact with North America, East Asia and Australia. The most favourable conditions on this band will be to Africa, South and Central America.

14MHz will improve still further, and shorter nights mean the band will remain open longer at night. Contact with Central and North America should be possible throughout the night. There will be a break in traffic with South Africa, as can be seen in the graph. Traffic with Hawaii should be possible on 14MHz between 0730 and 0900gmt and from 1730 to 1900gmt. As the path lies over the N Pole, traffic will be interrupted by the Aurora. The possibility of contacts with Australia via the indirect path might occur, but during summer there will be much more chance.

There will be suitable conditions on **7MHz** for dx when the longest part of the path lies in darkness. As the season advances, dx on this band will often be interrupted by static. During daytime local traffic will be affected by the dead zone. The distances covered will shorten on this band and on 3·5MHz as summer advances. Local traffic will seldom be interrupted by the dead zone on 3·5MHz.

The provisional sunspot number from the Swiss Federal Observatory for February 1972 was 91·6 with solar activity concentrated in the middle of the month. On 19 February the daily number was 162. The predicted smoothed sunspot numbers for June, July and August are 48, 46 and 44 respectively.



MICROWAVES—1,000MHz and up

by DAIN EVANS, G3RPE*

Optimum horn design

G2RY (Bridport) has pointed out a slip in the February column: the length of a 20dB horn should be 7·7in not 22·8in. Where the 22·8 came from is a mystery—it does not correspond to anything very sensible at all.

Activity periods

The second activity period of the season, this time for the 3cm and 15mm bands, takes place on 29-30 April. Details of sites, including NGR, should reach the writer by mid-April, please, so that the information can be broadcast over GB2RS on 23 April. It would considerably increase the value of these tests if brief details of the equipment used, and of contacts and failures, could be collected and then analysed. Please send these to G3RPE.

Other 3cm news is that G8AZU and G8CIT also were on in the London area over the Christmas period, that G3KSU will shortly be on from the Isle of Wight, and that Des Clift, VK5CU, had an excellent contact with VK5ZMW over a 61-mile path despite a 50 mph wind. The writer had thought that only English summers were like that!

VHF Convention 1972

The fine display of microwave equipment at last year's convention was thoroughly appreciated by all, so the VHF Committee repeats the invitation to please bring along plenty of your microwave gear together with as much descriptive information as you can muster.

Horn feeds for dishes

The use of horns as aerials has been discussed briefly in an earlier column [1]. While they are convenient to use, and provide a good match to the rest of the system, their physical size is large compared with a parabolic dish having the same gain. The advantages of both types can be combined by using a horn as the feed to a dish.

Factors affecting the type of feed that can be used with a given dish have been covered by a recent article [2], to which the reader is referred. For use with a horn feed, the ratio of the focal length of the dish to its diameter $\left(\frac{f}{D}\right)$ should be in the range 0·32 to 1 and preferably near the optimum value 0·48. Widely available focal plane dishes, for which $\frac{f}{D}$ is equal to 0·25, are unsuitable for this type of feed as only the centre of the dish can be illuminated.

The design of horns is covered in various reference books, of varying degrees of accessibility and ease of use. The following simple treatment is self-contained, and is due to G3HWR (Swiss Cottage). The procedure is firstly to calculate the dish geometry, then to determine the radiating characteristics required from the horn, and finally to design

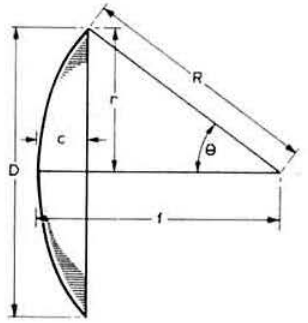


Fig 1.

the horn to produce these characteristics. The process may be done in a series of steps in the following way, using the notation of Fig 1:

(1) Measure the dish diameter D (= 2r), and the dish depth c, and calculate its focal length from the equation

$$f = \frac{r^2}{4c}$$

(2) Check that the ratio $\frac{f}{D}$ is appropriate, that is within the range 0·32 to 1.

(3) Calculate the angle θ subtended by the dish at the focus from

$$\tan \theta = \left(\frac{r}{f - c}\right)$$

θ, or more precisely 2θ, is a measure of the beamwidth of the radiation necessary to illuminate the dish.

(4) Calculate the distance R from the focus to the rim of the dish from

$$R = r.\ \text{cosec}\ \theta, \text{ or } R = \sqrt{r^2 + (f - c)^2}$$

(5) Because this distance R is greater than the distance to the centre of the dish, f, the illumination at the edge will be lower than at the centre set by the inverse square law. This attenuation is given by

$$A = 20 \log \frac{R}{F}\ \text{dB}.$$

(6) As there is a progressive fall in the strength of the radiation on moving away from the axis of the horn, it is necessary to decide what proportion of the radiation is to be intercepted by the dish, and how much is allowed to spill past its edge. A common practice is to control the beamwidth of the horn so that the illumination of the edge is 10dB lower than at the centre. Since the illumination of the edge is already reduced by AdB, as calculated in (5), the additional attenuation required from the horn is (10 − A) dB.

(7) The horn required must, therefore, have a half beamwidth of θ at the (10 − A)dB point. As most design data are expressed in terms of 3dB bandwidths, it is convenient

Continued on page 231

* 4 Upper Sales, Chaulden, Hemel Hempstead, Herts.

Radio frequency probes

by M. WATSON, RTechEng, MIPRE, G3JME*

Occasionally an article appears in *Radio Communication* which necessitates a probe in some shape or form to allow the constructor to line-up an oscillator (receive or transmit), a generator or a complete transmitter, usually at vhf, by sampling rf at various points in the circuit and tuning for a maximum reading. For this purpose a circuit is given and the station multi-meter suggested as the indicating device. All these probes follow the same basic pattern and in all cases the author has gathered the impression that this is just a temporary device for use while the article is being constructed, to be discarded once the particular piece of equipment is in operation.

In the course of his work, the author has come to realize the value of this particular tool. However, unless it is built as part of a piece of commercial test gear, any probe must be constructed locally. Various methods of construction have been tried but in all cases the finished product had that air of impermanence, which was not helped by the long probe and short, fat 35mm film type can holding the active elements. Although these served their purpose, the losses approached unacceptable proportions as the frequency approached 400MHz. This basic design was also rather rigid in its application, being only usable for direct metallic connection; unless the rf level was rather high, when pick-up could be used. However, due to inadequate screening, readings tended to be inaccurate due to pick-up from previous stages.

Prompted by an article in one of the technical journals about an ac valve voltmeter, it was decided to experiment to see if a versatile probe could be constructed which would be well screened to reduce pick-up, still be light and comfortable to hold for longish periods, and have a range of tips instead of being confined to the usual fixed, pointed tip. A start was made by machining a body to hold the active elements and some form of connector to which the tips could be mated. Belling type coaxial connectors were found to be suitable and arrangements were made in the machining to allow a free female type connector to be fitted into the body, the cap being screwed on to the body after the active elements had been assembled.

Construction

Fig 1 shows the general layout of the components and the dimensions of the body. Construction of the body will obviously be dictated by the availability of materials; in the author's case a short length of discarded plastic towel rail was machined in the lathe to the required dimensions. As long as the body is comfortable to hold and the screwed cap of the female connector can be accommodated as a tight fit in the body any alternative should be equally as good. The main requirement is that the probe tips can be interchanged and that the screening is continuous into the diode detector mounted in the female connector.

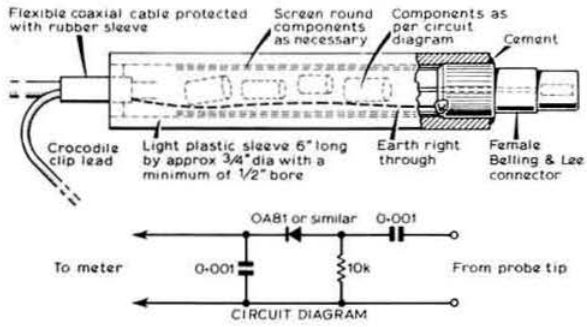


Fig 1. Circuit diagram (The instrument was constructed before the advent of the 1N914, which would probably be a better type of diode to use)

The active element is completed by soldering a piece of *flexible* coaxial cable to the dc side for the indicator, making sure that the cable is securely fixed mechanically, as the element is more or less a permanent fixture after assembly. The cable and element are now threaded into the body and the connector cemented into place with one of the proprietary cements now available. This completes the construction of the probe body.

The probe tips are made from the male type of Belling connector. These will obviously depend upon the requirements of the individual, but a straight metallic contact probe and a loop probe are the first obvious choices. The construction of these is shown in Fig 2 and does not require any explanation.

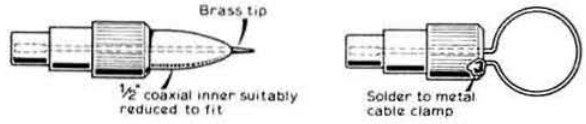


Fig 2. Contact and loop probes

The type of indicating device is a matter of personal preference but needs to be sensitive, 50–100μA giving the best results. The use of a small current meter can, of course, create problems, since full scale deflection is soon reached and the use of the station multi-meter means that connections have to be changed frequently, but by using ordinary tv-type connectors the meter range can easily be extended by using coaxial attenuators as used to reduce incoming tv signals. These can be interposed between the probe tip and the probe body. Be warned, however, these attenuators are only designed for low-level power, the most the author has used them on is 2W for about 15s and even then they become warm. However, this method does leave the station multi-meter free for other measurements.

One problem remained, the question of output power measurement and this was solved by a paragraph in "Technical Topics" (August 1970). If the output to be measured is

* 38 The Paddock, Boroughbridge Road, York.

terminated in its correct impedance, then a sample taken at the termination will be proportional to the total amount of power across the load. If the probe is calibrated to several known powers, a curve can be drawn to give a reasonably good calibration of power for the unit. The method is to connect a terminating resistor between the centre conductor and the metal case of the connector, and to take a further connection from the centre conductor via the mating connector of the probe (Fig 3). Two of the long brass type of connector were fixed back to back, the load resistor was mounted in the body, and the body was filled with MS4 grease to help heat dissipation. With a suitable resistor, this method allows the dissipation of about 5W for short periods, but the resistor should not be overloaded for too long or its value will be altered irretrievably.

By making suitable calibration charts a versatile instrument can be made out of a piece of temporary test gear, and the vhf man particularly will wonder how he managed without a decent probe. Having built the basic model, its uses will be found to be endless, and by fitting a tuned probe any unwanted harmonics can soon be traced to their source. This model has been used by the author in his work for some considerable time and its versatility has been proved, and pick-up, which was the bugbear of the earlier models, has been virtually eliminated.

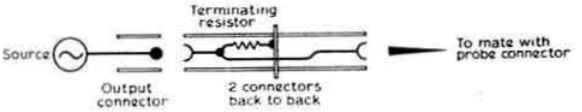


Fig 3. Output terminator for power measurements

MICROWAVES—1,000MHz and up

(Continued from page 229).

to convert these requirements into this form. The appropriate equation is:

$$\text{3dB half beamwidth } \theta' = \theta\sqrt{\frac{3}{10 - A}}$$

The 3dB beamwidth of the horn required is then $2\theta'$.

(8) The dimensions of a horn which will give a beamwidth of $2\theta'$ in both horizontal and vertical planes are obtained from the formulae below using the notation of Fig 2. Horizontal polarization is assumed.

$$a = \frac{68\lambda}{2\theta'} \qquad b = 0{\cdot}78a \qquad > \frac{a^2}{3\lambda}$$

As an example, we may consider the design of a horn for use at 10GHz with a dish having a diameter D equal to 36in and a depth c of 4·25in, and using the same numbering steps as above.

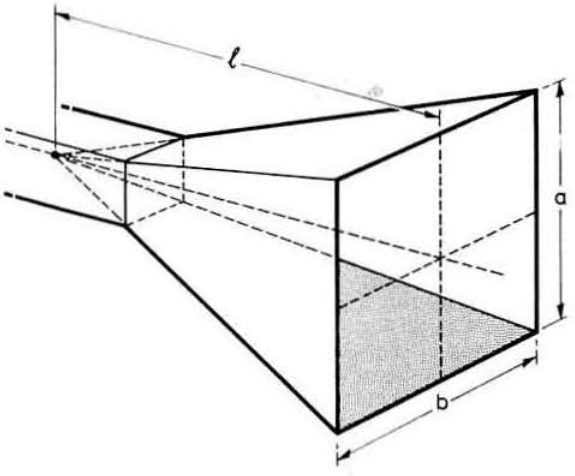


Fig 2. Dimensions of horizontally polarized horn

(1) Focal length $= \frac{r^2}{4c} = \frac{18^2}{4 \times 4{\cdot}25} = 19\text{in.}$

(2) The ratio $\frac{f}{D} = \frac{19}{36} = 0{\cdot}53$, which is satisfactory for a horn feed.

(3) The angle θ subtended by the dish

$$= \tan^{-1}\left(\frac{r}{f - c}\right) \qquad = \tan^{-1}\left(\frac{18}{19 - 4{\cdot}25}\right) \qquad = 51°$$

(4) $R = \sqrt{r^2 + (f - c)^2} = \sqrt{18^2 + (19 - 4{\cdot}25)^2} = 23{\cdot}27\text{in.}$

(5) Additional attenuation at rim,

$$A = 20 \log \frac{R}{F} = 20 \log \frac{23{\cdot}27}{19} = 1{\cdot}76\text{dB.}$$

(6) Attenuation to be produced by horn $= 10 - A = 8{\cdot}24\text{dB}$

(7) 3dB half beamwidth required

$$\theta' = \theta\sqrt{\frac{3}{10 - A}} = 51\sqrt{\frac{3}{8{\cdot}24}} = 31°.$$

The horn has a 3dB beamwidth of $2\theta' = 62°$.

(8) Dimensions of horn required are:

$$a = \frac{68\lambda}{2\theta'} = \frac{68 \times 3}{62} = 3{\cdot}29\text{cm} = 1{\cdot}3\text{in.}$$

$$b = 0{\cdot}78a = 2{\cdot}56\text{cm} = 1\text{in.}$$

$$> \frac{a^2}{3\lambda} = \frac{3{\cdot}29^2}{3 \times 3} = 1{\cdot}20\text{cm} = 0{\cdot}5\text{in.}$$

Where the dimensions of the horn aperture are about one wavelength, and therefore comparable with the size of the waveguide, the simple theory behind the equations given immediately above breaks down, and the dimensions calculated can only be used as a rough guide. The next step would be to make up a horn having inside dimensions of 1·3in by 1in, tapering to 0·9in by 0·4in over a length of 1 to 2in, and to use this as a reference for other experimental designs.

References

[1] "Microwaves—1,000MHz and up", *Radio Communication*, February 1972, p98.

[2] "Designing paraboloids", *Radio Communication*, April 1971, p244.

TECHNICAL TOPICS

by PAT HAWKER, G3VA

IT is quite a time since *TT* looked at the question of fully-transistorized high-power transmitters; in the interim period quite a lot of 100W and even 1kW communications transmitters, broadcast vhf/fm transmitters and the like have been developed and described in the professional journals—and quite often these have been brought to our notice by readers who wonder if it is not time for amateurs to follow suit. My own view is that despite the growing availability of transistors of higher power and (perhaps more important) higher gain and (perhaps most important) higher reliability and ruggedness, for the amateur home station this approach is still costly in £/watt, and demanding in its need for careful engineering if catastrophic failures are to be avoided entirely and good waveforms and good linearity are to be achieved. These remarks, it should be stressed, are not intended to apply to lower power transmitters (say 15W or below) or to exciter stages where transistors now more than merit consideration. Perhaps one day they will not apply to high power also—but for most of us that time still has not arrived.

Recently, when I quoted *Microwave Journal* in pointing to the need to show caution in too wholeheartedly embracing the semiconductor revolution, Joe Cropper, G3BY, was provoked into the justifiable riposte that it is hardly fair to compare valves with transistors when the valve has had the benefit of so many years' existence and the impetus of research and development during two world wars. Indeed he feels that if the transistor *had* been discovered first, it is doubtful whether the valve would even have got out of the laboratory stage—"Who would have been prepared to forsake the transistor for a clumsy device devouring some 6V at 1A, requiring a high voltage supply, offering no significant advantages, and liable to burn out even when treated fairly."

"Let's face it," he adds, "the valve is still a rather inefficient device. In reckoning efficiency we blithely ignore the power consumed in the heater, screen and bias circuits; when all these are included efficiency rarely betters 33 per cent. Why should they be ignored when they are all part of the price of generating a signal."

G3BY supports his case even with high-power valves such as the 813 (with its 5A at 10V heater). He believes the entire space programme would have been impossible but for semiconductors (I am not too sure that the Russians would agree since much of their early space programme appeared to be solidly based on valves).

RF power transistors

Still, whatever one feels about power transistors in general it is well worth taking a quick look at two very advanced ranges of devices now on the market—those of TRW and of Communications Transistor Corporation (an affiliate of Eimac/Varian).

H. S. Brown, G3FRG, recently drew my attention to the very useful catalogue cum applications bulletin of CTC (301 Industrial Way, San Carlos, California 94070 or EMI-Varian, Hayes, Middlx). This includes devices and circuits capable of providing (single device) as much as 70W output at 175MHz from 12V (CTB70-12); 50W at 400MHz from 28V (XB50-28); 20W at 960MHz from 28V (CT960-28). One design provides 140W output at 175MHz from 12V using two CTB-70 devices. The XB50-28 needs only 3W drive to produce 50W output in the range 200 to 600MHz, though there are a number of precautions which must surely be considered absolutely essential when dealing with a device whose USA price in small quantities is around $90. It is of course primarily this price tag which limits its application in the amateur field; it seems to me no good waxing lyrical about devices with this magnitude of costs, though we should be aware they exist, and recognise that from time to time they may be used in amateur equipment.

In the longer established TRW range (UK Langley Electronics, Langley House, 60 Abbots Langley, Hertfordshire) one now finds such devices as the J01001 which delivers 70W at 180MHz from 17·5W drive with 28V rail; the PT5542 for hf ssb capable of 60W pep from 12·5V; the PT8726 for 25W fm at 175MHz from 12·5V with 7dB overall power gain. These and other advanced devices can be assembled in modules to provide powers up to the 100 to 1,000W levels—at least for those prepared to meet the cost and to exercise the engineering techniques needed, if full power is to be achieved without the possibility of destructive oscillation.

An article in *Electronics* (13 September 1971) by CTC authors was headed "You can depend on today's rf power transistors" and suggested that "designers no longer face unrealistic power claims, unreliable multi-chips, and stringent circuit parameters; present devices give up to 150W of dependable rf power and they're steadily getting better." At least some modern rf power transistors will withstand infinite standing wave ratio conditions, show much less spread of characteristics, and have increasingly overcome the problems of high lead inductance and the like. Overall efficiency of a power amplifier stage can be around 50 per cent.

Speech processing for ssb

The subject of speech processing for ssb continues to excite considerable interest; it seems worth providing a few more references since, as G6XN pointed out, full benefit is not likely to be obtained without careful engineering and knowledge of the various approaches. So here are some articles to look up in your own library or the one at the club; London members will also find *QST* back issues in several libraries open to the public, including the former Patent Office library (now National Reference Library of Science and Invention, Holborn Division).

One of the first practical articles on rf speech clipping was that by W. K. Squires, W2PUL, and E. T. Clegg, W2LOY, in *QST* July 1964, where a single-valve (6AZ8 triode-pentode) clipper unit for use with a 9MHz ssb generator was

described; later came "RF clippers for ssb" by William Sabin, W0IYH, (*QST* July 1967) who stressed that clipping is most effective under weak signal conditions. Another detailed survey article, which distinguished between six different approaches to speech processing, was published in *QST* January 1969 by Harold Collins, W6JES. The methods outlined were: (1) af clipping; (2) conventional af compression with a slow time constant; (3) syllabic af compression with time constant short enough to follow the speech waveform; (4) automatic level or load control (alc); (5) rf clipping; and (6) rf syllabic compression (very fast acting alc). Each of these methods was related to "intelligibility threshold improvement" (iti) in decibels, on the assumption that unprocessed speech results in a peak-to-average power ratio of about 14·5dB (in practice this varies with different operators due to voice characteristics). From this study, the advantages of rf clipping emerged clearly (iti up to 8·5dB), but it should be noted that syllabic compression can be pretty useful (af up to about 5 to 5·5dB; rf up to 6dB). One could add to the above list more complex techniques such as Lincompex which uses a second control channel alongside the speech channel. It can be equivalent to an increase in transmitter power of 12–15dB.

ALC techniques have been used in some amateur ssb rigs since about the end of the 'fifties, but there may be some readers who are a little hazy about them. The usual approach is to provide an "agc-type" arrangement in the rf stages of the transmitter so that when no grid current is drawn by the power amplifier, normal bias is applied to an earlier stage—which may be the driver. But when the pa begins to draw grid current, the alc circuit provides a rectified voltage, following audio peaks, which is applied as additional bias to the earlier stage. The system is thus very similar to receiver agc. In practice, alc improves performance primarily by making it difficult to overdrive the pa far into the flat-topping condition, thus reducing distortion, adjacent channel interference and providing a measure of speech compression. With conventional time constants the very wide range of speech levels makes it difficult for an alc system to increase average-to-peak power ratios very far, and an iti of 1dB is about typical for conventional alc systems.

From the above remarks, and also from what Walter Schreuer adds later, it seems clear that we could all benefit from a detailed article on effective alc circuit techniques.

Integrated-circuit speech processor

Several years ago, a new ic gain control unit—the LM170—was marketed by National Semiconductors for agc and squelch applications. I recall writing about the device in *Electronics Weekly*, but because of the price (of the order of £10) there seemed little point in drawing attention to it in *TT*. However, later two much cheaper versions appeared, the LM270 and LM370, the only significant difference being a reduction in the recommended operating temperature range; the LM370 at around the £2 mark should be entirely suitable for most amateur applications. A useful application note (AN-11) by National Semiconductors (2975 San Ysidro Way, Santa Clara, California 95051) includes the following suggestions: remote gain-controlled audio amplifier; agc circuits; audio squelch with hysteresis to suppress background noise; twin-tee regulated output audio oscillator; modulated 455kHz signal generator; automatic level control for ssb transmitters; and transmitter or tape recorder vox—a mouth-watering selection of applications for a single device!

The suggested alc system is intended for use with 455kHz ssb generators, and the devices are nominally rated for use up to 2MHz. However, Gene Nurkka, VK9GN, (*Ham Radio* December 1971) shows how the LM370 can be used as a fast-acting audio compressor to provide a claimed threshold improvement of 4dB with 18dB peak limiting, compared with an iti of about 1dB for long time-constant circuits, or roughly the equivalent of an increase from 400W pep to 1kW pep (provided that the power supply holds up). Attack time is about 0·5ms and release time about 10ms. VK9GN shows that by biasing pin 2 of the LM370 at about 1·5V positive, negative peak distortion can be eliminated at 18dB compression. Fig 1 shows the main details, but the original article includes compression metering and other useful information on setting it up.

Speech processing pros and cons

The various notes on ssb signal processing have brought a heavy mail. A number of amateurs still clearly regard any form of ssb with a degree of suspicion, if not positive dislike. Certainly many of us regret that more is not being done to maintain interest in other modes of operation. C. B. Raithby, G8GI, from time to time lets me know his feeling that we have lost something, with modern ssb transmission seldom providing the instantly recognizable voices that we used to appreciate on broader-band a.m. Bill Matthews, G2CD, is afraid that misusers of modulation will always by-pass any critical paragraphs "as with road-users, the delinquents can't, won't or don't read and comprehend the warnings". But one must surely recognize that in practice ssb has made possible regular dx phone operation for many more amateurs than ever achieved this with a.m.

Doug Hutchinson, ZS6-225, one of the keen group of

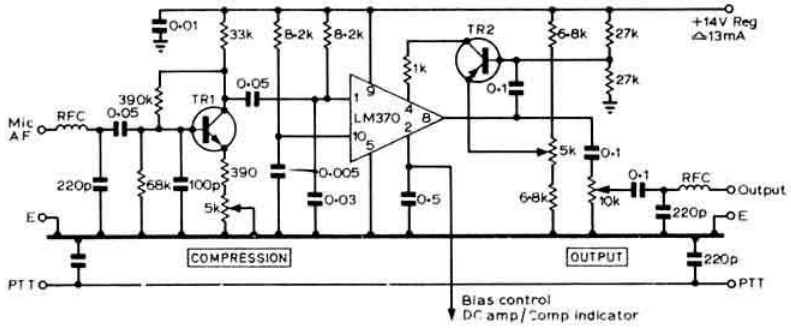


Fig 1. Heart of the VK9GN ic audio speech processor. TR1 40233, TR2 2N3702 or 2N3638A. TR2 provides detection of the negative audio peaks; there is no current flow or compression until threshold is reached; the 5kΩ pot sets the emitter voltage, and if set too near the zero output end a severe transient pulse appears at the output of each syllable, with control at maximum output a compression range of about 28dB is possible

amateurs working with Racal Electronics South Africa at Pretoria, believes that the Stephen Dykes' views might have been valid about 10 years ago, but bear little or no relevance to today's techniques, adding: "With a well-designed alc circuit no linear amplifier should flat top and the use of a crt monitor after initial setting up should not be necessary. The alc must operate on a low level stage and *because* of the alc some form of speech processing is imperative to produce optimum talk power. If the alc is set to reduce drive to the linear immediately the linear attempts to draw grid current, then of course the mean power will be low if speech processing is not used."

He recalls that Dave Larsen, ZS6DN (formerly ZS5DN), was one of the first amateurs in South Africa to use ssb and was also chief engineer of SMD (Pty) Ltd, predecessor of the present company (of which ZS6DN is technical director). When commercial users became interested in ssb he designed the RT422B—which later became "the workhorse" of hf radiotelephones in southern Africa with several thousand in use. One reason for the success of this design—currently being phased out for a 100W pep fully solid-state equipment type TR15—was the extra talk power achieved with rf clipping. The system used in the RT422B was a diode following the crystal filter with subsequent filtering achieved by the use of a high-Q i.f. transformer which gave reasonable rejection of spurious signals at low cost and which is possible with a 445kHz i.f. (but not at 9MHz etc!).

In the new TR15, rf clipping is again used, this time at 20MHz in conjunction with two crystal filters. Here again the solid talk-power, Doug Hutchinson says, is attracting favourable comment. The spurious suppression with this equipment is sufficient to allow two pairs of equipments to be used with same suppressed carrier frequency, one pair operating usb, the other lsb without mutual interference.

Joe Cropper, G3BY, has some sympathy with the comments of Stephen Dykes since he always feels uneasy when he sees circuits of speech compressors using transistors. "Having spent some time trying to generate audio sine waves from transistor circuits I expect most of the published circuits do a good job as square wave generators! It's not the fault of the transistors but, with the spread of parameters, especially in surplus types, it is just not on to assemble such circuits from a diagram. This is where potentiometer biasing (see *TT* August 1971) is valuable."

He wonders if some of the overdriving on ssb is not due to the customary statement that it is not advisable to reduce drive by turning down audio gain because this may degrade carrier suppression. "As the carrier in a reasonably well adjusted ssb transmitter is generally inaudible at the receiver, this is nonsense," he adds.

Arie Bles, VK2AVA,—like G6XN last month and also Walter Schreuer—warns against clipping the dsb signal as mentioned by G3XVY. He reports that some years ago, Tim Hooper, VK2ATH, at the University of New South Wales, did a lot of experimental work in ssb speech processing, along the lines of the Comdel CSP11 units but at 455kHz and 9MHz. He found that unless clipping is done on a pure ssb signal without carrier or second sideband, any clipping would introduce intermodulation of one sideband clipping products with the other or the carrier: extensive clipping is successful only with a pure ssb signal followed by rf filtering. VK2AVA feels that "too much muck is already emitted in the bands and we should warn against further misguided attempts to raise speech level with broader signals and distortions. It is amazing how few amateurs can analyze what they hear—generally the louder a signal the better the reports on quality. It gives me goose flesh when I hear some things."

Walter Schreuer, K1YZW/G3DCU, who admits to having been the originator of the Comdel CSP11, points out my price error (corrected in the December issue), and also comments on the "cynical views" of Stephen Dykes. "The situations he describes could not exist if all rigs featured properly designed and functioning alc systems. As I mentioned in *Ham Radio* (February 1971), most commerical rigs are very poor in this regard; presumably contain the feature only for advertising reasons at the smallest possible cost. Several of the equipments which I have been able to examine would perform little worse—and possibly better—without their brand of alc," he writes.

He also warns that clipping a dsb signal "will give identically disastrous results as audio clipping".

So if we dare attempt to sum up what seems to have emerged over the past few months:

(1) Good alc plus good rf clipping gives optimum talk power with clean signals—but there are few short cuts to the engineering and not all existing rigs would take the changed duty-cycle.

(2) Most of the other speech processing techniques can give some limited improvement (with very useful possibilities in fast-acting compressors).

(3) Good alc is operationally significantly more useful than the rather low iti figure might suggest—but a lot of amateurs with factory-built alc are fooling themselves in believing that they are already gaining the full benefit from alc.

(4) With no af clipping and no alc a certain degree of flat-topping is reasonably acceptable to other users.

(5) If you do have good alc, your need for some effective clipping tends to be greater than without alc!

Stable audio oscillator

Bert Allen, G2UJ, draws attention to a simple twin-tee audio oscillator described by WB6ZBX and W6HAB in

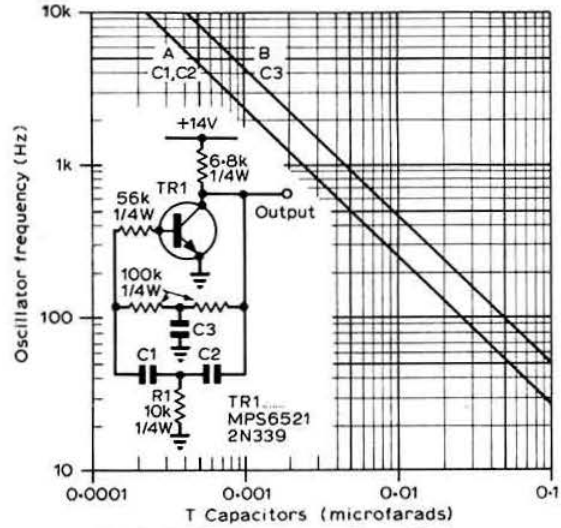


Fig 2. Stable twin-tee audio oscillator

"Hints and Kinks" *QST*, November 1971. He has tried the circuit, with transistor-type changes, and finds it the most stable that he has come across.

Fig 2 shows the *QST* circuit together with the associated nomogram to help select capacitor values. The original units were built on interchangeable circuit boards, and frequencies checked with a counter as varying only about 0·1Hz around the design frequency. By replacing R1 with a 50kΩ control, the oscillator would tune as much as 1,500Hz from the design frequency.

As he did not have any of the transistor types specified, G2UJ uses two 2S512 (Texas) devices as a Darlington pair (with a single 2S512, the 56kΩ base resistor had to be reduced to about 5kΩ to achieve oscillation). With the Darlington pair and a 50kΩ variable as R1, a useful range of frequency exists when the control is varied between 1,700Ω and 20kΩ. G2UJ reports *no* variation of frequency when the supply is varied between 6·5V and 17V. Maximum consumption (17V) is about 2mA. He used 3,300pF for C1 and C2, and 5,000pF for C3, with other values as specified. A final point is that G2UJ found that the oscillator keys perfectly.

28MHz "folded stacked dipoles"

From Ted Cook, ZS6BT, comes a further idea on folding aerials into loop-type aerials, stemming from a recent need to establish a 28·5MHz link over about five miles with 5W. A conventional dipole failed to produce sufficient signal and improvement was sought if this could be done without anything too fancy. So it was planned to try a pair of co-linear dipoles (Fig 3(a)) voltage-fed from coaxial cable by means of a lightweight matching unit suspended in the aerial, and the matching unit shown in Fig 3(b) was built. This has 10 turns on a ribbed and grooved former, ¾in diameter, as L1 with six turns overwound to form L2. C1 was a tiny 30 + 30pF air-spaced split-stator with C2 a 100pF mica compression trimmer, all mounted in a 4 by 4 by 3in plastics box with feed-throughs on top and a coaxial socket underneath, capable of being made fully waterproof after initial adjustment, and suitable for powers up to about 10W. But before the original plan was implemented another idea occurred to ZS6BT, why not bend round two full-wave wires to produce a loop ¾λ long with ¼λ spacing between them: Fig 3(c).

The system is brought to exact resonance by L1-C1, and L2-C2 tuned to series resonance. Once the transmitter has been tuned into a dummy load at the aerial end of the feeder, a reflectometer can be inserted between coaxial and matching unit and the unit tuned up until (a) the aerial draws the same load as the dummy load; and (b) zero swr on the feeder. The matching unit can then be sealed, and hangs from the centre of the lower element. A piece of vertical nylon cord between upper and lower elements keeps the spacing correct and helps take the small weight of the matching unit.

ZS6BT reports results as fantastic. Perfect aerial balance, perfect resonance, absence of standing waves and the gain of a two-over-two co-linear array—and judging from mobile checks with sharp beam focus.

ZS6BT puts forward a further possible application of this "double-quad loop"—this time for 144MHz. Two similar loops from small diameter tubing, both with L1-C1 and one driven by a coupling coil, spaced one-fifth wavelength apart. ZS6BT feels such an arrangement would form the basis of a

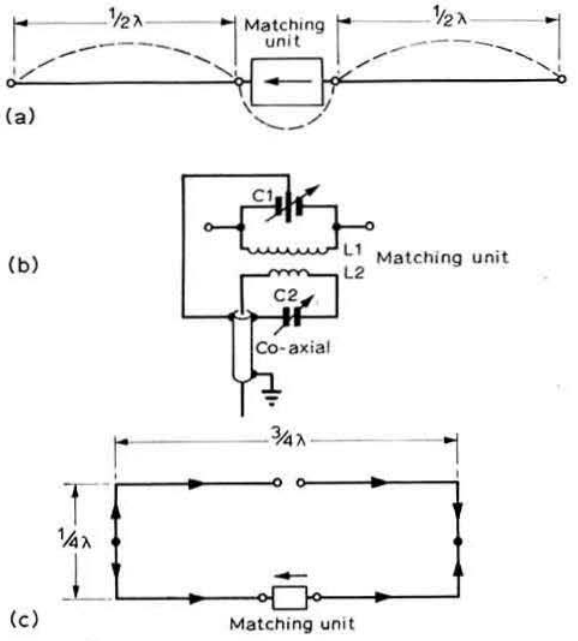


Fig 3. Development of ZS6BT's "double quad loop" or folded stacked dipole aerial for 28MHz

double-quad rotatable array with the back-to-front ratio tunable by a capacitor; the loops would be only 5ft by about 20in but should represent something like eight half-waves in phase with the back-to-front ratio of a quad array. This idea has not been used in practice but might give vhf operators something to try.

Another possibility, it seems to me, would be to try feeding the aerial with open-wire zepp feeders to eliminate the need for a matching unit.

Short-span 3·5MHz dipole

A frequent requirement in these days of low sunspot activity is for a 3·5MHz dipole that will fit into a small garden. Peter Waters, G3OJV, has been using the configuration shown in Fig 4 to good effect; although only 20ft high he has been getting useful reports on ssb from VE, KP4, VP2 etc.

Dimensions of the various sections are not important provided that the whole aerial is made to resonate. The simplest method is to make the dimensions roughly as above but

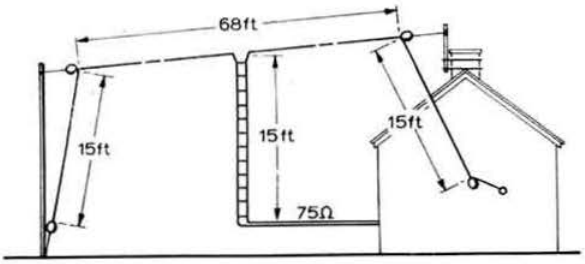


Fig 4. Short-span 3·5MHz dipole found effective by G3OJV, using section of open line or 300Ω feeder

with 18ft of 300Ω ribbon or open-wire feeder in the centre and then to trim this back for minimum swr at the transmitter end. The resonant feeder section can be fed by coaxial cable (preferably with a balun) or with 75Ω balanced twin. With a little care, the aerial will work usefully also on 14MHz. In this case, first disconnect the entire feeder and feed directly at the top with coaxial cable, adjust length for minimum swr which will indicate three half-waves on 14MHz. Then add 18ft feeder as before and adjust for minimum swr on 3·5MHz. G3OJV says the swr on 14MHz should not be affected.

Although the approach is akin to the G5RV, G3OJV considers that it provides vastly superior swr on 3·5MHz and makes feeding much easier.

Also in the aerial department are useful ideas from Dick Halls, G3EIW/ON8KM, (power meter/dummy load) and S. M. de Wet, ZS6AKA, (loop-type aerials) both of which we will try and squeeze in before long.

Digital mixing and the heterodyne vfo

During the past 12 months, digital techniques for ssb generation and for other transmitter applications have been mentioned a number of times in *TT*. The dramatic decrease in costs of, for example, transistor-transistor-logic (ttl) devices has opened the way to many possibilities in the area of frequency generation, including full-scale frequency synthesis and related techniques. For example, Bob Woodhouse recently reminded us of the "Racalator" approach developed several years ago by Racal. Technical details are given in *IEE Conference Publication No 31* which contains the papers presented at the 1967 conference on frequency generation and control for radio systems. The much lower prices of logic ICs could well mean that this type of system, capable of holding frequency indefinitely to within a couple of hertz, could be pursued for amateur applications. In essence it was an add-on unit which could be applied to the vfo of a receiver or transmitter allowing the vfo to be free-tuned to any desired frequency and then

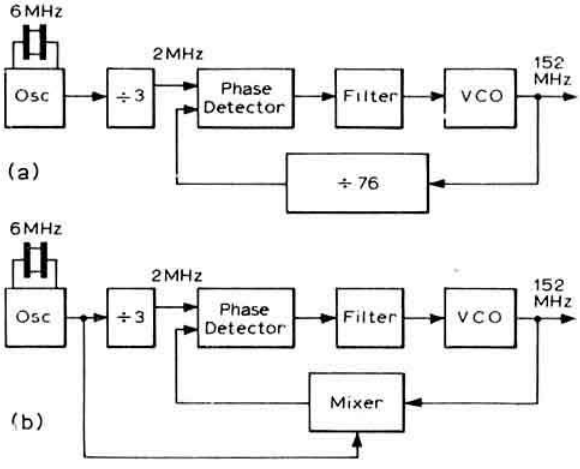


Fig 5. (a) Conventional method of obtaining phase-locked 152MHz signal from 6MHz crystal requiring chain to divide frequency of 76. (b) use of a single D flip-flop as mixer to replace several stages of counting elements

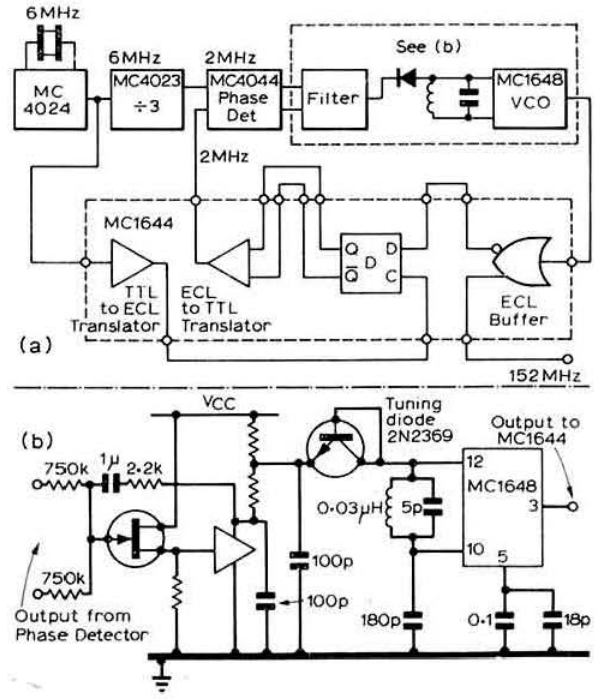


Fig 6. Detail of a phase-locked 152MHz generator using integrated circuits and a few discrete components

stabilizing it and eliminating all drift by the use of fairly complex computer-type techniques.

What—at least to me—is a novel idea that promises further simplification in frequency synthesis is described by R. Treadway and L. J. Reed of Motorola in *Electronic Design* 6 January 1972, "Generate stable high-frequency signals with D flip-flops as digital mixers and all-ic low-frequency phase-locked loops". In essence this shows how D flip-flops can be used as *digital mixers* to eliminate the need for chains of counters in frequency dividers. For example, in a fixed frequency 152MHz unit, a single mixer replaces eight flip-flops used to divide-by-76: Figs 5 and 6.

But furthermore—and possibly of more interest to amateurs—it shows that digital mixing can be used in a phase loop mixer-type vfo to synthesize frequencies from two oscillators where phase coherence is not required. Fig 7 taken from the article shows the outline of a 14 to 14·5MHz

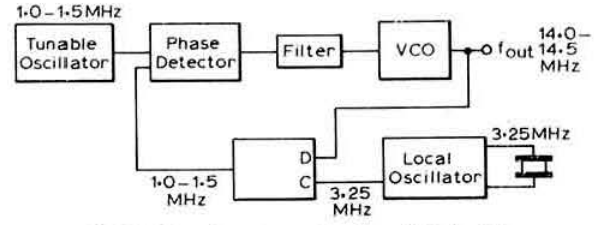


Fig 7. Heterodyne type vfo using digital mixing

vfo using a 1 to 1·5MHz tunable oscillator and 3·25MHz crystal oscillator. It is stated that throughout the range no evidence of sporadic operation could be observed and that a frequency-ratio counter connected at the inputs of the phase-detector always read 1,000,000.

The authors discuss the operation of a digital mixer in some detail, pointing out that the D flip-flop must be either a positive or negative edge-triggered flip-flop: that is, if the input is logic 1 when the clock makes its transition, the output goes to and remains a 1 for a full clock period; if it is a 1 from the previous time it remains a 1.

We are all getting used to the idea of ic digital dividers in such applications as crystal calibrators, so there seems a good chance that the digital mixers should also gain rapid acceptance.

Pulsemaker II

The note (*TT* January) on the GE Pacemaker pulse generator has prompted Pamela K. Wood, G8EHH, to give details of a circuit which finds many uses in the medical laboratories of The University of Newcastle upon Tyne. She is not sure where the circuit originated.

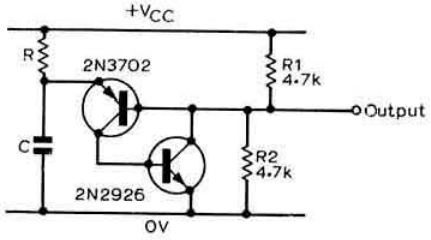


Fig 8. Useful pulse generator described by G8EHH

Pam's pulse maker (Fig 8) generates negative-going pulses from the level $(V_{cc} + R2)/(R1 + R2)$ volts to ground. Neither components nor V_{cc} are critical, other than that R must be large enough to allow C to be discharged when the complementary pair of transistors switches. With V_{cc} at 5V, the lower limit of R is about 47kΩ. With R 68kΩ and C 1μF the generator provides 20 pulses/sec, but the circuit will also operate at much higher pulse rates and G8EHH has had one running at 2MHz. Since the frequency, for any given RC combination, depends on the voltage feeding R, the arrangement will work as a voltage-to-frequency converter and the frequency can be made variable by driving R from a potentiometer connected between the supply rails rather than directly from V_{cc}. The generator can also be used (Fig 9) in conjunction with a ttl bistable device, turning it into a high-duty-cycle, fast-turn-off, monostable. Grounding the input to the bistable permits the generator to start and the first pulse will reset the bistable provided that "ground" has disappeared from the input.

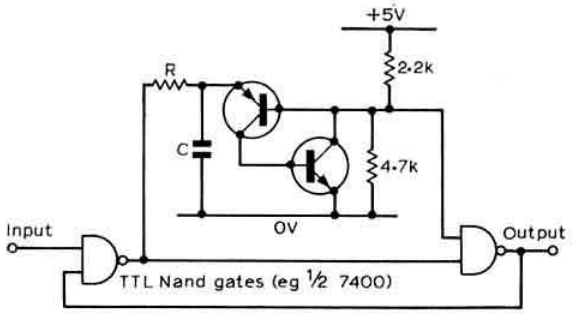


Fig 9. How generator can be used to provide high duty cycle, fast turn off monostable

Precautions with Nixie tube drivers

It may be recalled that *TT* (April 1971) included a list of precautions which Keith Griffith, ZL2BGP, considered advisable when using decade counter ic devices in conjunction with Nixie-type display tubes. Later (*TT* December 1971) W1DMU questioned the validity of certain of these precautions. Now ZL2BGP sends a further note to help clarify certain points.

He agrees that the practical experiences of W1DMU and others indicates that no special precautions in the switching of lt and ht supplies need be taken with the SN7441A/FJL101 devices.

But he warns that special precautions *should* be taken with another driver in common use, the Fairchild CuL9960. The firm's application brief (D004) includes the warning: "Operating a CuL9960 without some small output current is likely to destroy the device. The power supplies must be arranged so that the low-tension rail is disabled if the ht rail is not energized". In other words, pulling a Nixie tube out when power is on could destroy a CuL9960.

The other question concerns the triggering of counter ic devices. He points out that some are simply voltage level triggered and can be used irrespective of rise and fall times; they can be triggered over their full frequency range by the positive halves of sine waves, etc, this includes the Philips FCJ series flip-flops etc. He agrees with W1DMU that the majority are edge-slope rate-triggered and so require pulse shaping for utilization over their full frequency range. It is important that manufacturers' data sheets be consulted on such matters.

He notes that an interesting example of the modern state-of-the-art is the Plessey SP602A decade counter which will count 40 to 500MHz using positive halves of sine waves of approximately 500mV. Thus it can be used as a vhf divide-by-ten probe without a shaper—and if the unit is pulse driven, frequency response will be extended down to dc (see Plessey data sheet issue No 2, October 1971, publication No P.S.1305).

Here and there

Ham Radio has published some amendments to the K6JYO rf clipper (*TT* November 1971, Fig 1): fixed capacitor from gate of 2N5248 fet to earth should be 100pF not 0·01μF; an 0·01μF decoupling capacitor should be across the 4·7kΩ emitter resistor in the 2N2222 stage (if gain still not sufficient use 455kHz resonant circuit with loaded Q of 10 to 20 in place of RFC3). For Heath and some other transmitters an additional power amplifier stage should be added between the 2N2222 amplifiers and the clipping diodes.

On log periodic aerials (*TT* February) a reminder that useful design articles by C. R. Fry, G3NDI, appeared in *RSGB Bulletin* November 1966 and April 1967.

A correction to my opening remarks last month. *TT* has completed 14, not 13 years—the old *tempus* certainly *fugit!*

FOUR METRES AND DOWN

by JACK HUM, G5UM*

Concerting the contacts

Almost 20 years ago, at a time when contacts on vhf were sparse, G5KG and G5UM suggested on this page that activity should be concentrated in time to ensure that QSOs could be had. From this developed the concept of Monday Night Activity Night which has stayed with us so effectively down the years that although virtually every night is now an activity night on 2m, more people appear on the band on Mondays than at any other time during the week (except when there is a contest on).

Boosting 2m with activity periods like the Monday one became less necessary when the band was given its own particular shot in the arm by the advent of the Class B G8 licensees in 1968. (Before that, the Class B ticket permitted transmission only on 70cm and down.) But the bulk of this occupancy is A3 telephony, with fm very much on the increase. Single sideband, which is allowed to G8 operators, and telegraphy, which is not, remain in need of special dispensations along the lines often advocated here of "meetings by mode" that concert the contacts at particular times.

"Where do all the sidebanders and telegraphists get to after a contest?" The question has been voiced consistently during the last several months by users of both modes who wish that others who have A3J and/or A1 facilities would use them oftener.

Believing that fixed time "guaranteed QSO" sessions might persuade them out of hibernation, G3BA of Sutton Coldfield observes: "Many people are calling CQ on cw and ssb at times when the chances of getting a contact are, to say the least, minimal. There are not all that number of stations on cw and ssb at the moment in this country, and I feel that many are being driven away to other bands where QSOs are more easy to come by."

Tom Douglas goes on to propose that metre-wave men should be encouraged to come on the air on as many evenings as possible and to put out a call *every hour on the hour*, not solely on cw or ssb but on whatever modes may be available, and not solely on 2m either but on the other vhf and uhf bands as well. Knowing that other people will be around ready to make calls and to listen, the metre-wave operator enjoys the first pre-requisite for setting up a QSO.

"Initially, I suggest that the times of 1900 to 2300 hours be the main target for this operating aid," says G3BA: "If after a while the plan is successful no doubt 'every hour on the hour' would become the accepted habit, whatever time of the day or evening one had free for operating. This must help the newcomer and those going out to portable sites 'on spec'. At least they will know the times when somebody is likely to be on to hear their calls."

Home station users of amplitude modulation, who can get contacts on 2m at any time, may not need to watch for the hour to clock up so much as the cw and sidebanders, who cannot. To these, the suggestion will be a welcome sure-fire method to increase the QSO-rate.

See you on the hour on 4m and down!

The UK FM Group

It is not a long step from organizing activity by time, as above, to organizing it by mode. Many experienced operators assert that this is regrettable, that ideally there should be much more inter-mode communication on 2m than there is at present. The fm-to-a.m. QSO rate is not bad, but the sideband-to-fm/a.m. rate is virtually nil. Sidebanders tend to segregate themselves on 145·41MHz for the very natural reason that this is where the contacts come. Some complain that if they call a non-sidebander co-channel he fails to identify them. Others mention technical problems of moving too far off 145·41.

So the hard fact of existence is that much work remains to be done to promote more inter-mode conversation.

Meanwhile, the newly-formed United Kingdom FM Group comes up with the proposal that users of frequency modulation might find it helpful if fm operating frequencies were to be designated within each of the 2m zones, as follows:

Zone A, West, 144·40MHz. Zone C, Midlands 145·20MHz.
Zone B, South 144·80MHz. Zone D, North 145·60MHz.
National fm calling frequency on 2m: 144·48MHz.
National fm calling frequency on 70cm: 433·20MHz.

Already 144·48MHz has acquired general popularity among fm users as a calling channel, and a quick CQ put out in the London area almost guarantees an fm contact with one or other of the large numbers of mobile and fixed stations now crystallized for it.

The primary aim of the UK FM Group is to promote the orderly growth of fm operation in the vhf and uhf bands, and to seek common standards as regards frequencies and transmissions. It recommends that frequency tolerance should be within 2kHz of the specified channel, with peak deviation limited to 3kHz, and an audio bandwidth of 3kHz. The use of audio compression ahead of the bandwidth determining stages of the modulator is also recommended.

Popular Karl Kanalz, G5AGX, is secretary of the London branch of the group and will willingly supply interested members with further details and application forms. He can be reached at Flat 6, Marzena Court, Whitton Dene, Hounslow, Middlesex.

Keep with us: more about modes coming up . . .

No key, no four

The take-up of G4— callsigns has been so rapid as virtually to exhaust the whole of the block within a twelvemonth. Time and again familiar voices behind unfamiliar 4-calls pop up on 2m remarking: "You'll probably remember me better as old G8 so and so."

From what we hear, the exchange of G8 for G4 is likely to

* Houghton-on-the-Hill, Leicester LE7 9JJ

18th ANNUAL VHF/UHF CONVENTION

Saturday 22 April 1972

The Winning Post Hotel, Whitton, Nr Twickenham, Middlesex

LECTURE PROGRAMME

1400–1420 Opening address by the Society's VHF Manager, Geoff Stone, G3FZL.

1420–1440 The Space Conference, 1971: a report by Roy Stevens, G2BVN.

1440–1545 "Metre-wave operating techniques today": an illustrated lecture by Tom Douglas, G3BA.

1545–1615 Tea break (teas may be purchased in the hotel).

1615–1715 Stream A: "Some studies of vhf propagation", by Ron Ham, BRS15744.

1615–1645 Stream B "The design of vhf receivers having a wide dynamic range", by Bob Burns, G3OOU.

1645–1715 Stream B "Microwave pulse techniques", by T. C. Jones, G3OAD.

WHAT TO BUY

Raffle tickets from G3BPT, current publications from the RSGB bookstall, brand new items of equipment from the trade show, less new items (all very cheap and good) from the Bring and Buy stand (G8AXA). All these will start up at the opening time of 11am.

TIME TO EAT

Dinner at 7.30pm (assemble in the banqueting room at 7pm). Guest of honour will be Mr D. E. Baptiste from the MPT: he will propose the toast of "The Society", and the response will be by President Tim Hughes, G3GVV.

WANT A FREE 70cm BEAM?

Make a note of the number on your dinner ticket. It might be called during the evening, to bring you an 18-element Parabeam for 70cm.

. . . AND A CHALLENGE TROPHY?

Deposit your latest item of home-built equipment with any member of the VHF Committee for inclusion in the Constructors' Exhibition. The adjudged winner will be presented with the 1962 VHF Committee Trophy during the course of the dinner. But bring your item early (say by 11am) so that all visitors will have an opportunity to see it.

THE GM3EGW PRIZE

This year tor the first time the Fraser Shepherd Memorial Prize will be presented ". . . in connection with research into microwave applications into radio communication".

GETTING YOUR TICKETS

Write now to Mr A. Wheeler, VHF Convention Secretary, at RSGB, 35 Doughty Street, London WC1N 2AE, sending cash or cheque as follows:

For the entire day: £1.80

Morning and afternoon only: 40p

For the convention dinner only: £1.50

Cheques should be made out to "Radio Society of Great Britain" and crossed "VHF Convention Account". Mark the outside of the envelope "VHF Convention".

As in past years, an attractive "dinner only" price is quoted for the benefit of members who wish to bring their ladyfolk to the evening event.

. . . AND A FINAL NOTE

Get your application for tickets in *now*. Although the "Winning Post" is commodious, there is an ultimate limit to the numbers it can take. It would be a pity to have your cheque returned with a "Sold out" chit! "Looking forward to seeing you there once again!" say all members of the VHF Committee of the RSGB.

HAVEN'T BEEN BEFORE? You cannot miss the "Winning Post". It is a prominent building on the Chertsey Road at Twickenham (approach the car park from Percy Road at the rear). The nearest station is a short walk away: Whitton on the Southern Region.

accelerate. One of our locals with commendable single-mindedness imposed upon himself a sabbatical month, no operating, all morse, copying hf bands telegraphy for most of his free waking hours. Another bought himself a single sideband transmitter in readiness for a nibble on the hf bands when the full ticket comes, but primarily as a transverter source for 2m ssb (he is now left with a problem: which to do first, learn the code or build a properly engineered spurious-free sideband rig for 2m?)

Progress from Class B to Class A is prompted by two priorities, and "having a nibble on the hf bands" is not one of them. First, there is the desire to extend the range of the station by using A1, and secondly much curiosity about 4m.

A Class B licensee may not engage in contacts with telegraphy stations. Many people, feeling it would help their morse speeds if they could, ask if this is permitted. Answer: no. But most operators are within range of one or other of the RSGB slow-morse senders, which have been plugging away so admirably for so many years under the aegis of G3KGU (they are specially licensed to broadcast).

Secondly, a Class B operator may not engage in cross-band contacts into frequency allocations he is not permitted to transmit on. It is in order to cross-band 144 to 432MHz (announcing callsigns frequently for identification) but not 144 to 70MHz, nor, for example, 144 to 1·8MHz.

All this denies him the special delights of talking on 2m telegraphy to people at twice the range he ever achieved on phone, and of cross-banding on Wednesday Night 4m Activity Night.

These are the reasonable limitations accepted by the applicant for a transmitting licence when he opts to go for a G8 licence rather than a G4 one. The logic of the situation is inescapable: extend your area of vhf activity in every sense of the phrase by passing the morse test and taking a Class A ticket.

Easier said than done? Not at all. More about morse coming up next time.

Contest commentary

Blizzards bedevilled the two-band contest of 4-5 March, and an abysmal barometer either frightened many regulars off or persuaded them that a low score would not be worth sending in: which is untrue, for the real value of a contest table lies in the activity level which it shows up. "Rock bottom" . . .

When the Dunstable Downs Radio Club held its annual dinner the opportunity was taken to obtain this picture of seven of the eight members who hold television transmitting licences. Left to right they are (back row): G6AFK/T (G8AYB), G6AEH-/T (G8ASP), G6AGY/T (G8CGX), G6AEV/T (G3VZV); and front row: G6AFX/T (G8AWY), G6AGE/T (G8CPX) and G6AGX/T (G8DYB). Unable to be present was G6AGH/T (G8ENS). They meet on 70cm Wednesday evenings, and welcome other /T operators into their net

"You really have to dig . . ." and "I'd been calling CQ contest for half an hour before I got this QSO" were typical comments. At the start there was some dubiety as to whether separate logs were required for 144 and 432. Then the word got round that the last paragraph of the General Rules (under "Definitions") made the requirement plain enough. Yes, separate.

In spite of everything, many contestants topped the 100-worked. One famous group had reached it by mid-morning on the Sunday. Tactical skill was needed to decide when to use 2m and when 70cm, remembering that the latter carried a highly welcome multiplier of six.

During the weeks preceding the big March event the always popular 70cm Cumulatives were clobbered by power cuts but did not lose the "family gathering" spirit which informs them when conditions are normal. To work nearly 30 stations in two hours, as some of the better-sited operators did, showed that the occupancy was there all right, if localized.

Low band on Low Sunday, meaning the 70MHz Open on 9 April, could produce additional counties worked for the newercomers to 4m, and could bring the FMD Certificate for this band a little nearer (you need only three plus 20).

For keyboard men a date to note is 14 May, when the Mid-Severn Valley Teleprinter Group holds its annual 144MHz contest between 1000 and 1600bst. The rules are based on the RSGB General Rules for VHF Contests, and a copy may be had from Bob Fisher, G3PWJ, 47 Elmhurst Drive, Kingswinford, Brierley Hill, Staffs, if you send him an sae.

Overseas beacons

Here is an interesting one for those seeking after super-dx to check. It is at Vidnoe, 20km south-east of Moscow and operates on 145·5MHz with 50W between 2000 and 2100gmt and 0215 and 0300gmt daily. The Yagi is orientated on the following bearings: 180° from 2000 to 2015 and 0245 to 0300gmt; 270° from 2015 to 2030gmt and 0230 to 0245gmt; 360° from 2030 to 2045gmt, and 90°, which being east is of minimal interest to us in the UK, from 2045 to 2100gmt. Obviously the 270° cycles are the ones to look for in western Europe. Callsign is UK3A.

We note from *The Victorian VHF-er*, the lively newssheet published by the VK3 metre-wave men, that there are numerous beacons in the Pacific region, on both 2m and 6m in most of the Australian call areas, and on 2m in New Zealand (ZL1VHF, Auckland, 145·1, ZL2VHF at Wellington and ZL3VHF at Christchurch both on 145·2MHz). Three VK0 beacons radiate on 6m from Antarctica, and there are two in Hawaii. South Korea has HL9WI on 50·1 and Japan JA1IGY on 51·997MHz.

Certificates issued

Of the 30-plus-five cards submitted by the Dunstable Downs Radio Club for their 2m portable claim, no fewer than 22 were for contacts made during VHF NFD of 1970. To have to wait 18 months to get the last cards in means that some of the people worked were unconscionably slow in acknowledging. Annually, NFD produces many contacts to fill county gaps for those waiting to submit a Four Metres and Down Certificate claim. Send off cards to wanted counties immediately after 3 September next, when NFD is done. Right now, G8DDC/P has Certificate No 252 ready for display.

Whoever has holidayed in Hastings will know the problems members there have facing them. They are called the South Downs, and 2m signals do not like to go over them. So when Jim Davies, G8EBJ, submitted his FMD certificate claim he reported having worked over 700 stations in all, including 200 Frenchmen, but never a PA0. Persistence with the more difficult counties out to the north has brought him 144MHz Transmitting Certificate No 251. No 253 goes to G8EBF, Wolverhampton, and 254 to G3XFW of Yeovil.

Expeditionaries

Here is the itinerary of the expedition which the three GM men, '3ZVB, 'ZVL and '4AIS have organized under the special callsign of GB3GWC/P to embrace operation in G, GW and GM:

May: 13, Wigtown; 14, Kirkcudbright; 15, Dumfries; 16, Lanark; 17, Peebles; 18, Selkirk; 19, Roxburgh; 20, Cumberland; 22, Westmorland; 23, Flint; 24, Denbigh; 25, Caernarvon; 26, Merioneth; 27, Mont; 28, Cardigan; 29, Staffs; 30, Yorks; 31, Northumberland; June: 1, Berwick; 2, E. Lothian.

Operation: 1900-2300 clock time, first 30min tuning for A3 contacts, next 15min for co-channel A3, last 15min cw zone, continuing after 2300 if activity warrants.

Schedules: send sae to GM3ZVL, Roger Manners, 165 Mayfield Road, Edinburgh EH9 3AY.

Two Lancastrians, G8AYD and G8CZE, will be operating on 145·75MHz from Holland on 13-15 August, Luxembourg from 17-20 August and Belgium from 23-26 August, and if a Class A licence comes through they will be in the cw zone as well. There will be 30W into the feeder of a 10-el. Operation will be at breakfast time to catch the early morning lift, and 9pm to midnight each evening. To get on the sked-list send an

BEACON STATIONS

Callsign	Location	Nominal frequency	Emission	Aerial direction
GB3ANG	Angus	145·95MHz	A1	SSE
GB3CTC	Redruth, Cornwall	144·13MHz	A1	ENE
GB3DM	Burnhope, Co Durham	145·975MHz	F1	N/S
GB3GW	Swansea	144·25MHz	A1	ENE
GB3GM	Thurso	70·305MHz	A1	N/S
GB3GM	Thurso	145·995MHz	A1	N/S
GB3GEC	W. London	433·45MHz	F1	N/W
GB3SC	Sutton Coldfield	433·50MHz	F1	N/S
GB3SU	Sheffield (temporary location)	70·695MHz	A1/F1*	Omni
GB3SX	Crowborough Sussex	28·185MHz	A1	E/Omni
GB3SX	Crowborough	70·699MHz	A1	N
GB3VHF	Wrotham, Kent	144·500MHz	F1	NW

* Callsign on F1 continuously, on A1 once a minute. When on A1, F1 is suppressed

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sae to G8AYD, R. M. Clarke, "Hillside", Quickedge Road, Mossley, Ashton-under Lyne, Lancs.

Here and there

Never send cards for FMD Certificate claims to headquarters, always to G5UM. For safety use recorded delivery. And that goes also for contest entries sent to the named adjudicators.

Delete G8DXE from your copy of the current *RSGB Callbook*, and mark against it "Now G4AWJ." And listen for a big signal from Heathfield in Sussex with this new callsign behind a 3-el on 4m.

* * *

A note for 70MHz contestants on 9 April: GM3XWJ will be motoring from Liverpool to Newcastle, stopping high up on Hadrian's Wall, Northumberland, in the afternoon. Calling channels 70·26 and 70·375 at 25W, with crystal controlled receiver. All dx contacts and reports on G3XWJ/M will be QSLd.

* * *

The licence requires all test transmissions to be logged. Leaving mute carriers running is wrong, announcing your identity is right (you cannot conceal it anyway: the locals will know). Best of all, use a dummy load like the one on page 7.51 of *Radio Communication Handbook*.

25 YEARS BACK

"The full provisions which the G.P.O. are proposing for amateurs at the World Telecommunications Conference are now known . . . The Society has registered the strongest possible protests against the omission of a band around 60Mc/s . . . the impasse appears to be due to the encroachment of television"(The proposals also included an exclusive band at 168-170Mc/s and a shared band at 400-415Mc/s).

RSGB Bulletin, April 1947.

GB3MSA, Poldhu, 11-16 December 1971

This station was organized and operated by the Cornish Radio Amateur Club to mark the 70th anniversary of the first Transatlantic transmission from Poldhu to Newfoundland. The total number of contacts was 1,158, of which 165 were on cw. There were also 79 unanswered CQs and 84 lost contacts. Of the 14 mobiles contacted, one was a VK2 near Sydney.

To mark the other end of the link the Society of Newfoundland Radio Amateurs operated VB1MSA and it is issuing a certificate to those who worked both ends of the link. To simplify claims, a log extract for the two stations worked (VB1MSA and GB3MSA) with a stamped envelope addressed to VO1FX, PO Box 1462, St Johns, Newfoundland, Canada, and two IRCs for the reply should be sent to A. H. Hammett, G3VWK, Rosehill, Ladock, Truro, Cornwall, who will certify the GB3MSA entry and forward it to Canada.

Cornish Radio Amateur Club's Marconi Anniversary station at Poldhu in December 1971. Standing, l to r: Tony; Keith, G3XFL; Bert, G3VWK; Len, G3RMG; Bill, G3NKE, and two visitors. Seated l to r: Joe, G3THT; Bill, G3XC, and Clive, G3OCB

COUNCIL PROCEEDINGS

A brief report of the Council meeting held at Society HQ on 11 February 1972

Present: *Mr R. J. Hughes (President, in the Chair), Messrs B. D. A. Armstrong, J. O. Brown, W. J. Green, E. G. Ingram, G. R. Jessop, W. F. McGonigle, L. E. Newnham, C. H. Parsons, J. R. Petty, R. F. Stevens, G. M. C. Stone, F. C. Ward, E. W. Yeomanson (members of Council), D. A. Findlay, general manager, A. W. Hutchinson, editor.*

The President extended a warm welcome to Mr W. J. Green, G3FBA, whom the Council had invited to serve as Zone C Council Member.

The President reported that Mr A. W. Smith, GM3AEL, Zone G Council Member, who had recently been admitted to Aberdeen Royal Infirmary, had made good progress and was now at home although still receiving medical attention.

Apologies for absence had been received from Dr E. J. Allaway, Messrs J. Bazley, W. A. Scarr and A. W. Smith.

Official Regional Meetings

The President asked that ideas and suggestions should be put forward for the Regional Meetings in 1972.

The difficulties of organizing meetings were pointed out and it was accepted that there was a lack of guidance and information from headquarters. It was agreed that Regional Representatives should be encouraged to organize meetings and that support should be forthcoming from Council and headquarters.

Dr J. A. Saxton

Mr Hughes reported that he had written to Dr J. A. Saxton asking whether he would be prepared to serve as President in the Society's Diamond Jubilee Year, 1973. Dr Saxton had replied expressing his appreciation of the Council's action and stating that he would be prepared to serve as President in 1973.

It was agreed that Dr Saxton should be invited to attend Council and committee meetings during 1972 in order that he should be informed of the current activities of the Society.

Finance report

The Hon Treasurer reported that the provisional accounts which had been drawn up at 31 December 1971 indicated that the deficit for the year would possibly be less, by approximately £1,000, than the forecast, and the deficit might therefore be £2,000.

Mr Brown pointed out that expenditure on production and despatch of *Radio Communication* was still increasing but that it was hoped that suggestions made by the editor would help to off-set the increased postage rates that would come into effect in March 1972.

Mr Brown said that the results were not too disappointing but that he was not complacent and great efforts had to be made to reduce the expected deficit.

GB2RS news readers

Mr Parsons reported that he had recruited Mr J. Burns, G8FNL, Weston-super-Mare, as a GB2RS news reader on 2m. From his location G8FNL would be able to put a strong signal across the Bristol Channel into the South Wales area.

It was agreed that Mr Burns be invited to serve as news reader for the GB2RS news and that the MPT be asked to add his name to the licence.

Membership and affiliation

The general manager reported that the number of new members, transfers and reinstatements processed up to 15 January 1972 was only 53. However, it had been necessary to close the January figures earlier than usual and the number processed from 15 January to 10 February amounted to 214. There would probably be a further 100 applications to be dealt with in February and the total new members for January and February would show an upward trend in membership.

It was resolved.

(i) to accept reduced subscriptions from four members;
(ii) to waive the subscriptions of two members on the grounds of blindness or other disability;
(iii) to grant affiliation to the Amateur Radio and Electronics Society of Brentwood School, Henry Compton Comprehensive School Wireless Society, and the Furness Amateur Radio Society.

Headquarters station

It was agreed that the station should be operated as an example of good operating and encouragement to all operators; as an indication of the interest of the Council and headquarters in amateur operating; and as a means of maintaining the status of the Society with its members and all other national societies.

It was also agreed that the station should be available for use under the terms of the licence at such times as were approved by the Council in consultation with the general manager. It would be available at the discretion of the general manager to members of the Society who fulfilled the necessary licence qualifications and who had made a prior request for permission to operate.

Rules for the operation of the station would be drawn up and it would be emphasized to all operators that only the highest quality signal would be radiated and the standard of operating must be impeccable and an example to all amateurs.

Committee terms of reference

The draft terms of reference for the following Committees were considered, amended as necessary, and approved:

VHF Contests Committee;
Education Committee;
Finance & Staff Committee;
MPT Liaison Committee;
Membership & Representation Committee;
Raynet Committee;
Scientific Studies Committee;
Technical & Publications Committee;
VHF Committee, and
TVI Committee (subject to reference back of Clause 7)

In considering the Standing Orders it was agreed that the practice of including a very short report on committee activities in the Annual Report of Council was not satisfactory. It was decided that, in future, reports on committee activities would be published in the first possible issue of *Radio Communication* after approval by Council in January, and they would therefore give a more detailed account of committees' activities during the year.

Committee minutes

Council approved the minutes of the Education Committee (13.11.71); Finance & Staff Committee (15.12.71); HF Contests Committee (9.12.71); Membership & Representation Committee (2.12.71); Mobile Committee (2.11.71); IARU Working Group (19.11.71); Scientific Studies Committee (6.12.71); TVI Committee (8.10.71) and 22.10.71); VHF Committee (1.12.71); VHF Contests Committee (18.11.71 and 1.12.71), and VHF Contests Committee (6.1.72).

Beacon GW3GW—Swansea

Mr Parsons reported that the 2m beacon was now serviceable. He asked that agreement be given for the installation of a 70cm beacon on the same site. Mr Stone asked Mr Parsons to provide details so that an application for a licence could be made.

Publicity—Membership & Representation Committee budget

Mr Parsons, chairman of the Membership & Representation Committee, asked that Council give approval for a budget for six months to 30 June 1972 for membership advertising expenditure. After considerable discussion it was agreed that a budget be made available for advertising expenditure subject to supervision by the Hon Treasurer. It was also agreed that copy for advertising should be produced in co-operation with the editor.

University of North Wales Amateur Radio Society

Mr Ward reported that he had attended a meeting of the University of North Wales Amateur Radio Society and had presented the VHF Manager's Trophy to the society.

YOUR OPINION

The Editor
Radio Communication

Sir—I read the article by P. W. Waters, G3OJV, in the February issue with great interest. As I have had a long association with vertical aerials, from both a professional and an amateur standpoint, I thought I might add a few remarks to his article which might help some of your readers (and Mr Waters) get a little more out of their vertical aerials.

I think the first thing that one must remember about a vertical aerial is that it is deceptively simple. Without careful installation techniques, however, they can be nothing but an inefficient pain in the neck. Most commercial manufacturers of these things recognize this and try to present their aerials with a simplified set of installation instructions and all necessary hardware. This permits standardized installations, reasonable aerial efficiencies, and relatively few dissatisfied customers (and hence more sales). The reports which G3OJV quotes are typical of his aerial and could be expected in 10,000 other locations with similar installations.

But why not try to improve this a little? The average efficiency of the installation which he describes is possibly as high as 20 or 25 per cent. If it could just be increased to 40 per cent or so, it would be the same as doubling the transmitter power and lowering the receiver threshold by a factor of 1·4—a significant improvement. For a few hours' work spent in doing this you will reap the rewards of far greater pleasure on a long-term basis than you can imagine.

Let us begin with the ground plane itself. First, the ideal ground is an infinite sheet of perfectly-conducting material. The best we can do at temperatures above absolute zero is to put the vertical on a raft in the middle of the sea—but most of us do not own a sea. The idea of a resonant earth (or ground system) carries me back to the 'thirties and 160m phone operation with a counterpoise; it does little to enhance my ideas about a ground-plane aerial. And the idea of the ground plane is to return current to the base of the aerial—and thence to the pa, to complete the circuit. Therefore, the more current that is returned (or, conversely, the less that is used to warm the worms, flies, rain gutters, or ventilation stacks), the greater the efficiency. So we need more radials.

Good engineering practices for broadcast stations dictate the use of *at least* 120 radials, extending *at least* $\frac{1}{4}\lambda$ from the base of the aerial. The more radials, the better. The farther, the better (although the amount of current returned from lengths greater than $\frac{1}{4}\lambda$ is small, it helps). Since it is quite common practice to bury radials, the question of the insulators immediately raises its head. Why? Well, it's because the manufacturers do not want you to tie a radial to some metallic object which may result in an unbonded joint, or which may have an unbonded surface itself. This could cause all kinds of problems in the tvi field, make the tv viewer unhappy with you, and make you unhappy with the manufacturer.

So use as many radials as possible. Make them as long as possible. They do not have to be resonant. They do not have to be all the same length. They do not have to be flat. They do not have to be insulated. They can be plain galvanized iron wire (AWG16 is a good size). They can be tied to fences, trees, shrubs, the neighbour's garage, your garage, or almost anything. At least one of them should be securely bonded to an earth of some type, and if any of them are attached to anything metallic, the joint should be bonded and the metallic object itself scrutinized carefully to make sure that there are no places where it is not fully bonded.

You will find that the vswr of the aerial slowly drops as the number of radials is increased. Mr Waters' method of cutting a radial for minimum vswr is not necessary and not desired. It may cause an increase in the vswr on another band which is not noticed. So for operation with the 14AVQ, the radials should all be at least 35ft long for best results. However, many short radials are better than a few (eg two or three) long ones. Many long ones are the best of all.

It will also be noticed that the vswr will be improved slightly if the radials droop slightly away from the aerial. If the aerial is mounted on the ground it may be advantageous to feed it with two 72Ω cables in parallel to reduce the vswr (since the impedance of a quarter-wave vertical over a perfect ground is 36Ω).

Now adjust the individual aerial lengths (if you are using a trap vertical) for the lowest vswr at your favourite operating frequencies. Hy-Gain's admonition, noted by Mr Waters, about being restricted to a particular group of settings, is strictly for the reasons outlined in the second paragraph. Start with 10m, then proceed through the bands in an upward direction. But step well away from the aerial, or else get below your ground plane, before making your measurement. OK, it takes a little time—but it is worth it, especially in the added pleasure.

If you really want performance plus out of a ground plane, then just buy the 10m and 15m traps from the manufacturer, and about 50ft of aluminium tubing which can be telescoped in two sections with the traps. Put out as many long radials as possible, and then adjust element lengths to $\frac{1}{4}\lambda$. At this point the base impedance of the vertical is about 50-150Ω (it actually depends on the individual installation), and the reactive component can be "tuned" out with a small coil (0·6μH for 14MHz) at the aerial base. A switching network at the aerial base is required for multi-band operation, but it is worth it. With a home-built aerial of this type, guyed with 100lb test nylon fishing line (monofilament), I worked 268 countries on 80, 40, 20 and 15m between 1952 and 1956. On 40 and 80 the only station on the West Coast of California who consistently beat me out was W6AM, and Don had a field of rhombics. This vertical, if properly set up, has a gain of about 3·5dB over a dipole (not an isotropic), and concentrates about 75 per cent of the radiation below 20°, making it an ideal dx aerial. It also has a small high-angle lobe which makes it good for those local or short-skip QSOs.

Vertical aerials do work. They work well. If you are only struggling along with 100W into the aerial to start with, you can get a lot more good out of it if you spend a little more time on the aerial than the manufacturer intended. Use his recommendations for a starting point. Remember *why* he has written them, and go on from there. If you want a really good vertical, that is . . .

73,

Alfred M. Faries, W6OOU, W3SV, DJ0YJ, HB0XTD
(and formerly many others in various out-of-the-way places)

The Editor
Radio Communication

Sir—The advice given by J.W.S. in the February issue to do something about it when faced with interference problems seems sound enough. The question is, what should one do? There are many valid reasons for membership of the RSGB, but this of itself does not contribute towards finding a cure although it is comforting to be assured that one would have the Society's backing when the fight begins.

TVI can be dealt with, either completely cleared or reduced to negligible proportions by following well-publicized techniques. The greater problem is posed by the transistor radio, stereo radiogram, tape recorder and, of all things, the electronic organ. Whereas, with a really obstinate tv set one may come to an amicable arrangement with the owner, such as avoidance of peak viewing times, these diabolical devices are employed at all hours of the day or night. It is useless trying to reason with the complainant that the fault is in his gear, to return it to the shop and get it fixed, assuming the supplier to be willing, competent or even capable of understanding the problem. One such "expert" suggested that my aerial must be leaking. The final crunch would be the question of payment, as I cannot see this work coming under the terms of any guarantee, and the owner would be most indignant if called upon to foot the bill. I quote from experience. An old tv set next door was troublesome, apparently due to fundamental breakthrough. A demonstration on my old set in the shack made the point that the fault lay in their set, yet the Post Office request for payment for the three filters they found necessary was flatly refused. As the amount was most reasonable, and in the interest of good neighbourliness, I paid up.

One can quite well visualize the consequences of poking around oneself into the offending unit hunting for a cure. The amateur would be well and truly laying himself open to the charge that it worked fine before he touched it, but it has never behaved since. In fact, with the miniaturized special construction of modern gadgets, he may do some expensive damage or invalidate a guarantee. Stalemate?

We have our "rights'. We may find it quite legal to create this kind of nuisance, but an over-riding factor is that we have to live with our neighbours. To lose their goodwill, to be ostracized, can be too great a penalty, and to submit to social blackmail seems inevitable. It is too late to hope for legislation aiming at compulsory improvement in the manufacture of the subject devices. They are already in the homes and markets and it would take years to have any effect.

One final point, what action can be suggested when, as in my case, that old tv set in the adjoining house has been replaced with

a new colour set which, in spite of the earlier experience, has been located, aerial also, as close as it can be to my shack and now I get a bad case of tvi in reverse. The burbling racket throughout the hf, and If, spectrum is most distressing. Futile to suggest that they move it, household arrangements demand that it be so located. One could view this under the heading of illegal use of transmitting apparatus and causing undue interference with other services! Is this radiation deliberately built in to assist the detector van crews?

I feel that the only solution to these problems would come from the realization of every amateur's dream of paradise, a lonely shack on top of a hill—with all mod cons of course.

Yours faithfully,
H. Chadwick, G8CI

The Editor
Radio Communication

Sir—The letter from GM3UMW in the November issue interested me, and I would be very pleased indeed if the suggestion he makes regarding unclaimed QSL cards could be made to work, but I doubt it. The ones who are not interested in sending envelopes for the QSL cards are probably not interested in the News Bulletin. Since I became QSL sub-manager for the GB calls a year ago, I have received cards for over *500 different* GB stations and only 70 SAEs and many of these as a request over the air when I have been in QSO, or by writing to the person responsible for the licence, and who have very graciously refunded my postage. Nevertheless I must have a few thousand unclaimed cards, many of them from very attractive dx calls. It would appear that the enthusiasm that goes into the operating of a special station vanishes as soon as the station closes down. Some stations, I agree, ask that no QSL cards be sent, though they themselves QSL all contacts. This is fine, but ignores completely the listener who sends in his report in order to receive this "special" QSL. No matter what we think of these reports, it is to my mind one of the duties of the people who go to all the trouble of setting-up and operating a station from some remote uninhabited island, to oblige these SWLs who will be the licensed amateurs of the future. Only by collecting the incoming QSLs are they aware of these listeners.

Yours faithfully,
C. Turner, G8NL

The Editor
Radio Communication

Sir—With reference to the suggestion in the January "SWL News" that SWLs should report on hf band operation by urban amateurs in the UK, I feel that great care should be taken when drawing conclusions from swl returns.

I think it unwise to draw inferences about the relative merits of the various modes of transmission on the basis of returns from them. The returns will surely not be representative of hf bands operation, as I have yet to meet an swl who is interested in cw. I am operational in the London area on both 14 and 21MHz cw and ssb, but I am sure that the swl returns will indicate that I operate ssb only.

My own observations, which are of course inconclusive, are that there are more Gs on hf cw during tv hours in the London area than on ssb.

Could it be, therefore, that cw is less likely to cause tvi than ssb, or will the swl reports indicate, completely falsely, that British amateurs can use only ssb on the hf bands during tv hours?

I would hate a false picture to emerge.

Yours faithfully,
R. G. D. Stone, G3YDX

The Editor
Radio Communication

Sir—It may be of some interest to you, the fraternity within the orbit of the circulation of this journal, to hear of my experience after placing a Members Ad in *Radio Communication*.

It appeared in the January issue, and as a result I have been showered with helpful letters from all parts of the British Isles. Many sending the relevant information free of charge.

I am most grateful to all concerned and have replied to them all. The local post office was most interested to know what I was doing with all the stamps!

But the story does not end there. I received an airmail letter from a Mr Charles R. Wilson, K1GVA, in Portland, Maine, USA, dated 17 February, and I now quote from this letter:

"HI OM. Saw your ad in Jan Rad Comm. I have a copy of the LM15 technical manual that you can have if you want it. The only difference between the 14 and 15 is that the 14 is battery operated and the 15 is operated from a power supply (ac type).

If you want this manual, just ask for it. 73, Bob."

Now, Mr Editor, I am shattered, I am amazed, I am delighted. What more effective illustration could be envisaged, to adequately portray the fraternal amateur radio spirit?

I am, of course, communicating with K1GVA right away.

Yours most fraternally,
S. G. Charles, BRS33089

The Editor
Radio Communication

Sir—I would like to draw all members' attention to the new NFD rules published in February 1972 *Radio Communication*. These appear to be the result of a questionnaire which was issued to all affiliated societies, and while the HF Contests Committee has no doubt done its best to satisfy the majority, there must surely be a case here for publishing the results of this inquiry.

NFD, as we know it, has now changed completely. Gone are all the rules that made it different from an ordinary contest. (The strict rule of tents only has been abolished. Entrants are no longer restricted to using wire aerials. The mad rush to get everything up and going in the five hours prior to 1700z (surely an art in itself) has also been discarded.)

The North Bucks ARS mourns its passing and hopes other clubs feel sufficiently likewise to write to the editor and say so.

Perhaps we may use a microphone next year?

D. A. Shepherd, CEng, MIERE, G3LCS,
Chairman, North Bucks ARS

The Editor
Radio Communication

Sir—It is easy, I know, for rockbound operators to complain about the "vfo boys" but unless these frequency varying devices are used sensibly things will surely get quite out of hand.

For ease of operating and efficiency (laziness?) co-channel operation has obvious advantages when working local stations, particularly in nets, and is seemingly a near necessity for working Continentals. However, the following points are interesting with regard to working more distant British stations, especially during good conditions:

1. If one calls CQ "in zone" listening on one's own frequency a dx station calling is likely to be interfered with by local stations on adjacent frequencies.
2. It follows, therefore, that a dx station calling CQ in **his** own zone, listening on **his** own frequency will suffer from similar problems and is less likely to hear you than he would if you were in your own zone.
3. Any station operating "out of zone" is likely to cause interference to his locals.

The simple answer is to stay in zone, tune the part of the band inhabited by stations in the area one is hoping to work, and use the vfo simply to find a clear frequency on which to operate within one's own zone.

The advent of the vfo on 2m has been coincidental with a large increase in out-of-zone operation. If co-channel operation on 2m for dx contacts is an attempt to bring the operating procedures into line with those of the hf bands it is a retrograde step. Many hf operators now find it essential to listen on a different frequency to that which they are transmitting on ... "Spread out please," they cry.

Yours faithfully,
R. J. Nettleton, G3YED

OBITUARIES

Mr A. Young, G5CC

Alfred Young, a pioneer of amateur radio in Bath, died on 7 February aged 83. During his lifetime he held callsigns AYX (spark), G5CC and G2FL.

Mr R. G. E. Martin, G3PNY

Bob Martin died on 22 February, aged 51. He was a member of the Torbay Amateur Radio Club.

We have also been advised of the death of:
Mr J. C. D. Nourse, VK2WQ, on 5 November in New South Wales, Australia.

MOBILE RALLY NEWS

Chiltern Mobile Rally, 28 May
Organized by the Chiltern Amateur Radio Club, this rally will be held in the grounds of Sir Francis Dashwood, Bt, at West Wycombe, near High Wycombe, on the same day as an annual steam rally.

Talk-in on 160m and 2m. Further details from G3OUV, telephone High Wycombe (0494) 21612.

Cornish Mobile Rally, 9 July
This rally, organized by the Cornish Radio Amateur Club, will again be held at the Truro Rugby Football Ground. Talk-in stations will be operational on 1,875kHz a.m., 3,720kHz ssb, 70·375MHz a.m. and 2m a.m.

Mobile Rallies Calendar

16 April	North Midlands, Drayton Manor Park, Near Tamworth, Staffs.
7 May	Spalding Tulip Time.
21 May	Northern, at Moor Grange School, Ring Road, West Park, Leeds.
28 May	Chiltern ARC at West Wycombe.
28 May	Hull & DARS at College of Agriculture, Bishop Burton, Beverley
11 June	Third Elvaston Castle, Elvaston Castle Countryside Park, Nr Derby
18 June	Anglian, at Suffolk Show Ground, Ipswich
25 June	Bristol City & County RSGB Group, at Longleat, Warminster, Wilts.
2 July	South Shields & DARC.
9 July	Cornish RAC at Truro Rugby Football Ground.
16 July	Worcester & DARC, at Hill County Secondary School, Upton-on-Severn, Worcs.
6 August	Woburn Abbey Rally
13 August	Torbay ARS at Newton Abbot Rugby Ground
13 August	Derby & DARS at Rykneld Schools, Bedford St, Derby
20 August	Saltash & DARC at Saltash Grammar School.
27 August	Preston ARS at Kimberley Barracks, Preston.
26–27 August	Stratford upon Avon RC and Mid-Warwickshire ARS combined in conjunction with National Town & Country Festival, Royal Show Ground, Kenilworth, Warwicks.
24 September	Harlow & DARS.

Special Event Station

Long Eaton Carnival, 20-21 May
The Amateur Radio Club of Nottingham will be using the callsign GB3LEC in connection with this carnival at West Park, Long Eaton. Operation will be mainly during daytime on 160-10m and 2m.

Looking ahead

18 April—"Dud" Charman, G6CJ, "Aerial Circus" at Lichfield ARS.
22 April—VHF Convention.
5 May—RAOTA Reunion.
20 May—BARTG Convention.
25 June-1 July—Echelford ARS "At Home" (GB3HCW), Hanworth Carnival, Hanworth Airpark, Middx.
26-27 August—Harlow & DARS at Harlow Town Show, Town Park, Harlow.
23-24 September—NW Amateur Radio Convention; University of Lancaster.

TVI thought for the month

Analogies are often useful when explaining tvi. Playing tennis on a sunny day is like tvi: it is difficult to see the ball when looking towards the sun without an eyeshade, in a similar way an ordinary television receiver has difficulty in sorting out the television signal in the presence of a strong local signal—**filters take the place of an eyeshade.**

RAYNET

by S. W. LAW, G3PAZ*

MOST of the problems resulting from the recent power cuts did not inconvenience those Raynet members who had ample emergency arrangements at home. Many even kept the home screens glowing to the great wonder of neighbours and the pride of families. All well and good, but Raynet members more than many people are aware that no man is an island and what is merely a challenge to our own ingenious inventiveness can assume the proportions of a full-scale calamity to those who do not possess our training or advantages.

It is, therefore, good to hear of various group endeavours in connection with any troubles arising during the periods when normal power was not available. As an example, we mention the lengthy stand-by of the Glasgow group under GM3VQJ who co-operated at the request of the local police and the British Red Cross Society to ensure that each member was ready to operate at any time available during cuts, and that all mobile stations were completely equipped at all times. A system was instituted for the speedy location of members when not at their homes, and a manning rota worked out for the local Red Cross base station during all power cuts, with the willing help of the WRVS in the capacity of incident location and message handling other than by radio channels. The local press also published particulars of the help available and the relevant addresses, telephone numbers and so on.

Needless to say, emergency power and light plus telephone facilities were available at all times at the base station while the cuts were in operation. Both 2m and 4m were fully useable and some mobiles even carried spare field telephone equipment for use if required.

The police were most impressed with the set-up and have asked GM3VQJ to investigate the possibility of monitoring the local Mountain Rescue Service. GM3VQJ reports that recent exercises have produced 55 signals on *half a watt* at 70MHz both ways over the 22-mile path from the top of Ben Lomond to the base station in Glasgow. Not resting on that achievement, the base station has also worked GM3TNT on 70MHz from his location on the Kintyre Peninsular; a path of 90 miles.

Pollution stand-by
It is reported that both the Cornwall and the Newquay groups were called to stand-by during the February scare over the numerous drums of dangerous chemicals cast ashore. As events turned out, the trouble was contained by the Coastguard vhf and police radio, and the assistance of the amateur service was not called upon. In this area the fire service and ambulances both have their own systems of communications, so it will have to be a very serious set of mishaps indeed before these groups get another chance of showing their prowess.

SE controllers meeting
Despite the decidedly unpleasant weather conditions on 5 March, they did not stop an attendance of nearly a dozen controllers and others of the SE section at RSGB HQ to spend some five hours in ironing out mutual problems and exchanging ideas. Some of the more easterly absentees could well be excused the journey in view of the conditions that day, and it reflects great credit on those who found the trip possible.

Floods
Conditions similar to the preliminary dangers of 1953 were noted in the East Anglia area prior to last Christmas yet, according to the Raynet groups thereabouts, there would appear to be no improvement in the official warning arrangements. It has, therefore, been decided to set up a form of early warning standby system with the assistance of a swl member who is in an admirable position to initiate a warning of any dangerous tidal surge some three hours sooner than might otherwise be received through official channels.

Honorary registrations secretary: **Mrs Jane Balestrini, "Merrivale", Willow Walk, Culverstone, Gravesend, Kent.**

* 130 Alexandra Road, Croydon, Surrey, CR0 6EW.

CONTEST NEWS

IARU Region 1

VHF, UHF and SHF Contests

Contests held in IARU Region 1 on the 144MHz and higher frequency bands fall into two categories, regional (or international) and sub-regional (or national). Regional contests are judged by the organizing society, which may be any of the societies in Region 1. Sub-regional contests are organized and judged by the national societies, but are arranged to coincide. The organizing society for the two international contests in 1972 is the RSGB, and the VHF Contests Committee looks forward to a record entry from UK amateurs.

The rules, reviewed every three years by a conference of vhf managers, are unchanged for 1972. The IARU VHF/UHF Contest coincides as usual with our VHF Field Day. There will also be an RSGB event running concurrently with the IARU UHF/SHF Contest, in that the RSGB will publish separately in *Radio Communication* the results for UK stations and will award certificates to the leading UK entrants in each section.

September 1972 IARU Region 1 VHF/UHF Contest rules

The following rules have been extracted from the general rules for IARU Region 1 vhf/uhf contests:

1. Eligible entrants. All licensed radio amateurs resident in Region 1. Multiple operator entries will be accepted provided only one callsign is used. Contestants must operate within the letter and spirit of the contest and at no greater power than permitted in the ordinary licences of their country. Stations operating under special high power licences do so *hors concours* and cannot be placed in the contest proper.

2. Sections.
(i) Fixed stations 144MHz
(ii) Portable/mobile stations 144MHz
(iii) Fixed stations 432MHz
(iv) Portable/mobile stations 432MHz
Portable/mobile stations may not change their location during the event.

3. Date and time. 1800gmt on 2 September to 1800gmt on 3 September.

4. Number of contacts. Each station can be worked once only on each band, whether fixed, portable or mobile. If a station is worked again on the same band only one contact will count for points, but any duplicate contacts should be logged without claim for points and should be clearly marked as duplicates.

5. Types of emission. Contacts may be made on A1, A3, A3j or F3.

6. Contest exchanges. Code numbers exchanged during each contact shall consist of the RS or RST report, followed by a serial number commencing at 001 for each band and increasing by one for each successive contact on each band. This exchange must be immediately followed by the QRA Locator of the sending station. (Example 579021YG46E.) QTHs may also be exchanged if desired.

7. Scoring. Points will be scored on the basis of one point per kilometre. The final claimed score must be shown at the top part of the first sheet.

8. Entries. Entries must be set out as shown in the example below. (See notes and VHF NFD Rule 19.) They must be postmarked not later than 18 September and must be addressed to: The Chairman, VHF Contests Committee, 20 Harcourt Road, Wantage, Berks. Late entries will not be accepted.

9. Disqualification. Entrants deliberately contravening any of these rules will be disqualified. Minor errors may result in loss of points. Errors in callsigns and code numbers will be penalized by deducting the following percentage of claimed scores for both stations.

One error: 25 per cent. Two errors: 50 per cent. Three or more errors: 100 per cent.

The claimed contact will be disqualified for
(a) an obviously wrongly stated QTH when no QRA Locator is exchanged, or (b) a time error of more than 10 minutes.

10. Judging. Submission of a log implies acceptance of the rules. The decision of the organizing society is final.

11. Awards. The winner of each section will receive a certificate. The top score on 144MHz, whether fixed or portable, will be awarded the Region 1 VHF Trophy. The winner in the remaining 144MHz category will be awarded the PZK Cup.

October 1972 RSGB UHF/SHF Contest rules (as part of IARU Region 1 UHF/SHF Contest)

1. Eligible entrants. As for September VHF/UHF Contest above.

2. Sections. There will be two sections, fixed and portable/mobile, on 432MHz and every other higher frequency amateur band.

3. Date and time. 1800gmt on 7 October to 1800gmt on 8 October.

4-7. As for September VHF/UHF Contest above.

8. Entries. Entries must be set out as shown in the example below. (See notes.) They must be postmarked not later than 23 October and addressed to: The Chairman, VHF Contests Committee, 20 Harcourt Road, Wantage, Berks. Late entries will not be accepted.

9-10. As for September VHF/UHF Contest above.

11. Awards. The winner of each section will receive a certificate.

Notes

1. In some countries it is customary to use a band identification letter (A for 144MHz, B for 432MHz, etc). Should this letter be used or not used, no penalty will be exacted.

2. An RSGB cover sheet (Form 427) and RSGB log sheets may be used for entries, which should otherwise be in the IARU format given below.

3. In the case of the September VHF/UHF Contest, entrants in RSGB VHF NFD may enter both the radial ring score and the score based on points per kilometre on the same log sheet (see rules for VHF NFD). Scoring for the October contest will be points per kilometre only, on all bands.

4. In the UHF/SHF Contest, contacts made using F2 emission will be acceptable.

Sample contest log sheet

Contest..... Date..... Claimed score.....
Section..... Callsign.....
Name.....
Home address.....
Location of station: Latitude..... Longitude.....
Height above sea level in metres.... QRA Locator .....
Transmitter ..... Input power..... watts
Operating frequencies ..... Crystal or vfo .....
Receiver ..... Aerials .....

Date time	Call-sign	Serial numbers		QTH	Emission	Dist. km	Points claimed
		Sent	Received				

Declaration

I declare that this station was operated strictly in accordance with the rules and spirit of the contest and I agree that the ruling of the organizing society shall be final in all cases of dispute.

Date..... Signed.....

June 1972 Microwave Contest rules

When: From 1700gmt on 24 June to 1700gmt on 25 June 1972.

All entries and checklogs must be sent to: VHF Contests Committee, c/o G3VPK, "Maple Leaf", Great Braxted, Witham, Essex.

1. Scoring contacts may be made on any amateur frequency above 1GHz but lower frequencies may be used for setting up contacts.

2. Contest exchanges will be as follows:
On the 1·3GHz band — RS or RST report followed by a serial number, QRA locator and QTH.

On other bands — RS or RST report followed by a serial number, and brief details of the equipment in use (eg 2C39, SIM2, 20-el yagi); if the station has not already been contacted on the 1·3GHz band, QRA and QTH may be substituted for equipment details. Serial numbers begin at 001 for each band. Information should be passed on the band for which points are claimed and it should all be logged.

3. Scoring will be as follows:
   1·3GHz band: 2 points per kilometre
   2·3GHz band: 3 points per kilometre
   Other bands: 5 points per kilometre
4. The same callsign must be used on all bands for all scoring contacts.

Unless superseded by the above, the following General Rules will apply: 1, 2, 3, 4b, 6b, 7b, 8b, 9a, 10a, 11-24.

June 1972 70MHz Contest rules

When: From 1800gmt on 10 June to 1500gmt on 11 June 1972.
All entries and checklogs must be sent to: VHF Contests Committee, c/o G2HIF, 20 Harcourt Road, Wantage, Berks.

The following General Rules, as published in the January 1972 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11-24.

DF Qualifying Round—Coventry

Date: 23 April 1972.
Map: OS Sheet 132 (Coventry and Rugby).
Assembly: 1300bst for start at 1320bst.
Location: Layby on A445 approximately 4½ miles SE of Coventry NGR 373728. Frequencies and callsigns will be announced at the start.

This event is being organized by the Coventry Amateur Radio Society, and intending competitors are asked to notify Mr G. Whenham, Lavernock, 33 Chapel Street, Bishops Itchington, Leamington Spa, Warks, of the numbers in their parties requiring tea. Please advise him as soon as possible, and in any case not later than 10 April.

January 144MHz SSB Contest results

This was the first time that a 144MHz ssb contest had been timed for a Sunday morning and it attracted 10 more entries than the last ssb event in August. Contestants were almost unanimous that the conditions were very poor. Many stations experienced deep QSB and some commented upon the difficulty of working N-S.

G8BBB informs us that there were "No PA0 stations due to a German contest running at the same time." The winner, GW8ERP/P, made only one Continental contact, which is an interesting contrast to the August event, when the winner notched 31 Continentals from 70 QSOs. Certificates of merit will be awarded to GW8ERP/P and G8BBB. Check logs were received from BRS28005 and A7795.

M. D.

Posn	Callsign	Points	QSOs	County	Best dx	Km
1	GW8ERP/P	533	75	DB	F6BQH	410
2	G8BBB	397	67	CE	GI3RKE	550
3	GW4ABR/P	357	52	MH	F6BHQ	350
4	G3NAS	338	68	SD	GI3IUO	355
5	GD2HDZ	313	33	IM	G8BBB	356
6	G3WZT	296	40	SX	GW8ERP/P	302
7	G3DY	232	43	CE		
8	G4ARD/A	209	52	BD	GD2HDZ	355
9	G3NNG	204	45	BE	GD2HDZ	300
10	G3USB	194	—	CE	GW3ERP/P	235
11	G3WPO	189	38		GW3ERP/P	
12	G3FEC	163	39	BE	G4ARN	233
	G3OBD/A	163	26	DT	G3XIX	281
14	G8DDW	158	44	LD	GW4ABR/P	260
15	G8ABH	147	44			
16	G3PWJ	141	34	SD	GD2HDZ	230
17	G3OZT	137	22	HE	GW8ERP/P	290
18	G3AKF	134	39	OX	GW8ERP/P	220
19	G3NHZ	121	41	LD	GW8ERP/P	260
20	GW3NNF	114	17	AG	G8BBB	326
21	G8LLY	109	22	EX	GW8ERP/P	280
22	G4ARN	105	15	NK	GW8ERP/P	295
23	G3MWQ	99	29		GD2HDZ	
24	G3EHM	63	23	SD	GW4ABR/P	110
25	G3ZSS	55	24	SD	GD2HDZ	235
26	G3XDY	34	5	LN	G8ABH	240
	BRS28005	213	37	SX	GW8ERP/P	305*

* Forwarded to listeners' championship.

1971 21-28MHz Telephony Contest results

The result of this contest seems to have hinged on operating efficiency on 28MHz. A considerable number of UK operators suffered from an apparent lack of overseas activity on 28MHz. In actual fact there was quite a lot of activity but several overseas contestants had considerable difficulty in breaking through, especially from the Far East, Australasia, etc. DX was available on both bands, with good, long openings to Africa, the Middle East and South America. The USA was virtually non-existent on 28MHz, but 21MHz produced hundreds of contacts.

D. F. Beattie, G3OZF, was the clear winner, with P. J. Hart, G3SJX, in second place and G5YC, operated by G. Foster, G3ZOQ third.

The overseas section entry was very disappointing compared with previous years. There was a very low return from the USA which was probably accentuated by prolonged dock-strike troubles in that country. The winner was D. R. Taylor, 9J2DT, who found 294 UK stations on 28MHz (the HF Contests Committee wonders why only 39 UK entries were submitted); I. G. Stauning, 5B4IS, came second, and A. M. Pomfret, 7Q7LZ, took third place.

The Receiving Contest, with a considerably diminished entry to recent years, was won again by J. Skidmore, BRS26431; with R. A. Treacher, BRS32525, second, and S. Cole, A6148, third. The overseas receiving section, with a disappointing four entries, was won by UB5-070-47, a yl incidentally.

The standard of logs was generally good, although simple addition still causes problems for some. Will would-be entrants for the 1972 Receiving Contest please observe the new General Rules for contests published in January. Note, please, the rule regarding separate log sheets for each band. A considerable amount of time was spent checking and sorting mixed-band entries in this contest.

Some competitors, both transmitting and receiving, considered the re-introduction of 21MHz unnecessary. The committee feels, however, in the light of the results, that the move was justified. It is quite possible that due to the low form of 28MHz for periods of the weekend, the entry would have been lower still, due to loss of interest.

The committee expresses its appreciation for check logs from G2MI, G3TR, PY1BOL, UK6PAA, VK4PJ, ZE6JL, ZS2EM and A7732.

M. H.

UK TRANSMITTING

		21MHz		28MHz		
Posn	Callsign	Contacts	Bonus	Contacts	Bonus	Points
1	G3OZF†*	229	53	121	65	23,070
2	G3SJX*	136	44	103	58	19,955
3	G5YC*	288	52	77	48	17,947
4	G3WPO/A	211	45	65	45	16,180
5	G3WJN	504	60	49	33	14,995
6	G2QT	198	48	54	41	14,990
7	G3KMA	317	59	51	34	14,310
8	G3ILO	91	31	58	40	13,455
9	G3YTU	20	15	59	43	13,075
10	G3YBH	214	53	47	31	12,650
11	G3YAR	199	46	39	30	11,770
12	G3NKR	428	66	23	18	10,515
13	G3LHJ	189	54	27	22	9,820
14	G3MGW	175	49	32	20	9,125
15	G3WHK	226	51	24	18	8,780
16	G3YJI	124	31	28	22	8,370
17	G3KWH	47	22	30	24	8,085
18	G2FLG	34	23	30	23	7,820
19	G3DME	—	—	35	27	7,625
20	G3UMV	126	26	24	19	7,260
21	G5GH	42	20	29	21	7,185
22	GC3YIZ	223	38	19	14	6,975
23	G3TBK	32	15	32	21	6,960
24	G4ANH	187	47	15	10	6,160
25	G3GXO	30	17	22	17	5,800
26	G3UKH	50	20	20	14	5,250
27	G3UFY	46	20	15	14	5,105
28	G3XSL	344	65	—	—	4,970
29	G3MWZ	10	9	19	15	4,725
30	G3YFZ	83	31	22	8	4,515
31	G2FNK	112	30	9	7	4,035
32	G3JKY	41	20	10	9	3,705
33	G3NSY	99	30	4	4	3,095
34	G8KU	69	32	5	4	3,070
35	G3RTU	56	24	6	5	2,880
36	GD3WFT/A	84	23	1	1	1,845
37	G2AJB	40	15	2	1	1,250
38	G3JGC	47	19	—	—	1,185
39	G3ZDD	13	6	—	—	365

† Trophy winner
* Certificate winner

OVERSEAS TRANSMITTING

Posn	Callsign	21MHz Contacts	21MHz Bonus	28MHz Contacts	28MHz Bonus	Points
1	9J2DT*	—	—	294	15	11,585
2	5B4IS*	37	8	234	15	10,170
3	7Q7LZ*	10	5	163	13	7,600
4	SV0WOO	238	14	86	10	6,540
5	CX2CN	14	4	127	12	6,445
6	OD5BA	17	3	128	13	6,352
7	9G1DY	135	15	64	10	5,510
8	EQ2BQ	266	17	47	8	5,352
9	EQ2TW	328	18	31	7	5,065
10	RA6HEB	—	—	77	9	4,175
11	CR7IK	53	9	50	8	3,915
12	VS9MF	42	8	45	8	3,735
13	G3MUL/CE3	23	4	66	5	3,212
14	9H1CH	161	16	24	4	3,190
15	W5WMU/5	103	12	11	6	2,885
16	PY4KL	24	7	16	7	2,620
17	YU5CZ	198	17	—	—	2,545
18	ZE1CU	83	12	13	4	2,340
19	PY3APH	—	—	30	7	2,325
20	RA6HEE	—	—	15	6	1,875
21	LZ2EE	145	15	—	—	1,475
22	UK3SAB	134	14	—	—	1,370
23	UA6HBE	—	—	13	4	1,325
24	W2DKM	110	14	—	—	1,250
25	YO8AMT	120	12	—	—	1,200
26	UA3QO	97	12	—	—	1,085
27	UB5LU	94	12	—	—	1,070
28	UW3EH	88	12	—	—	1,040
29	LZ1CW	71	12	—	—	955
30	W4DQD	62	10	—	—	810
31	W8GUZ	51	10	—	—	755
32	OK3UE	18	7	1	1	715
33	UB5EM	50	8	—	—	650
	9M2DQ	50	8	—	—	650
35	K2DT	14	6	1	1	645
36	UK6LDZ	—	—	5	2	625
37	UK3AAA	50	6	—	—	550
38	I2PHN	31	7	—	—	505
39	JA6BSM	34	5	—	—	420
	UC2BF	14	7	—	—	420

UK RECEIVING

Posn	BRS or A No.	21MHz Contacts	21MHz Bonus	28MHz Contacts	28MHz Bonus	Points
1	BRS26431†*	152	57	91	54	19,379
2	BRS32525*	246	62	66	42	16,480
3	A6148*	—	—	90	51	15,000
4	BRS28005	70	30	60	46	14,835
5	A5904	125	47	72	40	14,775
6	BRS25429	117	41	53	37	13,210
7	BRS32432	105	41	53	35	12,650
8	BRS26407	76	47	43	30	11,305
9	BRS27880	39	19	51	34	10,920
10	A6222	102	40	50	28	10,757
11	BRS27781	56	36	39	30	10,555
12	BRS18461	70	35	38	26	9,550
13	BRS32123	30	15	40	29	9,150
14	A7120	20	9	40	29	8,800
15	BRS26003	50	25	35	25	8,625
16	A6325	74	24	36	24	8,467
17	BRS26870	95	37	24	21	8,175
18	BRS27330	58	29	32	22	8,040
19	BRS30628	53	36	23	20	7,640
20	BRS32457	84	32	26	15	6,420
21	BRS20249	99	38	16	13	6,045
22	A7082	54	25	20	16	6,020

OVERSEAS RECEIVING

Posn	Identification	21MHz Contacts	21MHz Bonus	28MHz Contacts	28MHz Bonus	Points
1	UB5-070-47*	103	14	12	5	2,765
2	UB5-073-389*	94	10	15	5	2,595
3	OK1-15835*	8	4	12	4	1,540
4	W3-12836	69	12	3	1	1,270

† Trophy winner.
* Certificate winner.

Affiliated Societies Contest 1972 results

A total of 52 entries were received, 11 more than for the 1971 event when the postal strike resulted in a much lower than usual entry. This year's winner of the Edgware Trophy is the Government Communications Headquarters ARS, G3SSO, using a KW2000 and a dipole 55ft high. Runner-up is the British European Airways ARS, G3BEA, which also used a KW2000 and a dipole aerial. In third place is the Crawley Amateur Radio Club "B" station, G3TR, using a home-brew transmitter; a Sommerkamp FR100B receiver; and a dipole aerial, one half at 60ft and the other sloping down to 6ft. In view of the fact that G3TR's score was high, another member of the HF Contests Committee checked all the leading entries. G3TR himself should have adjudicated the contest.

This year's event was notable for the high percentage of log errors found and it is felt that entrants might like to know the effect of these errors on claimed scores; for this reason the claimed scores are also tabulated. The total number of log entries checked was 5,153 and of these 688 showed errors of one kind or another. Most of the mistakes were incorrect copying of RST and serial numbers; next came incorrect callsigns and claims for contacts which did not appear in the other log.

The club with the worst record of accuracy had 49 per cent of contacts with errors, while the worst operator made errors in 93 per cent of the contacts he made. It is clear from this that if accuracy of logging and copying out of logs had been higher the result would have been very different. The speed and quality of sending may have some bearing on the errors.

Posn	Station	Callsign	Points	Points claimed
1	Govt. Comm. HQ ARS	G3SSO	1,604	1,728
2	BEA ARS	G3BEA	1,559	1,678
3	Crawley ARC "B"	G3TR	1,547	1,597
4	Surrey RCC	G3SRC	1,537	1,681
	Mid-Sussex ARS	G3ZMS	1,537	1,602
6	Addiscombe ARC	G4ALE/A	1,527	1,710
7	Thames Valley ATS	G3TVS	1,480	1,579
8	Sutton & Cheam RS "A"	G2DMR	1,425	1,530
9	Verulam ARC	G3VER	1,408	1,648
10	Crawley ARC "A"	G3WSC	1,403	1,463
11	Maidstone YMCA ARS	G3TRF	1,399	1,583
12	Echelford ARS	G3UES/A	1,394	1,641
13	Royal Navy ARS	G3BZU	1,334	1,503
14	Reigate ATS "A"	G3REI	1,329	1,451
15	Leyland Hundred "A"	G3GGS	1,327	1,422
16	Edgware & DRS	G3ASR/A	1,323	1,503
17	West of Scotland "A"	GM4AGG	1,296	1,378
18	Mansfield ARS	G3GQC/A	1,269	1,643
19	Wheatsheaf (Grimsby) RC	G3PDL	1,267	1,447
20	Cambridge Univ. WS	G6UW/A	1,265	1,527
21	U.C.N. Wales ARS	GW3UCB	1,242	1,367
22	Wimbledon & DRC "A"	G3WIM/A	1,238	1,436
	Horsham ARC	G3TNO	1,238	1,317
24	Greenford ARS	G4AHU	1,197	1,470
25	Purley RC	G3XMW/A	1,181	1,430
26	Standard RC	G3NIS	1,173	1,322
27	Crawley ARC "C"	G3YVR	1,148	1,208
28	Moray Firth ARS	GM3TKV/P	1,138	1,447
29	Glenrothes & DARC	GM3YOR	1,105	1,387
30	Crystal Palace & DRC	G3VCP	1,112	1,206
31	Thornton Cleveleys ARS	G4ATH	1,070	1,221
32	Chiltern ARC	G3MCS	1,066	1,213
33	Cardiff RSGB Group	GW3GHC	1,065	1,329
34	Shefford & DARS	G3FJE/A	1,002	1,131
35	RAF Locking	G3IRS	998	1,301
36	Leyland Hundred "B"	G3WYY	946	1,025
37	East Kent RS	G3LTY	927	1,131
38	Acton, Brentford & Chiswick RS	G3IIU	867	1,081
39	Bromsgrove & DARC	G3VGG	827	1,235
40	Eccles & DARC	G3GXI	803	985
41	Adur Contest Group	G4ACG	777	1,075
42	Grimsby ARS	G3YMF	764	893
43	Salisbury & DSWC	G3FKF	760	874
44	Sutton & Cheam RS "B"	G4AAW	709	805
45	RAF Carlisle ARS	G3XQD	659	961
46	Sutton & Cheam RS "C"	G3CDK	575	825
47	Wimbledon & DRS "B"	G3ZQF	443	513
48	Gravesend ARS	G3GRS	418	590
49	Bolton & DRS	G8WY/A	326	500

Entries from the following were disallowed:
Echelford ARS "B" — AFS Rule (a)
Stoke on Trent ARS — General Rule 8(a)
Thanet ARS — General Rule 8(a)

Comments from the adjudicators

One club called and worked the famous G9BF and got a report of 333! Needless to say, the one point claimed for working this pirate was disallowed.

The standard of log presentation was high, with some notable exceptions. On the merit side the neatest log was received from G3WIM/A—Wimbledon ARS. The bad ones included a log having RST sent and received columns reversed, which makes checking more difficult. Another group only recorded what they had received; this entry was disallowed. A further entrant had serials out with reports in and vice versa, as well as being almost unreadable on scraps of paper—also disallowed.

Several entrants sent in logs without the callsigns of operators

against the contacts, these were returned to entrants for completion, all were completed and re-submitted.

The committee thanks GD5DZ, OK1MAL and G3PSK/M for their check logs.

Comments from participants

A number of clubs complained that AFS was not always sent in the reports, but tacked on the end or even forgotten. The correct way is to send RST serial number AFS all in one, ie 579005AFS.

Maidstone YMCAARS suggests that the times should be 1700–2100gmt as the finish at 2200gmt is rather late for those with a distance to travel.

RNARS, G3BZU, regret that EU and non-AFS contacts only count one point.

It may be as well here to restate the objective of AFS, which is to provide a means for competition between affiliated societies and groups—the contest is intended as a domestic club contest and is regarded as being in a different category from the normal 1·8MHz contests. By way of interest, no entrant worked all other AFS stations.

The West of Scotland ARS, GM4AEG, wishes that G8KW had made provision for a cw filter in the KW2000.

RSGB 7MHz Contest results

The HF Contests Committee was pleased to receive an increased number of entries for the 1971 contest in all sections except the phone receiving section. Conditions were very much improved over previous years which is reflected in the higher scores listed.

In the **CW Section** our congratulations to G3KMO with 361 contacts and 52 bonus countries, G3RPG with 352 contacts and 46 bonus countries and G3YDX with 350 contacts and 48 bonus countries.

There was a very close result in both transmitting and receiving parts of the **Phone Section** for the first two places. Congratulations to GI3CDF with 273 contacts and 39 bonus countries, followed by G3TR who had 223 contacts and 42 bonus countries, while third place was taken by G2FNK with 200 contacts and 36 bonus countries.

Comments

As requested by quite a number of contestants, information on the dx worked and heard has been included in the results. The standard of log keeping generally was very high with one or two notable exceptions—*check your claimed score with the results, gentlemen*! The committee is examining the possibility of penalizing listener logs with a high percentage of mistakes; this year, two in particular were full of inaccuracies and came very close to being disqualified. The committee would like to see a bigger entry from W, VE, VK and ZL in particular; with conditions improving on the lower frequency bands it is hoping for greater participation in 1972.

The HF Contests Committee thanks the stations written to for QSO verifications, and the prompt replies to its request for information was greatly appreciated; also the stations who submitted check logs, particularly those from overseas, which are always very useful. The majority of contestants had no comments regarding rules and scoring, but suggestions made will be considered by the committee before the rules for 1972 are published.

CW SECTION, TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	G3KMO*	4,735	26	G3KMA	2,055
2	G3RPB*	4,350	27	G3HZL	2,030
3	G3YDX*	4,320	28	W2LXK*	1,835
4	G3KWK	4,280	29	G3ZDD	1,795
5	GW3JI	4,255	30	VK3MR*	1,750
6	G5YC	3,665	31	UA9QAA	1,675
7	GM3CFS	3,645	32	G3APN	1,625
8	G3PDL	3,535	33	UK9HAD	1,550
9	G3ESF	3,395	34	UW9WL	1,525
10	G3VYI	3,390	35	UD6CN	1,500
11	G3MXJ	3,375	36	G4ANH	1,365
12	G3TBK	3,320	37	UK9HAB	1,275
13	G2DC	3,145	38	UW0AF	1,250
14	G3RZI	3,105	39	G2AJB	1,220
15	G3XTJ	3,055	40	G8KU, G3YCT	1,185
16	G3XAP	3,030			
17	G6CJ	2,855	42	G3SNN	1,165
18	G3SJX	2,725	43	SP2PAH	1,095
19	G2QT	2,700	44	G3ZLP	1,090
20	G3XWZ	2,610	45	G3ICH	1,050
21	G3AKF	2,460	46	YU3EO	1,045
22	G5AQO	2,395	47	VE1EK	1,015
23	G3KSH	2,345	48	F5AH, OK2BKV	985
24	G3MGL	2,275			
25	G3JKY	2,080	50	UK2BBB	980
51	G3ILO, PA0ABM	970	108	UQ2MU	625
			109	LZ1KSP	620
53	PA0CTR, W2LWI	965	110	SP2BRZ, UK2FAS	615
55	F9NF, YU1OAX	960	112	LA1OA, YO7AUN	610
57	G3MWP	955	114	OZ6HS, UQ2OA	595
58	UW1FZ	950			
59	YU3TYX	930	116	SM0BYD	590
60	SP9ABE	915	117	SP6EWQ	585
61	UK2GAA	910	118	GM3YOR, 9HICH	580
62	PA0GIN, UK5VAA	900	120	OM0PBM, UK3TAF	570
64	UK3LAD	895			
65	OM0EE	890	122	UV9DO	550
66	E12CA, ON4XG	885	123	HA1SB	525
			124	HA7PW	505
68	8P6DR	875	125	OZ4HW, SP9ECH	480
69	LZ1SS	870			
70	HA5HE	865	127	ON5EU, UK5ICA	470
71	UL7GW	850			
72	OH1LU	840	129	OK2BEC, SM0CMP, SP1ETC	465
73	HA5JI	830			
74	SP1NJ, UA6XQ	820			
76	G3PSY, W4OZF	815	132	GM4QK, OH2LG, YO2RA, YO9ABX	450
78	HA8UY, SP6TQ	800			
			136	SP9DH	445
80	G2FNK	795	137	SP9AGS	435
81	YU4VTN	765	138	OH2XM	415
82	UP2PX	755	139	G3GXO, UA3XN	405
83	OK1KZ, VO1AW	750			
			141	YO2IX	400
85	OK2PDL	745	142	SP8MJ	395
86	OM3YAX	740	143	F9RO	390
87	DJ7HZ	730	144	UR2HB	375
88	SM0BDS, UR2QD	725	145	W8KJN	370
			146	9HIBP	365
90	UC2DQ	705	147	OK3KEG	360
91	HA5BH	700	148	HA6NJ	350
92	UA1DX	690	149	SP3AK	345
93	DK3BJ, OH7NW, OK2BBI, UP2BP, YO2AVP	685	150	SP7CKF	325
			151	F8DF	320
			152	UK5WAS	315
			153	OK2PAW	300
			154	G3LCH	290
98	DJ1QQ, OM2QX, SP8EMO	675	155	UA3RH	285
			156	OH2BJY	220
			157	UJ8AB	200
101	F9KP	670	158	SP6CXC, YO2QQ	190
102	UK1AAG, UK2WAF	665			
			160	SM4EEA	175
104	OZ4H	650	161	UA3QO	170
105	UC2OAG	640	162	UA1PU	140
106	G3YCQ, W4HOS	630			

* Certificate winners.

CW SECTION, RECEIVING

Posn	Identification	Points	Posn	Identification	Points
1	BRS6604*	1,990	6	BRS30628, UB5-065-289*, UB5-073-619*	640
2	BRS15822*	1,500			
3	A7082	1,280			
4	A7120	1,190	9	UC2-006-46	620
5	SP21157*	675	10	UA6-08 669	555
			11	BERS-195	550
			12	NL-455	265

* Certificate winners.

PHONE SECTION, TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	GI3CDF*	2,695	23	OZ4HW	635
2	G3TR*	2,620	24	GW3ZQH	630
3	G2FNK*	1,970	25	I1ANP	610
4	G2QT	1,960	26	LA5QK	570
5	G3KMA	1,855	27	9HIBP	560
6	G3WHK	1,410	28	OK1MPP	550
7	G3NAS	1,345	29	F9KP	525
8	DK3BJ*	1,275	30	OZ8MG	500
9	DL8JS*	1,185	31	F3IJ, OZ6HS	485
10	G3WFT/A	1,140			
11	GD5DZ	1,130	33	OH0NI	465
12	G4ACQ	1,115	34	UK2BBB	430
13	G3KSH	1,050	35	F9OJ	415
14	YU3EO	990	36	CN8BB	400
15	SM6BZV	850	37	SM4EEA	365
16	YV5BPG	825	38	UK3YAB	360
17	SM0CMP	770	39	LA3LC	325
18	SP5XM	750	40	SM5BNX	310
19	GC3YIZ	705	41	G3GXO	260
20	I2PHN	680	42	LA5KO	250
21	DJ2YE	655	43	LZ1QR	240
22	ON4XG	645	44	UA3XP	235

Posn	Callsign	Points	Posn	Callsign	Points
45	SM3BUS, UV3HD	220	48	OH2LU, UQ2MU, UR2HB, UW3DH	115
47	OD5BA	175			

PHONE SECTION, RECEIVING

Posn	Identification	Points	Posn	Identification	Points
1	BRS32525*	2,040	12	OK-1-15835*	690
2	BRS26431*	2,005	13	OZ DR 1529	650
3	A6148	1,950	14	A6117	645
4	A7082	1,500	15	UQ2-037-6, SP2-1157	625
5	A6003	1,190			
6	BRS28201	1,135	17	13-13395	615
7	BRS25429	1,115	18	LA-M5605	495
8	BRS20249	985	19	NL-455, UA2-12593	410
9	BRS28198	980			
10	BRS26870	955	21	BRS30628	400
11	I1-12387*	780	22	A7732	185

* Certificate winners.

Check logs acknowledged
YO7NA, UY5VA, SP6CZ, UY5TH, G3ATU, LZ1WZ, G2MI, W2DXL/VP9, VP9BY, G3LNS/VP9, GM3PIP, OH6AA, WB4RJK/TF.

Bonus countries worked by the top 10 CW Section
CT, DL, EA, EA8, EL, EI, F FG7, HA, HB9, I, KP4, KL7, KH6, LA, LZ, ON4, OH, OK, OZ, PA0, PY, SM, SP, TG9, UA, UA2, UA9, UB5, UC2, UD6, UH8, UJ8, UL7, UO5, UP2, UQ2, UR2, VE1, VE2, VE3, VE5, VE7, VK2, VK3, VK7, VO, VP9, W1 2 3 4 5 6 7 8 9 0, YO, YU, ZL3, ZL4, 8P6, 9H1. **Total: 64.**

Bonus countries heard by the top three CW Section
DL, EI, F, HA, HB9, I, LA, LZ ON4, OH, OK, OZ, PA0, SM, SP, TG9, UA, UA2, UA9, UB5, UC2, UD6, UL7, UP2, UQ2, UR2, VE1, VE2, VE3, VE7, VK3, W1 2 3 4 5 7 8 9 0, YO, YU, ZL3, 9H1. **Total: 44.**

Bonus countries worked by the top five Phone Section
CN8, CR4, CT1, DL, EA, EI, EQ2,F, HA, HB9, HK, HP, HR, I, IS, JA, KZ5, LA, LU, LX, OA, OD5, OE, OH, OH0, ON4, OZ, PA0, PY, PZ, SM, SP, TF, UA, UA2, UA9, UB5, UP2, UQ2, UR2, YN, YO, YU YV, 5X5, 5Z4, 7X2, 8P6, 8R1, 9H1, 9Y4. **Total: 51.**

Bonus countries heard by the top three Phone Section
CN8, CR4, CR6, CT1, DL, EA, EA6, EA8, EI, EQ2, F, HA, HB9, HK, HP, HR, I, IS, JA, LA, LU, LX, LZ, OA, OD5, OE, OK, OH, OH0, ON4, OZ, PA0, PY, PZ, SM, SP, TF, UA, UA9, UP2, UQ2, UR2, YN, YO, YU, YV, 5X5, 8P6, 8R1, 9H1, 9Y4. **Total: 51.**

EQUIPMENT USED

Callsign	Aerials	Receivers
G3KMO	2-el rotary quad 60ft high, 3-el broadside vertical array	Home brew
G3RPB	¼-wave inverted L, ¼-wave vertical	HRO 5T
G3YDX	¼-wave vertical, inverted V	Drake 2B and Q mult
BRS6604	40ft vertical, 132ft long wire	FR DX500
BRS15822	60ft long wire, 35ft high	Trio JR 500SE
GI3CDF	¼-wave dipole 60ft high, ¼-wave vertical	KWM.2
G3TR	250ft wire centre-fed tuned feeder, 60ft high	FR 100B
G2FNK	130ft wire running E-W, 30ft high	EA12
BRS32525	Inverted V at 25ft high	FR DX 500
BRS26431	100ft end-fed wire 40ft high	Trio JR 500SE

Cray Valley RS 3rd SWL Contest results

Congratulations are extended to the certificate winners and thanks to the others who took part. Conditions during the contest were good with much dx audible. It proved to be very widely enjoyed and a very successful venture with 52 entries from eight countries received. Logs were of a mediocre standard and very few faultless entries were received.

Posn	Listener	Certificate winners	Points 15m	20m	40m	80m	Total
1	S. Phillipo, A7531	1st(G)	828	979	82	361	2,250
2	R. Shilvock	2nd(G)	473	1,032	201	311	2,017
3	P. de Silva,W3-12836	W3 1st	646	969	66	296	1,977
4	V.P. Hill, A7548	GW 1st	508	1,136	89	227	1,960
5	J. Young, A7082		631	599	308	321	1,859
6	J. Martin, A7089	GM 1st	508	706	272	362	1,848
7	I. Forse, G-13685		545	787	181	333	1,846
8	J. Fitzgerald, G-11570		564	549	275	386	1,774
9	D. J. Mellor, A7784		538	686	200	217	1,641
10	P. Austin, A7417		637	517	154	295	1,603
11	R. A. Treacher, BRS32525		330	715	253	286	1,584
12	D. Tunnicliffe, A7789		324	543	305	391	1,563
13	R. Freeborn		365	645	174	337	1,521
14	S. Cole, A6148		231	654	240	387	1,512
15	R. Holland, G-4005		366	510	204	363	1,443
16	O. Cross		244	537	213	318	1,312
17	E. Parker, BRS27330		369	510	213	196	1,288
18	A. Hall		211	572	117	375	1,275
19	D. Lowe		—	898	131	191	1,220
20	G. Jowett, A7058		—	658	244	262	1,164
21	D. J. Lawley, A7681		326	426	155	224	1,133
22	Z. Parmigiani		196	491	148	281	1,116
23	D. Toombs, A6578		269	380	149	268	1,066
24	D. E. Green A7497		364	409	174	137	1,064
25	D. Carcay, A7714		191	455	114	284	1,054
26	T. Thornton, A7120		223	274	155	393	1,045
27	C. Doubleday, A7779		136	433	104	360	1,033
28	K. Plumridge, BRS29474		159	402	147	183	891
29	L. Aldridge, A7780		130	460	35	223	848
30	S. Widdett		277	352	107	111	847
31	D. Johnson, A7511		200	237	91	313	841
32	W. Torode, BRS26870		198	352	121	165	836
33	R. Skimmons, WDX2PQA	W2 1st	322	423	—	90	835
34	R. A. Jones, A7532		183	239	22	288	832
35	J. R. Lord, A7731		—	579	—	227	806
36	S. G. Phillips, A6686		363	421	—	12	796
37	K. Murphy, A7317		44	276	129	321	770
38	N. Beasley		—	369	85	271	725
39	J. Boylin		11	416	—	278	705
40	E. Jacobs, BRS32513		182	326	44	147	699
41	C. Hemming		—	696	—	—	696
42	A. West, A7790		—	323	94	284	691
43	T. Endo, JA1-1176	JA 1st	90	565	14	16	685
44	P-O. Nilsson(SM)	SM 1st	67	150	255	184	656
45	R. B. Cowley		—	463	—	184	647
46	B. Rogers, A7701		—	151	216	258	625
47	N. Huntley, G-13665		96	217	126	172	611
48	V. Maddex, A6753		—	390	—	205	595
49	R. Graves, A7159		—	229	14	211	454
50	S. Parry, A7767		212	220	—	—	432
51	J. E. Thomas		136	257	—	22	415
52	M. Hardy, ZE-101	ZE 1st	198	110	33	—	341

Mid-Severn Valley Teleprinter Group 1972 144MHz Contest

The RSGB General Rules for VHF Contests published in the January 1972 issue of *Radio Communication* will apply, together with the additional rules detailed below.

1. 1000 to 1600bst, Sunday 14 May 1972.
2. Entries to be sent to: R. W. Fisher, G3PWJ 47 Elmhurst Drive, Kingswinford, Brierley Hill, Staffordshire.
3. The contest is open to radio amateurs holding a British licence.
4a, 5a, 6a, 7a, 8b.
9. Radioteleprinter only.
10a.
12. With the addition of time of commencement of contact.
13, 14, 15, 17, 18, 20-23 inclusive.

Any enquiry with sae, please, to G3NUE, QTHR.

Contests calendar

9 April—80m LP (Rules in March issue)
9 April—70MHz (Rules in February issue)
23 April—DF Qualifying Round, Coventry
6-7 May—432MHz (Rules in March issue)
21 May—144MHz (Rules in March issue)
3-4 June—NFD (Rules in February issue)
10-11 June—70MHz (Rules in this issue)
24-25 June—Summer 1·8MHz
25 June—Microwave Contest (Rules in this issue)
25 June—RSGB Region 1 VHF
1-2 July—144MHz
8-9 July—SSB Field Day (Rules in March issue)
23 July—432MHz
13 August—70MHz
20 August—144MHz SSB
2-3 September—VHF NFD (Rules in March issue)
2-3 September—IARU VHF (Rules in this issue)
10 September—80m Field Day
7-8 October—21/28MHz
7-8 October—IARU UHF (Rules in this issue)
21-22 October—7MHz CW
4-5 November—7MHz Phone
5 November—144/432MHz CW
11-12 November—Second 1·8MHz
November-December—70MHz Cumulative

BAND PLANS

Region 1 VHF-UHF Band Plan

4m band

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

2m band

144·00—144·15MHz	CW only.
144·15—144·5MHz	Zone A, the South West. (*Berks, Cornwall, Devon, Dorset, Hants, Somerset, Wilts, Channel Is., Brecon, Cardigan, Carmarthen, Glamorgan, Gloucester, Hereford, Monmouth, Pembroke, Radnor, Worcester.*)
144·5—145·1MHz	Zone B, the South East. (*Kent, Surrey, Sussex, Beds, Bucks, Essex, Herts, London, Middlesex.*)
145·1—145·5MHz	Zone C, the Midlands. (*Cambs, Hunts, Leicester, Norfolk, Northants, Oxford, Rutland, Suffolk, Warwickshire, Anglesey Caernarvon, Cheshire, Denbigh, Flints, Merioneth, Montgomery, Shropshire, Stafford.*)
145·5—145·95MHz	Zone D, the North, Scotland and Northern Ireland. (*Derby, Lancs, Lincs, Notts, Yorks, all Scottish and Northern Ireland counties, Isle of Man, Cumberland, Durham, Northumberland, Westmorland.*)
145·95—146·00MHz	Beacons.

70cm band

432·0—432·1MHz	CW only.
432·1—432·2MHz	Zone 1. (*Berks, Cornwall, Devon, Dorset, Hants, Somerset, Wilts, Channel Is.*)
432·2—432·3MHz	Zone 2. (*Brecon, Cardigan, Carmarthen, Glamorgan, Gloucester, Hereford, Monmouth, Pembroke, Radnor, Worcester.*)
432·3—432·5MHz	Zone 3. (*Kent, Surrey, Sussex.*)
432·5—432·7MHz	Zone 4. (*Beds, Bucks, Essex, Herts, London, Middlesex.*)
432·7—432·9MHz	Zone 5. (*Cambs, Hunts, Leicester, Norfolk, Northants, Oxford, Rutland, Suffolk, Warwickshire.*)
432·9—433·1MHz	Zone 6. (*Anglesey, Carnarvon, Cheshire, Denbigh, Flints, Merioneth, Montgomery, Shropshire, Stafford.*)
433·1—433·3MHz	Zone 7. (*Derby, Lancs, Lincs, Notts, Yorks.*)
433·3—433·45MHz	Zone 8. (*all Scotland, Northern Ireland, Isle of Man, Cumberland, Durham, Northumberland, Westmorland.*)
433·45—433·5MHz	Beacons.
433·5—434MHz	Television sound.
434 to top of band	Video.

23cm band (narrow band communication segment)

1,296—1,296·15MHz	CW only.
1,296·15—1,297·95MHz	All modes (narrow band).
1,297·95—1,298MHz	Beacons.

Special services

2m band

144·09—144·10MHz	CW for random meteor scatter contacts, but not held exclusively for this.
144·1—144·15MHz	SSB *only* when artificial satellites or translators are operational.
145·85—145·95MHz	SSB *only* when artificial satellites or translators are operational.
145·0MHz	Mobile calling channel (international).
145·3MHz	RTTY international and UK north.
144·6MHz	RTTY UK south.
145·41MHz	SSB calling channel (international).

70cm band

433·3MHz	RTTY international and UK north.
432·6MHz	RTTY UK south.
432·1MHz	SSB calling channel (international).
425—429MHz	Self excited transmissions.

Amateur Bands in the UK

Amateur (Sound) and (Sound Mobile) Licences

Note No.	Frequency bands (MHz)	Classes of emission	Power: Maximum dc input power	Power: Radio frequency output peak envelope power for A3A and A3J emissions only
1 and 5	1·8–2	A1, A2, A3, A3A, A3H, A3J, F1, F2 and F3	10W	26⅔W
2	3·5–3·8		150W	400W
	7– 7·10 14–14·35 21–21·45 28–29·7			
1 and 3	70·025–70·7		50W	133⅓W
1 and 4	144–145 145–146		150W	400W
1	425– 429			
1	432– 450			
1	1,215– 1,325			
1	2,300– 2,450			
1	3,400– 3,475			
1	5,650– 5,850			
1	10,000–10,500			
	21,000–22,000			
1 and 6	2,350– 2,400	P1D, P2D, P2E, P3D and P3E	25W mean power and 2·5kW peak power	—
1 and 6	5,700– 5,800			
1 and 6	10,050–10,450			
	21,150–21,850			

Notes

1. This band is allocated to stations in the amateur service on a secondary basis on condition that they shall not cause interference to other services.
2. This band is shared by other services.
3. This band is available to amateurs *until further notice* provided that use by the licensee of *any* frequency in the band shall cease immediately on the demand of a Government official.
4. The following spot aeronautical frequencies must be avoided *whenever* this band is used: 144·0, 144·09, 144·18, 144·27, 144·36, 144·45, 144·54, 144·63, 144·72, 144·81 and 144·9MHz.
5. The type of transmission known as radio teleprinter (rtty) may not be used in this band.
6. Use by the licensee of *any* frequency in this band shall be only with the prior written consent of the Minister of Posts and Telecommunications.

Amateur television

An additional licence is required for the use of amateur television. Operation is permitted in the following bands: 425–429*, 432–450*, 1,225–1,290*, 2,300–2,450*, 5,650–5,850*, 10,000–10,500, and 21,000–22,000MHz.

* Subject to Note 1 above.

Region 1 HF Band Plan

This plan is supported by all IARU societies in Europe and Africa.

Frequency band	Types of emission
3·5 — 3·6MHz	CW only
3·6 — 3·8MHz	CW and phone
7·0 — 7·04MHz	CW only
7·04 — 7·1MHz	CW and phone
14·0 — 14·1MHz	CW only
Around 14·090MHz	RTTY
14·1 — 14·35MHz	CW and phone
21·0 — 21·15MHz	CW only
21·15 — 21·45MHz	CW and phone
28·0 — 28·2MHz	CW only
28·2 — 29·7MHz	CW and phone

Note: 3,500–3,510kHz and 3,790–3,800kHz are reserved for intercontinental working.

CLUB NEWS

Items for inclusion in this section should be sent to regional representatives before the first of each month for inclusion in the following month's issue. They should not be sent direct to the editor.

The date of publication of the following month's issue, first Tuesday in the month, should be borne in mind so that events are not, in fact, history when the details are published. While regional representatives are pleased to receive clubs' events calendars for several months ahead, they still require monthly events lists so that entries can be confirmed or amended.

REGION 1 — RR B. O'Brien, G2AMV

Special events

Belle Vue Convention—Northern Radio Societies Association Convention and Exhibition at Belle Vue, Manchester on Sunday 7 May. Trade displays, club stands and grand raffle. Refreshments available, also licensed bar. Talk-in facilities on 160, 4 and 2m. The Zoo and Amusement Parks are ideal for the family, who can be entertained while members are visiting the exhibition. Full details from G8BCG, QTHR.

North West Amateur Radio Convention—23-24 September in Lancaster.

Region 1 VHF Contest—25 June. Details from G2CUZ, QTHR.

Ainsdale (ARC)—Members should contact N. Horrocks, G2CUZ, QTHR, for details of the changed meeting arrangements.

Blackburn (East Lancs ARC)—First Thursday of month, 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Please note secretary is W. E. Baxendale, G8FDG, "Juverna", 28 Westland Avenue, Darwen, Lancs.

Blackpool (B & FARS)—Mondays, 8pm, Pontins Holiday Camp, Squires Gate. Morse tuition, 7.30pm.

Bury (B & RRS)—11 April (Demonstration of Nombrex transistorized test equipment by A. D. Joyce), 8pm, George Hotel, Market Street, Bury. 18 April (arrangements are being made to visit the PO TV Switching Centre at Manchester), 4 May (Visit to the East Lancs ARC at Blackburn, when Bury acts as quizmaster for a Blackburn v Preston quiz), 9 May (G3FLR will give a talk on converting transistor broadcast receivers to cover top band) The club now produces its own news sheet, price 3p, edited by G8DHT. Copies are obtainable from G4ATK—please send sae plus 3p stamp (cost of news sheet). Hon secretary F.S.C. Burnett, G3RSM, 13 Rhiwlas Drive, Bury.

Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock. Hon secretary A. R. Harper, 23 Roman Way, Stanwix.

Cheshire (Mid-Cheshire ARC)—Wednesdays, 7pm, Technical Activities Centre, Winsford Verdin Comprehensive School, Grange Lane, Winsford. Morse practice from 1900-2000gmt and on the air working, 160 and 2m, extending later to 80m. 2000-2130gmt main activities. Net night on 160m on Monday starting at 1900gmt, Tuesdays on 2m at the same time. Full details from G3JWK.

Chester (C & DARS)—Tuesdays, except for the first Tuesday of month which is net night, 8pm, YMCA, Chester. Further details from G8AYW, QTHR.

Douglas (IOM) (D & DARS)—Every Monday and Thursday, 7.30pm, rear of Douglas Holiday Centre, Victoria Road, Douglas. Club callsign GD3ZCM. Hon secretary J. Parnell, Cronkbane, Quines Hill, Port Soderick, IOM.

Eccles (E & DARC)—Tuesdays, 8pm, Bridgewater School, Worsley, Manchester. Club 2m net on 145·7MHz approx. Hon secretary S. W. Redfern, G3AEQ, 5 Pinfold Road, Worsley, Manchester M28 5DZ.

Lancaster (UOLARS)—The society is busy organizing the North West Amateur Radio Convention to be held on 23-24 September. Club station G3ZBY is active on most bands with cw, ssb and rtty. All gear apart from the hf receiver is homebrew. The vhf station, G8DOU, will be back on the air as soon as the transmitter is operational. Visitors are always welcome. Further details from G3YLV, University of Lancaster.

Leyland Hundred Amateur Radio Group—Second Monday of month, 7.30pm, Rose & Crown, Ulnes, Walton, Leyland. Net night Saturdays at 1900gmt on 145·8MHz. Further details from Frank Harrison, 78 Lancaster Lane, Leyland.

Liverpool (L & D ARS)—Thursdays 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary K. Wood, G3WCS, 90 Childwall Valley Road, Liverpool 16.

Liverpool (NLRC)—Tuesdays, 8.30pm. Informal meeting at the Nag's Head, Thornton, Crosby, Liverpool 23. Visitors welcome. Hon secretary M. Graham, G3XMG, 14 Albert Road, Waterloo, Liverpool 22.

Manchester (M & DARS)—Wednesdays, 7.30pm, 203 Droylesden Road, Newton Heath, Manchester 10. Morse classes for G8s and SWLs. 12 April ("Aerials", by E. Taylor, G2ALN), 17 May ("Computers", by Don Shaw, G3JIB). Hon secretary G3IOA, QTHR.

Manchester (SMRC)—Every Friday. 7 April ("Fault finding techniques", by D. Holland, G3WFT), 14 April ("Reflectometers", by M. Barnsley, G3HZM), 21 April (Practical df demonstration, please be early), 28 April (Homebuilt equipment contest), 19 May (AGM), 8pm, Sale Moor Community Centre, Norris Road, Sale, Cheshire. The VHF activity night is Mondays, with operation of G3UHF on 2m and 70m at 8pm from the club shack, "Greeba", Shady Lane, Manchester 23. Visitors are welcome on Mondays and Fridays. Hon secretary D. Holland, G3WFT, QTHR.

Manchester University (ARS)—This club runs a series of visits and lectures and tuition for the RAE and morse test. G3VUM is now operational on all hf bands with a KW2000A into a 6-element beam, G5RV, or 160m dipole at 100 ft. G8FUM operates on 144MHz with 40W to a 6/6 at 100ft. Further information from G8BVF, G3ZNS or GM3YOK, University Union, Oxford Road.

Preston (PARS)—13, 27 April, 11 May, 7.30pm, Windsor Castle (private room), St Paul's Square. Morse practice at 7.30pm, main meeting at 8pm. Hon secretary G. Earnshaw, G3ZXC.

Stockport (SRS)—Second Wednesday of month (Discussion night); fourth Wednesday of month (Lecture night), 8pm, Blossoms Hotel, Buxton Road, Stockport. Hon secretary G8BCG.

Thornton Cleveleys (TCARS)—First and third Wednesday of month, St John Ambulance Brigade HQ, Fleetwood Road North, Thornton. 5 April (Discussion of field days and summer exhibition stations), 19 April (Film night). Further details from G3ZYE, QTHR.

Westmorland (WRS)—First Monday of month, New Allen Technical College. Hon secretary E. P. Goonan, jnr, "Longridge", Storth, nr Milnthorpe, Westmorland.

Wirral (WARS)—First and third Wednesdays of month, 7.45pm, Sport and Indoor Recreation Centre (Old Drill Hall), Grange Road West, Claughton, Birkenhead. Hon secretary, G3WDS, 34 Glenmore Road, Oxton, Birkenhead.

Wirral (Wirral DX Association)—Last Thursday of month, at members' homes. Hon secretary G3OKA, 219 Prenton Dell Road, Prenton, Birkenhead.

RSGB members in the **Crewe** area meet at the QTH of R. Owen, 10 Circle Avenue, Willaston, Nantwich; and **Merseyside** RSGB members hold luncheon meetings at HMS Landfall on first Monday of each month, contact G3VQT or G2AMV.

REGION 2 — RR J. E. Agar, G8AZA

Barnsley (B & DARC)—Fortnightly on Fridays, 7.30pm, King George Hotel, Peel Street, Barnsley. Details from G3LRP.

Bradford (BRS)—4 April (NFD discussion), 18 April ("Problems of the service engineer", by B. C. Ackroyd), 7.30pm, 10 Southbrook Terrace, Great Horton Road, Bradford 7. *G3HJP.*

Fulford (York) (FARS)—Tuesdays, 7.30pm, Scout HQ, 31 George Street, York. *G5KC.*

Halifax (NHARS)—12 April (AGM), 19 April (Meeting of new committee), 26 April (Junk sale conducted by G8CB), 7.45pm, Peat Pitts Inn, Ogden. *G3MDW.*

Harrogate & Knaresborough (H & KRS)—Meets second and third Monday of month. Details from G8CRH, 2 King James Road, Knaresborough HG5 8EB. *G8CRH.*

Hull (H & DARS)—Fridays. 7 April ("Electronic control", by a representative of the Hull Docks Board), 14 April (Receiver comparison), 21 April (Introducing a G3), 28 April ("Mobile supression", by G3GBH), 5 May (Preparation for vhf field day), 7.30pm,

592 Hessle Road, Hull. RAE classes held every Friday at 9.30pm. Details from Mrs M. Longson, 4 Chester Road, Hull HU5 5QE.

North Riding (NRARG)—Meets at the Alma Inn, Alma Parade, Scarborough, and The White House Inn, Westcliffe, Whitby, on alternate fortnights. Details from the hon secretary J. E. Agar, G8AZA.

Northumberland (NRC)—Meetings held weekly at the clubroom, 3 Wheatsheaf Yard, Morpeth, except the first meeting of month which is held in the Sun Inn, Bedlington. Details from G3XAI.

Otley (ORS)—Meets every Tuesday, 14 Back of Court House Street, Otley, Yorks. Details from H. S. Johnstone, 12 Rumple Croft, Newall Carr, Otley LS21 2RE, telephone Otley 2850.

Scarborough (SARS)—Fridays, 7.30pm, Technical College, Scalby Road, Scarborough. Club callsign G4BP. Hon secretary G3VAN: PRO G8KU.

South Shields (SS & DRC)—Fridays, 8pm, Trinity House Social Centre, Laygate, South Shields.

Spen Valley (SVARS)—6 April (Visit to Cooper Maithies factory at Huddersfield), 13 April ("The aspirin", by Mr North), 15 April (Annual dinner at Lakeside Cafe, Batley, details from G8DSB), 20 April ("420MHz and above", by P. Billingham, G4AGQ), 27 April ("Noise", by L. M. Dougherty, MSc, FRAS), 7.30pm, The Grammar School, High Street, Heckmondwike.

Sunderland (SARS)—First and third Tuesday of month, 7pm, Sunderland Polytechnic. G3XID.

Wakefield (W & DRS)—Alternate Tuesdays, 7.30pm, Wakefield Youth Centre, Ings Road School, Ings Road, Wakefield. Details from hon secretary G3XVU, 13 Kingsdale Avenue, Drighlington, Bradford DB11 1EY.

York (YARS)—Thursdays, 7.30pm, British Legion Club, 61 Micklegate, York. Details from J. A. Rainbow, 14 Temple Road, Bishopthorpe, York.

REGION 3 — RR R. W. Fisher, G3PWJ

Birmingham (MARS)—No information received. Club meets at the Birmingham & Midland Institute, Margaret Street, Birmingham 2. *G8BHE*.

(Slade)-7, 21 April, (A comparison of hi-fi systems, led by Mr Williams), 8pm, The Church House, High Street, Erdington. *G8EYL*.

(South)—5 April ("Stereo sound", by R. Sarm), 8pm, Hampstead House, Fairfax Road, West Heath, Birmingham 31.

Bromsgrove (B & DARC)—No Information received. Club meets at the Royal Oak, Barley Mow Lane, Catshill.

Coventry (CARS)—7 April ("Trip to VP9", by G3HCT and G3LNS), 14 April (Club night on the air), 21 April (Visit to PO Rugby), 28 April (Club night on the air), 8pm, City of Coventry Scout HQ, St Nicholas Street, Radford Road.

Dudley (DARC)—11, 25 April, 8pm, Central Library, St James' Road, Dudley. *G3PWJ*.

Hereford (HARS)—No information received. Club meets at Civil Defence HQ, Gaol Street, Hereford.

Leamington Spa (MWARS)—10 April (Equipment for amateur tv transmissions), 17 April (Open meeting), 24 April (Open meeting), 8pm, 28 Hamilton Terrace, Leamington Spa. Hon secretary A. C. Outhwaite, 2 St Anne's Close, Leamington Spa.

Solihull (SARS)—18 April ("No 1 tape and slide lecture", by W1BB), 7.30pm, Manor House, High Street, Solihull. 2 May (Informal meeting), Malt Shovel, High Street, Solihull. *G3XPY*.

Stoke-on-Trent (University of Keele), 22 April (Open day—21st anniversary celebrations).

Stourbridge (STARS)—No information received. Club meets at Longlands School, Stourbridge.

Stratford (SuA & DARC)—7 April (Direction finding competition), 21 April ("Advance computer programming", by G3RPJ), 8pm, Halls Croft, Old Town, Stratford. *G3OOQ*.

Sutton Coldfield (SCRS)—No information received. Club meets at 8pm, Clubhouse, Sutton Town Football Club, Coles Lane. *G8AVH*.

Wolverhampton (WARS)—10 April ("Making telescopes talk", by Mr Ansty of Wolverhampton Astronomical Society), 17 April (Discussion on emergency power supplies), 1 May (homebuilt gear competition), 8pm, Neachells Cottage, Stockwell Road, Tettenhall, Wolverhampton.

Worcester (W & DARC)—10 April (Visit to Worcester Telephone Exchange—limited numbers), 15 April (Annual constructional contest), 7.30pm, Crown Hotel, Broad Street, Worcester. G8ASO, telephone Worcester 29208.

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—5 April (Surplus sale), 12 April (Basic radio, part 3), 19 April (Df practice night), 26 April "Specialized photography", by M. Shardlow, G3SZJ). The annual dinner and dance will be held at the "Derbyshire Yeoman", Kingsway, Derby, on Saturday 15 April at 7.15pm. Tickets, priced £1.50, available from G2CVV, 5 Uplands Avenue, Littleover, Derby. Meetings held at 7.30pm in the clubroom, 119 Green Lane, Derby. Visitors always welcome.

Derby (NHCAARG)—7 April (Technical film show), 14 April ("The working of a railway", by Reece Nicholson), 21 April (Df walk—Alvaston locality), 28 April ("Receiver alignment", by G8EIX).

Melton Mowbray (MMARS)—21 April (Lecture and film show by Rentokil, woodworm and dry rot specialists). Meetings 7.30pm, St John Ambulance Hall, Ashfordby Hill, Melton Mowbray.

Nottingham (ARCON)—6 April (on the air), 13 April (Forum), 20 April (AGM), 27 April (Discussion on plans for 2m). The club will be operating an exhibition station at Long Eaton Carnival in May using the callsign GB3LEC. On 6 April it is hoped to make contact with G3LFA in Andorra. The station will be operated by three club members from 1 to 16 April using 80–10m.

REGION 5 — RR P. J. Simpson, G3GGK

Bedford (B & DARC)—6 April ("From arc to spark to ssb", by G3RFG), 13 April ("Digital frequency meter", by G3UQR), 20 April (Vic's van of goodies—G4AAA). 27 April (Tvi—members' experiences), 4 May (NFD and contest planning—G3UQR). Meetings at the Dolphin, The Broadway, Bedford. Hon secretary John Bennett, G3FWA, 47 Ibbett Close, Kempston, Bedford.

Cambridge (C & DARC)—7 April (Demonstration of spectrum analyser by G8CQZ), 14 April (Informal), 21 April (Sale of surplus items), 28 April (Informal), 5 May (Idiot inventors contest—a radio leg pull). Meetings at 7.30pm at Corporation Yard, Victoria Road, Cambridge. Hon secretary C. Powlesland. G8CQZ, 341 Cherryhinton Rd, Cambridge.

Dunstable Downs (DDRC)—7 April (Raynet discussion and talk by P. Balestrini, G3BPT), 14 April (Between week), 21 April (Proposed talk on microwaves), 28 April (Between week), 8pm, Chews House, 77 High Street South, Dunstable. New officers and committee: President, G3HEO; chairman, G3WBC; vice-chairman, G3SRX; treasurer, G3CGX; secretary, G8BPK, contests, G3XKN; liaison, G8FAL.

Ely (EARS)—Alternate Thursdays, 7.30pm, Ely Adult Education Centre, St Mary's Street, Ely. Hon secretary P. Brown, A6775, 59 Fieldside, Ely.

Luton (George Kent ARS)—Information from the hon secretary John Allen, G3DOT, 77 Rosslyn Crescent, Luton, Beds.

March (M & DARS)—Tuesdays, 7.30pm, The Old Police HQ, High Street, March, Ely. Hon secretary K. C. Smith, G8BEN, 36 New Road, Whittlesey, Peterborough, Northants.

Shefford (S & DRS)—Thursdays, 8pm, Church Hall, Ampthill Road, Shefford, Beds. Hon secretary Arthur Sullivan, G2DGF, 12 Glebe Road, Letchworth, Herts.

Stevenage (S & DARS)—6 April, Senior Staff Canteen, Hawker Siddeley Dynamics Limited, Gunnelswood Road, Stevenage. Hon secretary F. Collett, G3OVT, 8 Silvan Road, Stevenage, Herts.

REGION 6 — RR L. W. Lewis, G8ML

Bicester (BARS)—Meets every Friday. 7 April (AGM), 14 April (Colour tv, part 1), 21 April (Modulation), 28 April (Colour tv, part 2), 7.30pm. 11 Stoneburge Crescent, Bicester. *G8EWS*.

Cheltenham (RSGB Group)—First Thursday of month. 6 April (Spring junk sale), 8pm, "Royal Crescent" Hotel, Clarence Street, Cheltenham. *G2FWA*.

North Bucks (ARS)—Meets on everysecond and fourth Tuesday of month at Wolverton and New Bradwell Youth Club. *G3WXO*.

South Bucks VHF Club—4 April (AGM), 8pm, Bassetsbury Manor High Wycombe, Bucks.

REGION 7 — RR R. S. Hewes, G3TDR

Acton, Brentford & Chiswick (ABCRC)—18 April ("Varicaps", by G3VUQ), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick W4. Hon secretary W. G. Dyer, G3GEH, QTHR.

Addiscombe (AARC)—11, 25 April (No details), 7.30pm, Prince George Hotel, High Street, Thornton Heath, Surrey. Further information, c/o 32 Nursery Road, Thornton Heath.

Ashford (Echelford ARS)—10 April (G. Jessop, G6JP, talks on vhf/uhf), 27 April (Microwave evening), 7.30pm, St Martin's Court, Kingston Crescent, Ashford, Middlesex. Hon secretary, V. Higgs, G3WVJ, QTHR.

Barking (BR & ES)—13 April (no details), 7.30pm, Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking. Hon secretary H. Davidson, G3FZP, QTHR.

Bexley Heath (NKRS)—13 April (Junk sale), 27 April (Geoff Stone, G3FZL, to talk on current developments at vhf/uhf), 7.30pm, Congregational Church Hall, Chapel Road, Bexley Heath, Kent. Hon secretary M. A. Lee, G8EJH, QTHR.

Burnham Beeches (BBARC)—6 April (AGM), 8pm, Hedgerley Scout Hut, Hedgerley, nr Slough, Bucks. Hon secretary I. Mac Hardie, G3YMV, QTHR.

Cheshunt (CDRC)—7 April (no details), 7.30pm, Methodist Church Hall, opp Theobalds Station, Cheshunt. Hon secretary K. S. Arnold, G3XNP, QTHR.

Chingford (Silverthorn RC)—Fridays, 7.30pm, Friday Hill House, Simmonds Lane, Chingford E4. Hon secretary A. P. Mitchell, G3YJZ, QTHR.

Cray Valley (CVRS)—6 April (AGM), 20 April (Natter night), 8pm, Congregational Church Hall, Court Road, Eltham SW9. Hon secretary J. M. Tripp, G3YWO, QTHR.

Croydon (SRCC)—18 April (No details), 7.30pm, "Swan & Sugarloaf" South Croydon. Hon secretary S. A. Morley, G3FWR, QTHR.

Crystal Palace (CP & DRC)—15 April (Test gear evening—oscilloscope valve voltmeter, grid dip oscillator), 8pm, Emmanuel Church Hall Barry Road, East Dulwich SE22. Hon secretary G. M. C. Stone G3FZL, QTHR, telephone 01-699 6940.

Dartford Heath (DF Club)—7, 21 April (No details), 7.45pm, Clubroom Broomhill Road, Dartford, Kent. Hon secretary M. Worby, G3XVC, QTHR.

Ealing (E & DARS)—Tuesdays, 7.30pm, Northfield Community Centre, Hernhcroft Road, W13. Hon secretary J. E. Alban, G3JEA, QTHR.

East London (RSGB Group)—16 April ("QRA printed circuit design", by J. Hooper, G3PCA), 3pm, Wanstead House, The Green, Wanstead E11. Chairman R. A. Ledgerton, G2ABC, QTHR.

Edgware & Hendon (E & DRS)—10 April (Constructors contest), 24 April (Informal meeting), 8pm, St George's Hall, 51 Flower Lane, Mill Hill NW7. Hon secretary A. J. Masson, G3PSP, QTHR.

Gravesend (GRS)—Wednesdays, 8pm, Northfleet Recreation Centre, Springhill Road, Northfleet, Kent. Hon secretary A. J. Moules, 166 Darnley Road, Gravesend, Kent.

Greenford (GARS)—Fridays. 14 April (Test gear), 28 April (Homebrew night), 8pm, Greenford Community Centre, Oldfield Lane. Hon secretary J. Hedges, G3MMQ, QTHR.

Guildford (G & DRS)—Fridays. 14 April (AGM), 28 April (No details), 8pm, Model Engineering HQ, Stoke Park, Guildford, Surrey. Hon secretary P. Hopwood, G8CQM, QTHR.

Hampton Court (TVARTS)—5 April (No details), 8pm, The Three Pigeons, Portsmouth Road, Long Ditton, Surrey. Hon secretary R. D. Muir, G3LHN, QTHR.

Harlow (DRS)—Every Tuesday, 8pm Mark Hall Barn, First Avenue, Harlow, Essex. Further details from V. Heard, hon secretary, 106 Vicarage Wood, Harlow, Essex.

Harrow (RSH)—7 April (Mobile ramble—venue to be announced), 8pm, Harrow County School for Boys, Sheepcote Road, Harrow. Hon secretary L. Light, G3KDC, QTHR.

Havering (H & DARC)—5 April (Practical night, df receiver testing), 19 April (HF NFD preparations. RAE questions). British Legion House, Western Road, Romford, Essex. Hon secretary S. J. Hobday, G3SKV, QTHR.

Hemel Hempstead (HH & DARS)—7, 21 April (No details), 7.30pm, "Addmult" Sports Club, Hemel Hempstead. Hon secretary A. J. Wakefield, 88 Heather Way, Hemel Hempstead, Herts.

Holloway (Grafton RS)—Mondays (RAE) 7pm; Wednesdays (Morse) 7.30pm; Fridays (Club) 7.30pm. Club meets at Whittington School, Highgate Hill, N19.

Hounslow (BEAARS)—26 April, 7pm, BEA Training Centre, Southall Lane, Heston, Hounslow. (This club is open to non-BEA members by invitation—contact David Evans, G3OUF, telephone Amersham 3257, for details.)

Kingston (K & DARS)—12 April (No details), 8pm, Penguin Lounge, 37 Brighton Road, Surbiton, Surrey. Hon secretary R. S. Babbs, 28 Grove Lane, Kingston, Surrey.

Loughton (L & DRS)—No information received. Club meets at Loughton Hall, Rectory Lane, (nr Debden station). Details from R. Stevens, treasurer, 66 Wellfields, Loughton, Essex.

New Cross (Clifton ARS)—Wednesdays and Fridays, 8pm, 225 New Cross Road, SE14. Details from N. Moore, hon secretary, 87 Inchmerry Road, Catford SE6.

Paddington (P & DRS)—Wednesdays, 8pm, Beauchamp Lodge, 2 Warwick Crescent, W2. Hon secretary M. A. Porley, G8AWV, QTHR.

Purley (P & DRS)—11, 25 April (No details), 8pm, Lansdowne Hall, Lansdowne Road, Purley. Hon secretary A. Frost, G3FTQ, QTHR.

Reigate (RATS)—Wednesdays. 5 April (AGM), 8pm "Nutley Hall", Nutley Lane, Reigate. 19 April (Informal meeting), 8.30pm, "Marquis of Granby", Hooley Lane, Redhill. Hon secretary D. Thom, G3NKS, QTHR.

Scouts (BPHSARG)—20 April (No details), 7.30pm, Baden Powell House, Queensgate, Kensington SW7. Hon secretary A. Watts, 312 Tudor Drive, Kingston-on-Thames, Surrey.

Southgate (SRC)—13 April (No details), 7.30pm, Civil Defence Hut, Bowes Road, N11. PRO S.P. White, G3ZVW, QTHR.

Sutton & Cheam (SRCS)—18 April (AGM), 8pm, The Harrow Inn, High Street, Cheam. Hon secretary J. Korndoffer, G2DMR, QTHR.

Welwyn (Mid-Herts ARS)—13 April (Mr Turner of MPT will talk on interference problems, including tvi to monochrome and colour tv), 8pm, Welwyn Civic Centre, Welwyn. Chairman P. Willcocks, G8AIE, QTHR.

Wembley (GECARS)—Thursdays, 7pm, c/o Hirst Research Centre, Wembley. (This club is open to non-GEC employees by invitation, telephone Dain Evans, G3RPE, at 01-904 1262, for further details).

Woolwich—This society is being reformed. Contact B. D. Corper, G3ZOJ, QTHR, for details.

REGION 8 — RR D. N. T. Williams, G3MDO

Brighton (BTCARC)—After the Easter holidays meetings will resume at 7.30pm on alternate Mondays from 10 April to 19 June. Programme to be announced.

Canterbury (EKRS)—20 April (The project), 18 May ("Test equipment for the radio shack", by G3JIX). Monthly meetings held at Westgate Hall, Canterbury, alternate meetings held in conjunction with the UKC at the Electronics Building. Further details of future events from G3MDO, QTHR.

Crawley (CARC)—26 April ("Receiver design", by KW Electronics), 5 May (Annual dinner dance at Airport Hotel, Crawley. Tickets from G3FRV, price £2.50.) Meetings held at Trinity Congregational Church Hall, Ifield, Crawley.

Eastbourne (SARS)—10 April (Junk sale), 1 May (Amateur television demonstration). All meetings held at Victoria Hotel, Latimer Road, Eastbourne.

Horsham (HARC)—First Tuesday of month, 7.30pm, Guide HQ, Denne Road, Horsham. 4 April (Junk sale), 2 May (Wavemeters and licensing conditions for the radio amateur).

Maidstone (MYMCAARS)—Meetings held every Friday at "Y" Sports Centre, the first and third Fridays being devoted primarily to beginners. 28 April ("Suppression of breakthrough on hi-fi equipment", by G3ORP).

Mid-Sussex (M-SARS)—6 April ("Apollo 11" film), 20 April ('Constructional contest').

Thanet (TRS)—Meetings held every Friday at Hilderstone House, Broadstairs.

Worthing (W & DARC)—Meetings held every Tuesday, Rose Wilmot Youth Centre, Littlehampton Road, Worthing.

REGION 9 — RR H. W. Leonard, G4UZ

Bristol (City & County RSGB Group)—24 April (Cause and effect", by R. Ham, BRS15744), 7.30pm, Becket Hall, St Thomas Street, Bristol 1. On 27 February over 80 amateurs were present to hear Paul Sollom's lecture on "Pictures from the satellites". *G3ULJ.*

Bristol (BARC)—Tuesdays and Thursdays, 7.30pm, 41 Ducie Road, Bristol 5.

Bristol (University ARS)—Every Saturday, 2.30pm, Dept of Physics, Royal Fort, Tyndalls Park Road, Bristol 8. *G8ADP*.
Burnham on Sea (BoSRC)—Contact J. Robertson, G3ZOR, telephone 2333.
Cornish (CARC)—First Thursday of month. 6 April (AGM followed by films), 7.30pm, SWEB Social Centre, Pool, Camborne. G3UCQ.
Newquay Group (CARC)—Fortnightly, 7.30pm, Treviglas School, Newquay. Further details from G3NKE, telephone Camborne 2419. *G3THT*.
Exeter (EARS)—Every Tuesday. 11 April ("Stereo hi-fi", by P. Scott), 7.30pm, Community Centre, St David's Hill, Exeter.
North Devon (NDRC)—Second and fourth Wednesdays of month. 12 April (Talk), 26 April (Ragchew), 7.30pm, "Grinnis", High Wall, Sticklepath, Barnstaple. RAE session at 7pm each meeting. *G4CG*.
Plymouth (PRC)—First and third Tuesday of month. 4 April (Film show by Mullards), 2 May (AGM), 7.30pm, Virginia House, Bretonside, Plymouth.
Saltash (S & DARC)—First and third Fridays of month, 7.30pm, Burraton Toc H, Saltash. Contact I. C. Aldridge, G4AJU, 302 St Peter's Road, Manadon, Plymouth PL5 3DU.
Taunton (T & DARS)—Fridays, 7.30pm, Jelalabad Barracks, The Mount, Taunton.
Torbay (TARS)—Every Tuesday and last Friday and Saturday of month. 29 April (AGM, all members to attend please), 7.30pm, rear of 94 Belgrave Road, Torquay. G3NQD, 10 Truro Avenue, Hele, Torquay TQ2 8AA.
Weston-super-Mare (WsMRS)—Contact G3GNS for details.
Yeovil (YARS)—Every Thursday, 7.30pm, Youth Centre, Park Lodge, The Park, Yeovil. *G3NOF*.

REGION 10 — RR D. M. Thomas, GW3RWX

Barry College of Further Education (ARS)—Thursdays, 7.30pm during school terms. At the time of publication, arrangements for the 75th Marconi-Kemp anniversary of the experiments across the Bristol Channel, are well in hand, and will be given in detail in the May issue of *Radio Communication*. *GW3VKL*.
Cardiff (RSGB Group)—10 April, 7.30pm, BBC Club, Llandaff, nr Cardiff. *GW3GHC*.
Glamorgan Raynet Group—Details of meetings and exercises from GW3ZFG, telephone Cardiff 62411.
Haverfordwest (ARS)—Tuesdays, 7.30pm, HQ Rosemary Lane, Haverfordwest, Pembs. *GW3YBB*.
Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, nr Merthyr, Glam. Hon secretary Mr F. E. Tribe.
Port Talbot (ARC)—On Tuesday 11 April at 7.30pm, the annual social will be held. An open invitation is extended to all South Wales clubs to attend, and it is hoped that all old friends and their ladies will be present. Separate invitations have been sent and it is requested that early notification of intention to be present be sent to the secretary, GW5VX. Please note the change of address for this function, which is the Rail & Transport Club, Station Road, Port Talbot. *GW5VX*.
Sully & District Shortwave Club—Tuesdays, 7pm, The Annexe, Sully Bowls & Social Club, 59 South Road, Sully, Glam. Club callsign GW3ZIT. *GW3ZSV*.
Rhondda (ARS)—Meets at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. Details of programme from GW3PHH.
Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Swansea, Glam. Hon secretary Mr D. E. Connor, 7 Glanmon Road, Sketty, Swansea, Glam.
University College, Cardiff (ARS)—The main activities of this society at the moment are connected with various transistorized projects and it is hoped to have the KW2000 back on the air in the near future. Club callsign GW3UWC. Further details from the secretary, c/o Students Union, Dumfries Place, Cardiff.
University College of Wales, Aberystwyth (R & ES)—The combined universities meeting held on 23 February was one of the most successful functions held in the region since the last ORM. Over 50 people attended and the zonal and regional representatives were present. The afternoon session was taken up by talks on the history of radio, leading up to the present position of the RSGB, by GW8NP, and a technicel talk by GW3RWX. Following a meal, the evening meeting heard a talk by Mr P. V. Entwistle of the RAE Aberporth, on "Radio & Electronic aspects of Range Instrumentation".

In addition to the university societies attending, the gathering included Barry College of Further Education ARS, Cader Idris RS, United College of the Atlantic RS, and a number of local amateurs. The committee of the host society must be congratulated for attempting a meeting on this scale, and particular praise is due to Miss Ruth Bury, the most efficient secretary.

REGION 12 — RR A. J. Oliphant, GM3SFH

Aberdeen (AARS)—Fridays, 7.30pm, 6 Blenheim Lane, Aberdeen. GM3HGA, telephone Aberdeen 33838.
Dundee (Kingsway Technical College ARC)—Wednesdays, 7pm prompt, Kingsway Technical College, Old Glams Road, Dundee.
Inverness (IRS)—Thursdays, 7.30pm, Clubroom, 4 Falcon Square (nr Railway station), Inverness. Miss A. Veitch, telephone Drumnadrochit 266.
Lhanbryde (MFARS)—Wednesdays, 7.45pm, St Andrew's School, nr Lhanbryde, Elgin, Morayshire. GM3UKG, telephone Clochan 225.

REGION 13 — RR V. W. Stewart, GM3OWU

Berwick (BARS)—First Sunday in each month, 3pm Tweed View Hotel. Further details from C. H. Crook, G3YOG, 19 Hatters Lane, Berwick on Tweed or from the AR, G. Shankie, GM3WIG, 8 Ettrick Terrace, Hawick, Roxburghshire.
Dunfermline (DRS)—Second Wednesday in each month 7.30pm, Abbot House, Dunfermline. Further details from G. Martin, GM3NVQ 42 Rose Street, Dunfermline.
Edinburgh (LRS)—Second and fourth Thursdays, 7.30pm, 66 Hanover Street, Edinburgh. Further details from R. Manners, GM3VZL, 165 Mayfield Road, Edinburgh.
Glenrothes (GDARC)—First Sunday in each month, 7.30pm, Old Nursery Buildings, Leslie, Fife. Further details from K. Home, GM3YBQ, 14 Liss Way, Kirkcaldy.

REGION 16 — RR D. F. Beattie, G3OSF

Chelmsford (CARS)—First Tuesday of month. 2 May ("Hf propagation", by L. Barclay), 7.30pm, Marconi College, Arbour Lane, Springfield, Chelmsford. Details of meetings from G3VPK.
Colchester (CARS)—Wednesdays, 7.30pm, North-East Essex Technical college, Sheepen Road, Colchester. Details of meetings from E. Jacobs, 26 Pondfield Road, Colchester, Essex.
Ipswich (IRC)—Last Wednesday of month. 26 April (AGM followed by morse practice—time permitting). 7.30pm, Gippeswyk Hall, Gippeswyk Ave, Ipswich. Details of meetings from G3YWM.
Southend-on-Sea (S & DRS)—Every other Thursday. 6, 20 April, 7.30pm, Flarepath Canteen, Southend Airport. Details of meetings from G3AXN.

REGION 17 — RR L. N. G. Hawkyard, G3ZKR

Fareham (F & DARC)—9 April (Club night and committee meeting), 16 April (Lecture), 23 April (Film and raffle), 30 April ("Colour tv reception", by David James). The 7th annual dinner was held at the Red Lion, Fareham, on 25 February. The principal guests were G6NZ and founder member G3SHD.
Harwell (AEREARC)—Meetings on the third Tuesday of month, also informal gathering and junk sales every Friday lunch time, held at the Social Club, AERE, Harwell. *G3NNG*.
Southampton (RSGB Group)—Every Wednesday evening at the clubroom, Kent Road. 8 April ("Electronic equipment in smallcraft", by G3WCJ), Lanchester Building, Southampton University. G3ZKR, telephone 73378.
Swindon (SDARC)—12 April (Operating Awards), 26 April (Informal evening), 7.30pm, Penhill Junior School, Swindon. *G3JAP*.

MEMBERS' ADS

These low-cost flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the last page of each issue of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 25p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No other correspondence concerning this service can be entered into.

The closing date for each issue is the 4th of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale.

Members are advised to enclose a stamped addressed envelope when replying to advertisements.

See the current order form on the last page for further details.

FOR SALE

SB300 with SB301 mods, £90. Hammarlund HK1B el-bug, mains/batt with Vibroplex paddle, £17. LG300, £25. Carr. extra G3GJW, QTHR.

Ssb tx, 200W, comp with sep vfo and two psus, blower cooled TT21s, 10-80m, full band coverage, only £45 ono for quick sale. G3JWK, QTHR. Tel Winsford 2466.

AR88D, £30. BC221, £20. Both with hndbks, buyer coll. Z match, £3.50. Martin, 80 Carrant Road, Tewkesbury GL20 8AA.

Eddystone 840A gen cov rx, 500kHz-30MHz comp with service sheet + set spare valves, £28 ono. Dc/dc invertor to suit same rx, £15. G8CHE, QTHR. Tel 01-573 2041 (evenings).

Property of late G3SJO: Sommerkamp FTDX150, swr meter, Ezee match, £190. 70cm tx as handbk, QQVO3-20A tripler, pa pair QVO-25s, modulator UM2, large psu, £25. G3FIJ, QTHR. Tel Colchester 70189.

2m Mosfet cnvrtr i.f. 2-4MHz, 4in by 4in by 1½in, £6. 2m pre-amp cascode 2N5245s, 2½in by 1½in by 1in, £3. G3KNB, QTHR. Tel Stafford 62105.

Airfix psu, input 200-240V ac, output 12·5V dc, as new, used twice only, boxed 4 by 3 by 2, £2. West, 29 Halfmoon Lane, Herne Hill, London SE24.

Deceased member's AR88D, vgc, £40. Buyer coll. G3YPS, QTHR.

FL200B and FR200B in absolutely mint cond comp with all extra xtals inc WWV, manuals, mic, spkr and interconnecting cables for tx/rx. Comp stn, £130. G6XY, 22 Southbank Road, Kenilworth. Tel Kenilworth 52679.

Marconi 10-100MHz cnvrtr type TM5951, plug-in, £7. Cossor fm alignment gnrtr type 1324, £7. Taylor cap/inductance adaptor type 313D, £3.50. 3823E FETs, 20p. Taylor 100A multimeter, £25. G8CMG, QTHR.

Coutant psu modules type ASB100, 6-15V, 1A stabilized, overload protected, 8in by 5in by 3¼in, two only, unused, £18 ea (list price £25). G8BNJ, QTHR. Tel Cheltenham 57595.

Wobbulator Metrix model 210. Heathkit ssb adaptor model SB10U, comp wkng manual. Test panel type 774, rack mounting, new cond, comp packing case, three 4in meters 2kHz-30kHz, xtals, fully valved, offers. G3UVS, Kechil Rumah, Green Lane, Yelverton, Devon PL20 6BW. Tel Yelverton 2986.

TW 2m tx/rx, little used, offers. CR100, tatty but wkng, £8. Lafayette HA63 rx, £12. 12AVQ, almost new, £10. G3ZZJ, 90 Childwall Valley Road, Liverpool L16 4PF. Tel 051-722 1693.

SBE34 small phone only ssb tx/rx, built-in batt, mains psu. £140. Green & Davis LA600 linear, £40. /M Heliwhips + base, 80-15m, £10. Eddystone 750 dble-conv, 550kHz-30MHz, £45. G3FIF 160m whip + base, £5. G3UGX, Worston House, nr Clitheroe, Lancs BB7 1QA. Tel Chatburn 321.

KW2000A, ac psu, 201 mic, swr bridge, lpf, hndbk. HW30, 2 xtals, pa tuning, mic, 230V trnsfrmr, handbk. 40ft telomast, all rigging, all vgc. Sw rx needs attn. Midland a.m./vhf airband rx, vgc, offers. G3XLL, QTHR. Tel Norwich 48685.

Creed 7B teleprinter, comp with base + silence cover, £12.50 ono. Pref buyer coll. G3WMM, QTHR. Tel Colchester 42453.

Honda E300E p/e gene, £50. G8BBA, QTHR.

160m ssb tx, 25W p.e.p. size 8 by 6 by 11 with psu, £10. 160m /M tx, 10W a.m. all transistor +ve earth, size 8 by 7 by 2½ with cc cnvrtr for bc set, £8. G3BAC, QTHR. Tel Meopham 2049.

Codar AT5 250/S psu, £9 ono. G3PXJ, QTHR. Tel 021-444 4312.

KW Viceroy ssb tx, £50. Star 550 ssb rx, variable selectivity + internal calib, £25 ono. Buyers test and coll. McFarlane, 23 Gateside Avenue, Bonnybridge, Stirlingshire.

ASB8, £6. ACT22 in 432MHz cavity, £6. Scrap 52 rx, £1.25. Scrap MN26, £1.25. Wanted: Mohican rx. GW8AIB, QTHR.

Wharfedale SFB3 spkr. Garrard 301 leak dynamic mono head. Quad acoustical tuner, control, amplifier sell separately. Best offers. Herring, 29 Norton Park Drive, Sheffield S88GP.

Stereo record/playback tape deck Eagle Mod JC45OH, four track, under three yrs old, perf wkng cond, £37. G3ZCW, QTHR. Tel Turners Hill 611.

20th Century Electronics twin beam crt D6SQG base, screen, £10 or exch for gd transistor vhf gdo. R1392 drive, vry smooth, calibrtd 144-146 exc cond, £2. AVO multiple voltage trnsfrmr, £2. Wood, 68 Lakeside Rise, Blundeston, Lowestoft, Suffolk.

Codar CR70A rx with spkr + preselector, as new, £17.50 ono. Will del rsnble dist. Mitchell, 5 Hill Park Road, Gosport, Hampshire.

HRO with gc coils, £12. Heathkit OS-1 scope, £12. 5-10A, £5. 2002 tx/rx on 2m, £5. 130MHz tx/rx, £5. 40W 70cm varactor tripler, £10. G8CLH, QTHR (weekends). Tel Littlehampton 6161 extn 55 (daytime only).

Superb G2DAF Mk 1 tx + AR88LF, £65 or might separate or exch for gd vhf or solid state gear. G3UDI, 80 Coleridge Road, Cambridge CB1 3PJ.

Eddystone 750 rx, 1st class, unmodded, mtchng spkr, £35. G3XNG, 17 Wood End Road, Kempston Rural, Bedford.

Comp 160/80m stn comprising Codar AT5 tx with 250/S mains psu. Codar T28 rx, £25 ono. Tavasu whip with 160m loading coil, almost new and hardly used, £3.50. G3YPP, QTHR. Tel Luton 38656.

S band parametric amplifier, tunable, noise temperature readout, Klystron pump, all psus, comp unit in heat insulated forced-air cooled box 2ft 6in by 1ft 6in by 1ft, £100. GW3UPK, QTHR.

Codar P40 preselector, brand new, virtually unobtainable, battery operated, £8.50 + post, or will exch with cash adjustment for mains table radio modern uhf/fm lw/mw/sw bndsprd. Ireland, Carnhell Green, Camborne, Cornwall. Tel Praze 236.

Eddystone 840A rsnble cond, £20. Murphy base stn tx and psu aligned for 2m, £25. Pye Vanguard suitable for 2m with control unit + cable, £30. G8BJK, 119 Gurney Court Road, St Albans, Herts. Tel St Albans 59292 extn 290 (between 8.30am-5pm).

HRO 9 gen cov coils, 1 bndsprd coil, spkr, orig psu, miniature valves, £25. Number 10 xtal calib, £2.50. 20H 250mA Woden choke £1. QQVO3/20A modulation trnsfrmr, 50p. 50W modulation trnsfrmr, 50p. G3SAK, Hunters Quay, Hemp Lane, Wigginton Tring, Herts. Tel Tring 3874.

160m all-transistor /M rig. CSE tx/rx, aerial + mic, compact well made, works well, cost £99, little used. Cons exch arrangement Drake or KW107 atu. G3ASC, QTHR. Tel Oswestry 2500.

KW2000A, comp with mains + dc psus, £150 ono. G3LQB, 12 Oakfield Drive, Kempsey, Worcs.

Swan 500 comp with Swan psu + pair new pas. Offers. G3JQ, 17 Sandringham Road, Macclesfield, Cheshire. Tel 0625 22568.

2000B with ac psu, mint, £180. Separate vfo, £30. Dc psu,£22.50—or £225 the lot. Eddystone 750, exc cond, prof aligned and fitted internal sig strength meter, £40. G3WPX, QTHR. Tel High Wycombe 34143.

Codar PR40 preselector, brand new, battery operated, £8.50 + post or exch with cash for table mains radio vhf/fm mw/lw/sw (bndsprd), must be mint. Ireland, Carnhell Green, Camborne, Cornwall. Tel Praze 236.

Ssb fltrs 455kHz, 1·8kHz at 6dB, £4.75. Vhf power 2N3866, 2N4427, 65p. 2N3375, £3.75. 2N3553, £1.50. 40290, £1.25. 2N3053, 18p. BF387 low noise 3·5dB/800MHz ft 2,300MHz, 70p. Elliott, "Oatlands", Southend Road, Howe Green, Chelmsford, Essex. Tel Chelmsford 71604.

Heathkit SB301, gd cond with 2m VQ4EV cnvrtr if reqd, £70 ono. G8BLD, The Rectory, Framingham Pigot, Norwich, NOR 45W.

7B teleprinter, tv + psu, £20 ono. Lancom tx/rx, lowband with 15kHz fltr + deac, £8 ono. 2m tx, £2. Fm discriminator model, any rsnable i.f., £2. Wanted: hi band Bantam or sim. G8AGR, QTHR. Tel 0632 677537.

Minimitter tx, a.m./cw, some mods, wkng, can be seen, £20 ono. will del up to 20 miles. Contact secretary G3XIV, QTHR or tel Portsmouth 22351 extn 6372 (day only). Fareham & District Amateur Radio Club, Portchester Community Centre, Fareham.

CR150 dble superhet with mtchng psu, spare valves + hndbk, exc cond, unmodded, £20. Del Birmingham area or buyer coll. G3YPU, QTHR. Tel 021-744 4744.

Rf ammeters: 0·5A, 1A, 2·5A, 3A, 3·5A, 4A, £1.25 post pd. 0-1A round £1.50. G3ZVZ, Ancoats Hospital, Manchester, M46EB. Tel 061-205 2204.

Collins 51S-1, sensible offers. Also FR100B, FL200B, £140 pair. Free standing 50ft mast, £35. All gd wkng cond. Wanted: HRO60, SB401. G3MPN, 42 Browick Road, Wymondham, Norfolk. Tel Wymondham 3382.

KW2000A comp with Shure 201 mic + swr bridge. Also KW E-zee match, both in exc + unmarked cond. Offers. GM3YRK, 57 Dumgoyne Drive, Bearsden, Glasgow. Tel 041-942 2767.

HRO 4 coilpacks inc 15m wkng but no psu, £12. Wanted: /P top-band rx, homebrew accepted. Knight, 75 Ashcroft Road, Luton. Tel Luton (0582) 35617.

FTDX100B with built-in Vox one section 10m, ac/dc, spent most of its life in orig packing, £165 ono. New National fm stereo + a.m. radio and cassette, ac/batt, £67 ono. Barry, 47 Gerald Road, Wollaston, Stourbridge, Worcs.

Eddystone EC10 Mk 2 rx, only 9 mnths old, in perf cond comp with xtal calib, £65 (carr pd) ono. Edgecock, 1 High Street North, West Mersea, Colchester, Essex.

All-band linear 2X572Bs with psu built-in swr bridge, £32.50. 160-10m rx, sim G2DAF, Philpotts cab, Eddystone dial, £27.50. ZC1 Mk 2, £7.50. *CQs, QSTs, Bulletins, SWMs*, 25p per year—some bound vols. G3KWK, QTHR. Tel Redditch 63817.

AR88D, new boxed, £45. Dumont 5in CRO, £8. Homebrew 3in, £3. Precision variable capacitor, calbrtd, £5. Marconi audio watt-meter, 200µW—6W, variable impedance, £10. Suitable laboratory AVO7 + case, newish, £5. Hndbks. G2BPC, QTHR.

Basic Radar, part 1, 50p. *Dielectric Aerials*, 40p. mics, cost £3.75, will accept £3. Magnetron, cost £1.05, will accept 75p. Reditune, new, £2.50. Gauss meter, £4.50. Tannoy spkr in cab, £1. Seymour, 25 Ryde Buildings, Webb Street, London SE1 4RX.

Marconi No 13 sig gen, a.m./fm, 20-80MHz, £18. RCA audio freq meter, 50HZ-50kHz, direct freq readout, £12. Audio sig gen, £10. Strobe, 6Hz-14·5kHz, £8. Dosimeter, 30p. Charger, £1.50. Marconi wavemeter, 20-300MHz, £5. Homer, 32 Ironmill Lane, Crayford, Kent DA1 4RR. Tel Crayford 24625.

Collins 51J3 gen cov rx, 500kHz-30·5MHz in 30 1MHz bands, 18 tube triple conversation, exc cond, 1kHz freq readout, £195. G3BFC, Glenville, Ethorpe Close, Gerrards Cross, Bucks. Tel Gerrards Cross 86903.

Moseley V46, £10. Tatty V3 jnr, £3. Buyer col. LM14 similar BC221, calibrtd amateur bands only, needs power. FT241 xtals channel 324 6 of 450kHz, channel 327 4 of 454kHz 25p ea. KW 75Z lowpass fltr £2.50 + post. G3IZJ, QTHR. Tel Farnborough 48561.

35 Vols *Bulletins* Jan 1937 to Dec 1971 less Dec 1947 and April 1955, offers. G3APY, Brook Street, Sutton in Ashfield, Notts. Tel Sutton in Ashfield 2551.

2 Vols *Radio Communication* 1969-70, 1 Vol *Practical Wireless* 1969, £1 per Vol. All 1968 *Practical Wireless* except Jan and March, 5p per copy + post. 16 radio books, 75p + post. Simpson, 107 Derryhale Road, Portadown, County Armagh, N Ireland.

APM9 loran rxs, 2 only, contains 33 octal vales, 100kHz extal, 3Bp1 CRT ? must be worth £2 for constructing scope. Due to weight and size, callers only after 6pm. Smith, 365 Grimsby Road, Cleethorpes, Lincs.

3cm radar, comprising: incidator rf unit, magnetron, pulse trnsfmr, all psus and leads, wkng except rx klystron (723AB), £25. Homebrew rx, 10 valve xtal fltr, £5. 300V psu, £3. G3WJG, 22 Woodrow Close, Perivale, Middlesex. Tel 01-997 0901.

Eddystone EA12 in orig packing, only 6 hrs use, first offer over £160. Brash, 5 Hillview Drive, Edinburgh EH12 8QW. Tel 031-334 7152.

4X150D linear for 2m, fully metered, £15. Spare valves + stab psu available if needed. AR22 rotator, 110V ac, £10. Globe Radio speech clipper/fltr, £5. G3KEN, 141 Blackpool Road, Ansdell, Lytham St Annes, Lancs. Tel Lytham 6371.

3 4CX2500Ks, £2 ea. 2 813s + bases, £2 ea. 2 1616s, 50p ea. Lorenz T36LO printer, ZA39384 fsk adapter, offers. Samwell + Hutton 455kHz wobb with CRT display, £12. Del poss in London area. G3PGN, Steeple View, Peartree Lane, Doddinghurst, Brentwood, Essex. Tel Blackmore 822891.

HRO rx, vgc, comp with 9 coil packs, 50kHz to 30MHz + psu, £30 or best offer. Woollons, 12 Meadow Way, Letchworth, Herts. Tel Letchworth 5535.

Lucas blocking diode unit, 45A diodes, unused, neg earth, £4. Pyrex glass tubes, suit 4X150. 70kHz pot cores. LA2403. 4 CS3B microwave diodes, 6 5µF, 50V, new. 20p each lot. G3RWM, QTHR.

KW Vanguard 10–160m, £20 buyer coll. KW 75Ω swr indicator, £5. G3NSY, QTHR. Tel Pontesbury 457.

160 /M tx/rx, homebrew, Philpotts cab, no psu, £10. 80–160 G whip, new, £6. 12AVQ 10–15–20 aerial, new, £10. KW Ezee match, as new, £10. Swr meter, homebrew, £2, or exch hi-fi gear. G3XCF, 83 Meeting Lane, Penketh, Warrington, Lancs.

Sig gen, Marconi TF144G scope, EM1 WM2 bandwidth to 13MHz, offers. Cooper, 45 Nightingale Crescent, Harmans Water, Bracknell, Berks RG12 3PY. Tel Bracknell 4168.

Pair 807/UM3 25W modulator + 6000 psu, £6.50. Geloso 4/102 front end, £5.50. EK9X el-keyer, £5. Lionel bug key, £2. TT21 valve, £1. Coll or carr extra. G3VNG, 4 Thornyville Villas, Oreston, Plymouth, PL9 7LA. Tel Plymouth 41511.

2 Pye uhf fm txs, £10 ea. 1 mtchng rx, £10. 470MHz rack mounting. 1 12 Set tx, £10. 2 B44 rx/txs, £12 and £8. Buyers coll, pref phone first. G8CHK, QTHR. Tel Towcester 581 extn 277 (wkng hours).

Vox T60 30W bass guitar amp + spkr unit, vry solid spkr cab with 18in tannoy and 12in Vox units, £50 ono. G3UKW, QTHR. Tel Garforth 5165.

PCR3 rx, 2–22MHz + mw mains psu, no mods, £5. Buyer coll. Wanted: G2DAF rx coils and i.f. trnsfmr for product detector. G3YRW, QTHR.

Johnson 500pF Z match cond, 42ft 3 sctn alloy mast, £10. 2in and 3in magslips, AVO sig gen, £3. *Radio Communication* Vols 44–47, offers. *ARRL Antenna Book*, 75p. Trnsfmrs, chokes, Woden UM3. G3PYP, QTHR.

Eddystone 840C, mint, with manual, £50. Marconi Electra rx, with manual, £30. Courier tx/rx, 160–10m, 200W p.e.p., £120. Furzehill freq standard, 1MHz, £5. Sig gen, 120kHz–84MHz, mod/cw, output meter, £5. G3UAR, QTHR. Tel 01-574 6384.

KW2000 + ac psu + dc psu and Shure mic, £135, ono. G2FUU, QTHR. Tel Nazeing 2274.

4CX250B with base. Pair 4X250Bs. Philips 12V transistorized car radio. Vintage Osram music magnet four. Bendix TA12. Two Pye Reporter base rxs. TR2002 vhf tx/rxs, £5 ea + post. Xtals, valves, meters. GW3EJR, QTHR.

Solartron oscilloscope type AD557, £40. Eddystone 898 dial, £4. QQVO-20A valve, £1.50. Morris, 3 Astley Road, Bradshaw, nr Bolton, Lancs. Tel Bolton 52384.

19 Set with psu (rx). Bound copies of *Practical Wireless, Electronics* and *Radio Communication* (1968–70). Also parts for junk box. Buyer coll. Festenstein, 14 Brackendale Grove, Harpenden, Herts. Tel Harpenden 5657.

Hf band tx, 150W a.m./cw, £18. Electroniques hamband coilpack. Eddystone 898 dial, own psu in cab, £10. Eddystone rx 358X, psu + spkr, £8. High band Pye Ranger PTC2002V, unmodded, £5. GM3RHR, QTHR. Tel 041-772 3085.

DX4OU + VF1U, £18. KT320, £18. Carr extra. G3XQX, QTHR.

Eddystone 840C rx, 550kHz–30MHz, gd cond, £30 ono. Codar PR30X self-powered preselector, mint, offers. Philips GA105/15T stereo record deck with plinth, cover, stereo cartridge, stylus, 4 mnths old, perf, £14. Kent, 4 Haig Road, Bedlington, Northumberland.

Constant voltage trnsfmr, 6·3V 0·75A mains input, ideal vfo etc, £1. Mann, 45 Old School Lane, Milton Cambridge. Tel 0223 824150.

AVO shunts, 100A dc + 50A ac, 50p ea. Stabilized psu 0–300V + 0–26V etc, £6. Sullivan CT13 lcr bridge, £15. Marconi TF675E pulse gnrtr, 100Hz–50kHz PRF 0·15μs–40μs pw. RCA audio freq meter, £12. Whitbread, 32 Iron Mill Lane, Crayford, Kent DA1 4RR. Tel Crayford 24625.

Many items inc mod trans, 6146s, 4X150, 4CX250s, BLY61s, BL62s BLY63s, Marconi diversity rx, rough AR88, QQV03–20 etc. Write or tel. G8CMU, 3 Hall Drive, Finedon, Wellingborough, Northants. Tel Finedon 284.

Panda PR120V, fb appearance and performance, £25, ono. Buyer coll. G3UQP, QTHR. Tel Huntingdon 72236.

Pair 4X250B with ptfe airflow bases and ptfe chimneys, as new, £10 ono. Homebrew top band a.m./cw tx, less psu, suit /M or fixed, £5. Buyer coll or carr extra. G3XDY, QTHR.

2m printed circ tx with valves (needs xtal, modulator + psu), £10. Xtals BC221 £2. 2m 6006 FT243, 25p. 8075 10XJ, 50p. 5U4G valves, 10p ea. G3TJC, QTHR.

Trio 9R59DS, £30. GM3YYY, QTHR. Tel 041-776 4833.

Hartley 13A scope, gd wkng order, £20. Bradley, 58 Bishops Court, Trumpington, Cambridge.

Heathkit rf sig gen RF1U, unused, £15. Homebrew superhet with 898 dial, Electroniques coils, S meter, 8 valves, vgc, £15. Price, "Grosvenor", Wanswell, Berkeley, Glos GL13 9SB.

Copies *Bulletin* Jan 1952, July 1953, June 1956, Oct 1956, July 1966, Sept 1967, Oct 1967, Sept 1969, Jan 1971. *SWM* Aug 1956, October 1960, Feb 1958, Jan 1971. 5p ea copy. G4FN, 31 Highfield Gardens, Grays, Essex.

Uncompleted "Williams" rx (RSGB *Bulletin* Jan 1967). Amateur bands Electroniques qoilpax, Eddystone 898 dial, psus, beautiful cab, all new, £25 ono. Carr to be arranged. Modulated test oscillator MT01, £2.50. G3ZLG, QTHR. Tel Bournemouth 27274.

Q mult Heath QPM-16, 1·6MHz i.f., comp with hndbk/manual, £5 + post. Lloyd, 70 Heath Drive, Ware, Herts.

HRO with 9 coils, psu, ld spkr, spare valves, £27.50 ono. Buyer coll. G4BC, QTHR.

Eddystone EC10, vgc, £35 ono. GW3TLP, 6 Pen Lon, Menai Bridge, Anglesey.

Valves ATP35, £10. Sae list other army octals or phone after 6pm. Cohen, "Coomtata", Coombe Park, Kingston on Thames, Surrey KT2 7EP.

813, 2 866s, 2kV-0-2kV, mains trnsfmr, 813 socket, valves new, £10 the lot. Buyer coll. 2 balanced armature keying relays, 50p ea post free. Spencer, 8 Brighton Close, Addlestone, Weybridge, Surrey.

Valves 4X250B ex equipment tested, £1 ea inc pp. G3OBD, 16 Talbot Drive, Poole, Dorset.

AT5, T28, 250/S, 12/MS, 12R/C, manuals, £35. G3XJS, QTHR. Tel 01-572 2311.

Yaesu FT101, as new and unused, FV101 remote vfo, £240. FT2F, comp 3 channels, FP2AC psu, both as new. Trio 9R59DE with spkr, stabilizer valve, makers box, instrctn + service manuals. Barry, 15 Fairlawn Court, London W4 5EE.

2m base stn comp except xtals, £20. Leak TL25 +, £15. 4m mains tx/rx, £10. Smiths rev counter, 4 cylinder, 12V, as new, £10 or make an offer. G3KTL, QTHR.

UM3, £1.90. Class D mains, £2.95. Parmeko psu, 650V 500V 375V with spare 5R4GY, £2.95. Parmeko tran as above, £1.60. Geloso vfo, spare valves, £2.80. Many other items—sae. Coll or post extra. G2RP, QTHR. Tel Duffield 2294.

Eddystone 940 rx in exc cond, £85. Del arranged. G3ZZS, QTHR. Tel Plymouth 31707.

Furzhill 1684N scope, req attention, £8. RCA TE149 freq meter, £8. Coutant 12V 1A stab psu, £4.50. Single channel radio control tx/rx, 2 actuators, servo, £12. Cons pt exch 160m /M eqpmnt, 14 AVQ. Diprose, 36 Tiverton Way, Chessington, Surrey KT9 2QS.

Minimitter 2–7 tx, £12. Codar PR30 preselector, £5. Codar RQ10 Q mult, £5. Nuvistor 2m cnvrtr, 28–30MHz i.f., £6.50. GW3YSA, 35 Pen-y-Waun, Efail Isaf, nr Pontypridd, Glam. Tel Newtown Llantwit 3809.

Codar AT5 tx + control box, £12. Carr or coll. G3SFV, QTHR. Tel Market Harboro' 4827.

AR88D, 2m + 70cm cnvtrs, type 234A, psu, 70cm tripler, pa, psu + beam. Joystick, 600–0–600 trnsfmr + many bits. Sae only pse. Wynn, 119 Horsa House, Middle Wallop, Hants.

Creed 7B teleprinter + cover and Creed auto tx, both with 240V ac motors. G8DDW, QTHR. Tel 01-858 3921.

AR88D, manual, meter, spare valves, gd cond, £32. G5RV lp fltr, £1.25. G2HCV, QTHR. Tel 01-954 2960.

Two 2m cnvrtrs, i.f. 26–28MHz, Swindon Club design on pc board, 1–40602, 1–BF180, 2–2N706. Both £5.50 post pd. Browne, 59 Kitchener Street, Swindon, Wilts.

Hammarlund HXL-1 linear amp, gd cond, 240V, £80. New finals B & W 5100B trnsfmr converted for rtty, exc cond, £50 or will trade for a gd G2DAF tx/rx. G5ASF, 13 Rothesay Road, Dorchester, Dorset. Tel Dorchester 4054.

Offers over £120 for Sommerkamp FT250 + psu, hardly used. Eddystone 940, as new, £110, ono. KW power meter, as new, £7.50. Sonatron scope, 2·5MHz bandwidth, needs slight attention, £10. G3SSI, c/o G2HCV, Eastcliff, Brookshill Drive, Harrow Weald, Middlesex. Tel 01-954 2960.

HRO + psu, 9 gen cov coils, £22. KW Vanguard tx, 160–10m, £23. BC 453-B, £2. 2m 12 ele collinear aerial array, £3. Constant voltage trnsfmr, 240V ac 250W, £3. Pref buyer coll. Williams, 27 Mynydd Garnlwyd Road, Morriston, Swansea. Tel Swansea 74012.

8 LS-50 valves, 2 P50s, 2 RL12-P50 with holders, 50p ea. Cowl Gill motor and psu, £7.50. Buyer coll. Wanted: HRO or sim rx, any cond, cheap. Field, 2 Hobbes Walk, Roehampton, London SW15.

Zener diodes, most values 3·3V-30V. BZY88 type, 4p ea, 5 for 15p. Ssb fltrs 455kHz, b/w 1·8kHz, £4.75, stamp for data. 2N3866, 70p, 2N3553, £1.50. 2N3375, £3.75. Elliott, "Oatlands", Southend Road, Howe Green, Chelmsford, Essex. Tel Chelmsford 71604.

Property of late G3SKO—all homebrew. Sae for dets. Cheap to RAIBC or sim if coll'd. Wanted: domestic vhf/P, Hacker etc for Cassette tape recorder. 1MHz xtal. G3TJY, QTHR.

Shack clearance: AR88LF also hro-mx with psu and 8 gc coils, both faulty, offers. GM4AEA, 5 Polbroc Place, Kirkconnel, Sanquhar Dumfriesshire.

Lafayette HA350 rx, xtal calib, immac, £55. KW Vespa Mk 1 tx, psu, perf, £60. Both with hndbks, diags, or would sell pair together £105. Buyer coll. GW3UZN, QTHR. Tel 02-917 309.

Yaesu Musen FTDX150 + miniature remote vfo and control unit for /M wkng, perf as new cond, £160. G3KLF, 12 Aveland Road, Ketton, Rutland. Tel Luffenham 241 xtn 406 (wkng hours).

HW12A, mint, £43 ono. Combined swr meter, atu, psu in mtchng cab, £10 ono. Bennett, 206 Corsham Road. Whitley, Nr Melksham, Wilts. Tel Melksham 3443.

7360 beam deflection tubes, £1 ea. Other valves available: 6HF5, 250TH, QY2-100, 100TH, 35T, 866A, RG1-240A, 830B, 805, 211, 1616, EF50, VR136, 807, 1625. Also TCS-5 tx only slightly modded, wks well, offers. G2PU, 39 London Road, Harston, Cambridge. Tel Cambridge 870454.

Hallicrafters HT32A tx + HT33A mtchng linear, 1,250W p.e.p., 80-10m, exc cond, comp hndbks auto trnsfmrs, £70 ea. Will separate. Interested Nikon FTN 28/144 trnsvrtr TH6DX. G3UHH, QTHR. Tel Watton 238.

KW2000, ac psu, £120. G3UBP, QTHR. Tel Dartford 70885.

Nixie decoder/driver ICs 7441AE, unmarked but new and tested OK, 45p ea, 5 for £2 post pd. GW3WVT, 40 High Park, Gwernaffield, Mold, Flintshire.

Auriol pneumatic pickup control for single play turntable, new, unused, accept £2.50. Bainbridge, 150 Chase Road, Southgate, London N14 4LG.

4m 2m 70cm tx/rxs, 12V dc or mains, between £10 and £20 ea, varied makes. Solatron HD psu, 150/350V at 500mA, hndbk, £12. Armstrong stereo amp, wkng, £20. G8ATK, QTHR. Tel Farnham 5765.

Heathkit RA2 rx, comp with mtchng spkr, xtal calib, vgc, £30. G3ROC, 75 Grosvenor Avenue, Hartford, Northwich, Cheshire.

Marconi CR100. Noise limiter S meter fitted but not wired unscratched royal blue enamelled panel, mostly new valves, with hndbk + phones, £17.50 ono. G4AFU, Flat 2, 221 Chippinghouse Road, Nether Edge, Sheffield S7 1DQ.

2 Heathkit HP13 switching transistors, £2. Table top cab with PPS, £2. Knight rf sig gen, £5. Torroid auto tx 115 240V 6A, £2. 2 BD181, £2. 2 AD140, £1. G3KPW, 62 Prospect Place, Grays, Essex.

BC221, c/w, stab psu + charts, fb cond, £16. Taylor valve analyser, £4. Trnsfmrs, chokes etc, all items + carr. Sae for lists. G3LLX, QTHR.

Heathkit GR78 solid state gen cov rx, factory aligned, 4 mths old, cost £65, offers? Can del London or Brighton. Pearcey, The Park Village, University of Sussex, Falmer, nr Brighton.

70cm cnvrtr GM0290, 3N140, 24-26 i.f., £5. 832, 50p. 829, £1. ECC88, 15p. 36·1875MHz xtal (144·75), 60p. 2XHC6U oven, £1.75. RAS508AF, 1000V 5A rectifiers, 8 for £1. G8CHC, QTHR.

SWMs 1956, 1957, 1962, 1963, 1964, 1966, 1967, 1968, 1969, 1970, 1971, 50p per year, post extra. *Radio Communication* 1965, 1968, 1969, 1970, 1971, 50p per year + post. G4FN, 31 Highfield Gardens, Grays, Essex.

B44 on 70·260, as new cond, £9 collect. Nife cells 12V 8AH, £2. Wanted: dc psu DC250 for FT250. G3YTU, 116 Hillcrest Close, Scaynes Hill, Sussex.

KW Viceroy 4 with makers mains psu, extra half lattice fltr, 614Bs, fitted in AR88 case so only £85. Also Inoue IC7OOR, 1 yr old, mint, £70. Wanted: Yaesu FT101 manual. G3ZHZ, QTHR. Tel Maidstone 44152.

BC221 with mains psu, £10 buyer coll. 1MHz HC6U xtals with wire connections, 50p ea. G3NXT, QTHR.

Fire service tx 300W comp valves + hndbk, will tune 70 and 144MHz, offers. G3HTC, QTHR. Tel Sunbury on Thames 84422.

AVO electronic testmeter with hndbk. Siemens high speed relays, 160m tx suit beginner. Moving coil mic. Grundig xtal mic. Woden modulation trnsfmr UM2. Rack cab 19in by 30in. Eddystone coils, 200 valves, offers. G3DFS, QTHR. Tel 021-354 7769.

TW2 Nuvistor cnvrtr, psu, £6. Mullard 1-10 hifi amp, £5. 20m beam + cradle, £10. Variac tranny 7A, £3. Harmonic indicator, £2. G6MN, 6 Kedleston Road, Worksop, Notts. Tel 3415.

Shack clearance: eqpmnt, compnts etc. Sae for comp list. Tomlinson, 10 Pomfret Mead, Basildon, Essex. Tel 3612.

E810F, new, £1.50. Miniature 2 pole c/o 12V relays, 20p ea. G3CUB, 91 Lewisham Road, Dover, Kent.

R206 gen cov comm rx, comp with psu, gd cond, £25. Robertson-Dunn, 26 Wilkinson Street, Sheffield S10 2GB.

KW Viceroy 3A, 6146Bs, KW500 linear. Pallant, "Wheatley" Martins End Lane, Great Missenden, Bucks. Tel 2642.

2m items: Fet cnvrtr 27·5-29·5 i.f. high grade compnts, £9. 6 ele J-Beam with DJ1NB tx pc board, 75p. £25 Lambda stock at par. Wanted: NCX3. G3PZF 16 Palfrey Close, St Albans, Herts.

M stn comprising T28, AT5, inverter + Halson whip with 160m coil, £30. G3ZJU, 35 Lyndhurst Road, London E4. Tel 01-527 4492.

3 tele Fs (1 no handset), buyer to insp and coll pse, £5 ono. Collins-Hooper, c/o Adams "Coves", West Mark, Sheet, Petersfield, Hants.

KW p.e.p. meter with 2 tone oscillator, £10. LED 2 tone oscillator reqs attention, £2. Xtal mic, B1201, £1.50 with base. Dynamic mic type DM16, dual impedance, £2. G3URE, QTHR. Tel Wideopen 3044.

AR88, new drive just fitted. Home brew S meter, gd cond. Best offer over £30 secures. Buyer coll. Couse, 34 Ludlow Avenue, Crewe, Cheshire CW1 1DZ. Tel Galsager 4373.

Heathkit RF1U gnrtr, new almost unused, £15. Marconi CR100 rx, wkng, needs slight realignment, £20. Thomson, 25 Clachan Road, Rosneath, Helensburgh G84 ORF.

Property of late G3SBH. Lists from G3ILO, QTHR.

Codar AT5 tx mains psu, 250/S /M psu 12MHz remote control switching unit 12r/c, £25 ono. Buyer coll. G3YIN, QTHR.

Pye television spg valve type, 625L, £10. 14in monitor 625 line, £10. 17in multistandard monitor, eht fault, £8. All with circs. Buyer to coll. TW 70cm cnrvtr, with mains psu, £10. Robertson, Toll House, Wilburton Road, Stretham, Cambs.

2m fet cnvrtr i.f. 22–24MHz, £4. GM0290 2m pre-amp, £2.50. Transistor 4m cnvtr £3.50. B40 + B40 15kHz–30·5MHz, £25. The pair, buyer coll. Wanted: RA17L or sim rx. Send sae for goodies. G8FCK, 47 Lye Copse Avenue, Hawley, Farnborough, Hants.

Minimitter 150W a.m. tx £17.50. TCS5 tx mains psu, £7.50. Class D wavemeter, £3. HRO + coils, needs slight attention, wkng, £10. Parcels of bits, £1 ea. Post pd. G3HTT QTHR. Tel Bridgwater 3698.

Scopes. EMI type WM3B £13. Solartron CD514 with tube (4EP1), £10. Sig gens. Boonton 65-B, 8kHz-30MHz separate meters for op level (1V max) and mod depth (up to 100%), £20. Other eqpmnt also fo callers by appntmnt. G8DLP, QTHR. Tel Yoxall 315 (after 7pm).

Radiospares auto trnsfmrs, 1kW, £5. 100W, £2. R210 rx exc stability, exc bandspread fine ssb, xtal calib, 100cps fltr, 240V, mains, £25. Wanted: Heathkit tower. Baker, Bontnewydd, Cards. SY23 4JH.

Labgear LG50 tx, £12. Wanted: hndbk for Creed 7B teleprinter. Laycock, Hall Place, Fen Ditton, Cambridge.

Lafayette HA-500 10V amateur bands (80–6m) rx, vgc, £32 ono. 41/29ft vertical aerial, comp and ready to erect, as new, £3.50. Beeson 63 Ashby Road, Tamworth, Staffs.

AVO rf sig gen, 300kHz-30MHz in 6 ranges, £5. G8EII, 76 Wilshere Crescent, Hitchin, Herts.

Selector unit type 4230, xtal oven unit type 12, from R4187 rx, £1.50 + circ. By post only. Wanted: trnsfmr PR10-250V sec 26V 3A, mods etc to R4187 rx. Bartlet, 4 Kelsall Close, London SE3 0JJ.

Heathkit 6R64 rx, gd cond, £10. Wanted: Gallium arsenide laser diode, output in infra-red spectrum, medium power. AKA1 gd sterio tape deck. *Practical Wireless* Oct, Nov, Dec 1971. Black, 63 Denewood Avenue, Handsworth Wood, Birmingham B20 2AF. Tel 523 8867.

KW160 phone/cw tx, £16. Canonball 160 ssb/tx £23. Variac 9A, £3.50. Heathkit gdo, mains, £10. Erskine d/beam scope, £18. Wanted: Omega noise bridge. G3AQX, Cottage Farm, Wessington, Derbys. Tel Alfreton 2943.

Panda 120V with mic, nice cond, £20. Buyer coll. G3DH, QTHR. Tel Alderley Edge 4276 (evenings).

1½in CRTs + base E4103/E/4, 50p. Valves: 5763, 12AX7, N78, 6CH6, 13p. Xtal calib No 10, £1.50. Above post free. Marconi CR150, £18, post £2. MacDonald, 38 Rolleston Street, Swindon.

G2DAF rx, part built, most comps, £15. Wanted: 1155 for schoolboy. G3LYV, QTHR. Tel Coventry 413438.

HW101, psu, cw fltr, £130 ono. Mohican GC1U, £30 ono. Both only few mnths old. Wanted: CR150 in gd cond. G3MEJ, QTHR.

Eddystone 770R Mk 2, £75 ono. Sony TC530 solid state stereo recorder with tapes and mics, £75 ono. 1968 Humber Sceptre, £810 ono. G3MRQ, Breckside, Brook Street, Fenny Compton, nr Leamington Spa, Warks. Tel Wroxton St Mary 496 (9am-5pm).

2m Pye base stn: QQV06-40A pa tx + rx + hndbk, £35 + carr. 5ft high 19in rack, £1. Local del or coll. Haseldine, 31 Ellesmere Road, West Bridgford, Notts. NG2 7DE. Tel Nottingham 23-1133.

Collins 75S3 rx, 2·1kHz + 200Hz fltrs, £200 ono, less if buyer will sell back cw fltr. G3KDA, QTHR.

WANTED

Creed 75 teleprinter, must be in gd cond. *QST* mags Jan to Dec 1970 + Jan to Dec 1971. *Wireless World* Jan to Dec 1970 + Jan to Dec 1971—must be gd. Boyd, 18 Meadows Road, Lower Willingdon, Eastbourne, Sussex. Tel Eastbourne 52721.

TA33 or TA33jnr or 3 ele 3 band aerial. G8CSC, QTHR. Tel 01-778 9290.

Manual or circ for Boonton sig gnrtr mod 65-B, buy or borrow. G3THY, QTHR. Tel 01-551 1467.

KW E-Z match, swr meter, gdo + 12 or 14AVQ aerial. G3YFI, QTHR. Tel Leeds 664823.

Loan or buy Pye Ranger type PTC 2207, circs, hndbk or cnvrsn data for 2 or 4m. G4AEZ, 48 Morley Hill, Enfield, Middlesex.

Schoolboy listener reqs Trio JR/59DE in gd wkng cond, pref with SP5D spkr, price below £25. Replies from readers 20 miles Nottingham only. Hugo, 618 Wollaton Road, Wollaton, Nottingham NG82AA. Tel Nottingham 282374.

Buy/borrow hndbk or circ diag for Marconi ssb tx/rx HSR21. Hibbin, G4AOP, GRF, 103 M.U., RAF Akrotiri, BFPO 53.

Swr bridge and power meter 50/75Ω suitable for 2m, must be in gd. cond. For sale: two 19in cabs. G8EDN, QTHR. Tel Coventry 301494.

Bases for 813s. G3BZG, RSGB HQ.

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Freq counter 2m, QRO linear amp, 2m and 70cm eqpmnt 4CX250Bs with bases etc. Davies, 26 Sandyridge, Aberavon, Port Talbot, Glam. Tel Port Talbot 4278.

Info on valve voltmeter CT54. Also circ of R1392 rx. G3VPT, QTHR. Tel Norwich 898 715.

Chimney for 4X150A, dc operated coaxial c/o relay. 2 ceramic coil forms, 45mm diameter, 32 grooves. Selling high Q ferrite pot coil 455kHz for Q mult. G3KH, 133 Station Road, Cropston, Leics LE7 7HH.

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Exch MR44 Mk 2 amateur bands rx for RA1 or EC10 with cash adjstmnt if nec. Additional RA1 wanted for swl, one needing attention consd. Will del/col rsnble distance. GW3DSV, QTHR.

Pye Bantam HP1AM for 2m, pse state price and cond. G8FQG, 31 Berry Drive, Bromham, Beds.

Morse Key, heavy duty, brass pounder, Navy type. Ssb tx 160m Sphinx/Cannonball. Dets pse. G4ADK, QTHR.

HW12A with dc psu. Electronique transistor gen cov coil pack. G3AOS, 5 Prospect Drive, Hale Barns, Cheshire. Tel 061-980 2415.

Clean copies of *Practical Wireless*, Feb, March, April, June 1967, Aug, Sept, Oct, Nov 1970. *Practical Electronics* Feb 1971. For sale: new Electroniques amateur band Qoilpax QP166, best offer. GM8BOM, QTHR.

Late model Electroniques transistor gen cov coil pack. Allsop, 15 Woodland Grove, Mansfield Woodhouse, Notts.

Manual/circuitry or any info on "NEV" 14in video monitor, your price pd, all letters answered. Also manual for AN-UPM1 test eqpmnt. G6AGC/T, 49 Station Road, Snainton, Scarborough, Yorks. Tel Snainton 252.

Electroniques i.f. amp IFA/455/SSB Mk 2 or IFA/1·6/SSB Mk 2, and/or HV166T Mk2 qoilpax. G8DJU, 4 Westfield Walk, Waltham Cross, Herts. Tel Waltham Cross 31584.

Scope, must display and trigger 30MHz sig Y sensitivity 100mV p/cm tb ·1μS, supply makers full spec and price. Talbot, 38 Green Lane, Roxwell, Essex CM1 4N4.

Baird television or cab only, or comps. A vintage domestic rx period 1922-30. All letters answered gratefully. Neale, 11 Pine Drive, Wokingham, Berks. Tel Eversley 2626.

Buy or borrow copies *American Electronic Design* from April 1970 to date. Would coll locally. Gardner, Stable Cottage, Meonstoke, Southampton SO3 1NT. Tel Droxford 595.

2p 12-way h/d switch, suitable for atu. G3SKK, QTHR. Tel Rayleigh 4385.

180m cnvrtr Moseley CM1. Would also be interested in Moseley Commando tx, why? Pigou, 52 Rowan Road, Bexleyheath, Kent. Tel Bexleyheath 304 6495.

Manual or hndbk for B40 or R209 rx. *QST* for Feb 1949. *QST* for April 1956. *SWM* for Dec 1954. *SWM* for Oct 1948. *RA* for Sept 1953. Simpson, 107 Derryhale Road, Portadown, Co Armagh, NI.

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Rotator AR22, CDR20 or sim with cable + control unit. State price and cond. G8EYU, TSSU, RAF Wattisham, Ipswich, Suffolk.

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2in mast 20ft for 2m beam, gdo up to 200MHz, 500 microV meter, 12MHz xtals for Zone B HC6U or FT243. 2m halo with mast and clamp. Goldsmith, Goodwell, Brancepeth, Durham. Tel Meadowfield 780669.

Radio Communication 1970, 1969, in gd cond, price reqd. GI8FOK, 26 Kilcoole Park, Belfast BT14 8LB. Tel 0232 78704.

HA14 linear, pref inc dc psu. G3CTP, QTHR. Tel 029382 2560.

Modulator driver trnsfmr, single anode to push pull 6146s in class AB1. G8BNJ, QTHR. Tel Cheltenham 57595.

QP166 coilpack, i.f., bfo, trnsfmrs etc, 898 dial, ultra-linear output trnsfmr 8000Ω, 10-15W. Mense, 14 Oakcroft Road, London SE13 7ED. Tel 01-852 4759.

QQVO/640A. Forward power meter for vhf. 2m cnvrtr. VHF/UHF Manual. G8ECT, QTHR. Tel Downland 54130.

Beam TA33JR or sim, also rotator for same. GW3XXB, QTHR. Tel Cardiff 613867.

Varactor for 23cm paramp. G3EGV, QTHR.

12K8 (M). G3KFW, QTHR. Tel Hornchurch 53912.

TCS tx (only), clean, unmodded essential, hndbk for Canadian 52 Set. Mainprise, 48 Earlsfield Road, Hythe, Kent.

Large dial + rotating drum with scale in gd cond, or comp drive unit, for CR100. G4AHT, QTHR. Tel 01-857 7810.

Help! Recently moved to London and need room etc + bit of sky over garden. Pse write G3YDX, QTHR. Tel 01-606 4906 (weekdays).

Buy or borrow Nov 1965 *Radio Constructor*, will pay postal charges etc. Jennison, 20 Carr Road, Higher Irlam, Manchester M30 6FJ. Tel 061-775 3580

Single beam scope 30MHz b/w. G8FIS, Campbell Mansion, 25 Campbell Avenue, York. Tel 59861 xtn 294 (daytime).

Pair of 6146Bs, 250W mains isolation trnsfmr. G3MOU, QTHR. Tel 01-570 6181.

BC348 cheap, comp, but not necessary wkng. G3GGS, QTHR. Tel Chorley 3371 (02572).

Linear amp + heterodyne wavemeter, pref 3·5-28MHz. Porter 8 Park Circus, Glasgow G3 6AY.

KW2000A, state price + cond. G3VLX, 17 The Weald, Chislehurst, Kent. Tel 01-467 8093.

Rotator suitable 2m beam, must be cheap. G8DGX, QTHR.

Copies *Ham Radio* Vol 1 Nos 1-6 inc. G3XPK, QTHR.

Exch houses Commonwealth Games Year 1974, Christchurch, New Zealand. exG3DJD offers small house Christchurch, rig, XYL's pottery shack, car; exch similar pleasant part G-land for 1 year. ZL3AL, 5 Kinver Place, Christchurch 2, NZ.

Back numbers of *Bulletin*, *Practical Wireless*, *Radio Communication*, 1950–60. Luxton, 12 The Vale, Acton, London W3 7SB. Tel 743 5566 extn 176.

Hndbk or circ for R1359. buy or photostat. For sale: 2 new boxed 4CX250BS, £2.50 ea. G2CWR, QTHR.

Rotator for 2m beam, also 2m cnvtr, pse state price and cond. Willing to coll 50 mile radius. Cowley, 18 Turner Road, Corby, Northants.

Carpenter type 3 or similar polar relay. G8CEA, QTHR. Tel 04867 3577.

Any info, manual etc, on US power measuring kit type URM-20, manufactured by Bruno. RF bolometer type DT-76/U or thermister pad for same reqd, as used in aforesaid kit. G8ELN, QTHR.

Loan, hire or buy; your price pd for 28 April 1969 issue of *Electronics*. Hockney, 7 Summerfield Close, Waltham, Grimsby, Lincs. Tel 0472 822052.

Heathkit vfo H910B, pref cnvrtd to 2m. Matthews, Lonthorpe, Driffield, East Riding.

Elbug and 2m tx. Have for exch photocopier ABDick model 104 G3COI, 58 Springhill Park, Penn, Wolverhampton. Tel Wombourne 2288.

Hndbk and psu dets for USA tx-rx No 48. Wallace, 7 River Court, Ferry Lane, Cambridge CB4 1NT.

Hndbk for Reece-Mace (Pye) Marine tx Type 100337. For sale: Pye Ranger PTC2007 with xatls for 144·35MHz, £7. SCR522 2m tx with psu, £8. GW3TKG, 201 Tyn-y-Twr, Baglan, Port Talbot, Glam.

2m cnvtr 28–30MHz i.f. or rx AR88D with manual etc. Thompson, 49 Widney Avenue, Selly Oak, Birmingham 20. Tel 472 4678.

Charts for BC-221-AF serial number 4058 and/or BC-221-AH serial number 5551. G3KFW, QTHR. Tel Hornchurch 53912.

100kHz calib xtal, can afford £1, with or without holder. Leask, "Baytna", The Avenue, Bletsoe, Beds. Tel Sharnbrook 634.

Manual type 13A scope (Hartley). To buy or copy, greatest care taken if loaned, postal charges refunded, hire charge if made. G3IXO, 13 Beech Road, Shipham, Winscombe, Somerset. Tel Winscombe 2360.

Racal RA17L, RA117 or other high quality gen cov rx. Telequipment D43 or other dc-15MHz oscilloscope. Marconi TF1041C, Advance VM76 or Airmec 314 valve voltmeter, gd quality hf sig gen. G3WRK, QTHR.

Waveguide WG16 comps especially 90° twists, ring couplers, round and square flanges and a matched pair of square flanged diode mounts. All other comps conds, dets only. G3VPE, QTHR. Tel Weymouth 5057 (after 6pm).

KW p.e.p. meter, dets pse. G3JZB, QTHR.

Chimney only for 4X150A, dc operated coaxial c/o relay. Omega noise bridge. Two ceramic 45mm diam 32 grooves coils forms for aerial tuner. Parker, 133 Station Road, Cropston, Leics.

YL1130 valve. G8BXJ, QTHR.

Hard-up sixth former reqs small cheap 2m rx. Mills, 46 Marlborough Road, Shipley, Yorks. Tel Shipley 55159.

Codar coil 1in diam 32 tpi 58 turns reqd, state price. Ross, 16 Glebe Crescent, Airdrie, ML6 7DH.

Lafayette model KT320 circ diag. Shepperley, 79 Little Oxhey Lane, Carpenders Park, Watford, Herts. Tel 428 0430.

KW Ezee match, also SX28 rx, pse state cond and price. G3XFU, QTHR. Tel Sheffield 363331.

Hndbk and/or mods for Cossor vhf tx CC22 PD6 and rx R121 PD6, buy or borrow. Busby, 50 Derby Road, Duffield, Derby. Tel Derby 840353.

Old mags, catalogues, books, from the twenties and thirties, for identification purposes in wireless museum, anything to do with early radio rxs. G3KPO, Alverstone Manor, Shanklin, IOW. Tel Shanklin 2586.

TW2 communicator in 1st class cond and unmodded, a one owner model pref. G3TYJ, QTHR.

Buy or borrow handbk or circ of EMI oscilloscope WM2. G3ZYW, QTHR. Tel 0225 23562 (evenings).

Heathkit VF1U vfo, high band Pye Cambridge or sim, Codar T28 or sim /P rx. Pse state price and cond. For sale: 1971 lightweight Joystick, £4. G3ZYS, QTHR.

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KW Ezee match and KW match—exch Trio TS500 tx/rx + cash for another ssb tx/rx with top band, pse state cond and price. G3XFU, 22 The Grove, Totley, Sheffield S17 4AS. Tel Sheffield 363331.

2000B (ac psu) in mint cond with manual. Offers will be consd on 22 March. GD3TIU, Arland Ussher, Crosby, IOM. Tel Marown 442 (062-485 442).

S meter for AR88D, also circ data + mods for Pye PTC500 rx. Watson, 8 Wood End, Esher, Surrey KT10 8DA. Tel 01-398 0778 (after 5pm).

Rotator TR44 or sim. G8DYY, 106 Goldthorn Hill, Wolverhampton.

CDR AR22 or TR44 or sim, heavy duty rotator unit complete. G3VNG, 4 Thornyville Villas, Oreston, Plymouth PL9 7LA. Tel Plymouth 41511.

Info on following valves: CV4033, CV4502, CV4004, JRP6112, JG5896, JG5727, 5636, 5638, CK5687WA. Bicester ARS, 11 Stoneburge Crescent, Bicester, Oxfordshire, OXO 8NA.

Urgently reqd: X band 3cm waveguide, variable attenuators pref vane type for No 16 waveguide. G3HSC, 45 Green Lane, Purley, Surrey. Tel 01-660 2896.

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Dets HW12 three band Camelot USA conversion—manual price. G3HJM, QTHR.

Eddystone 888A rx. Allport, The Linnels, Green Lane, Skellingthorpe, Lincoln.

Info on 20th century CRT type S4AG/120. G8CAC, QTHR.

Service sheet req for TAJA M40 standard tape recorder, can copy and return if desired. Bowell, 16 Margarite Way, Wickford, Essex.

Manual for BC348-Q rx. Harriman, 4 Rosebery Street, Leics. LE5 4GY.

Vacuum variable capacitor pref 300pF max, 5kV breakdown. Vincent, 9 Glendale Avenue, Wash Common, Newbury, Berks. Tel Newbury 2814.

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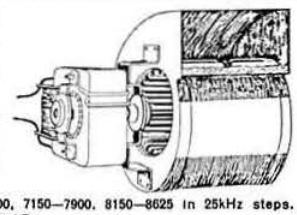

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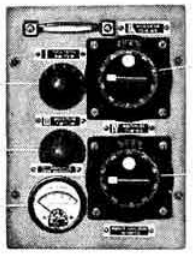

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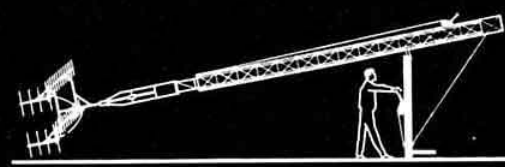

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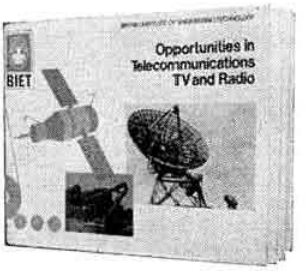

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