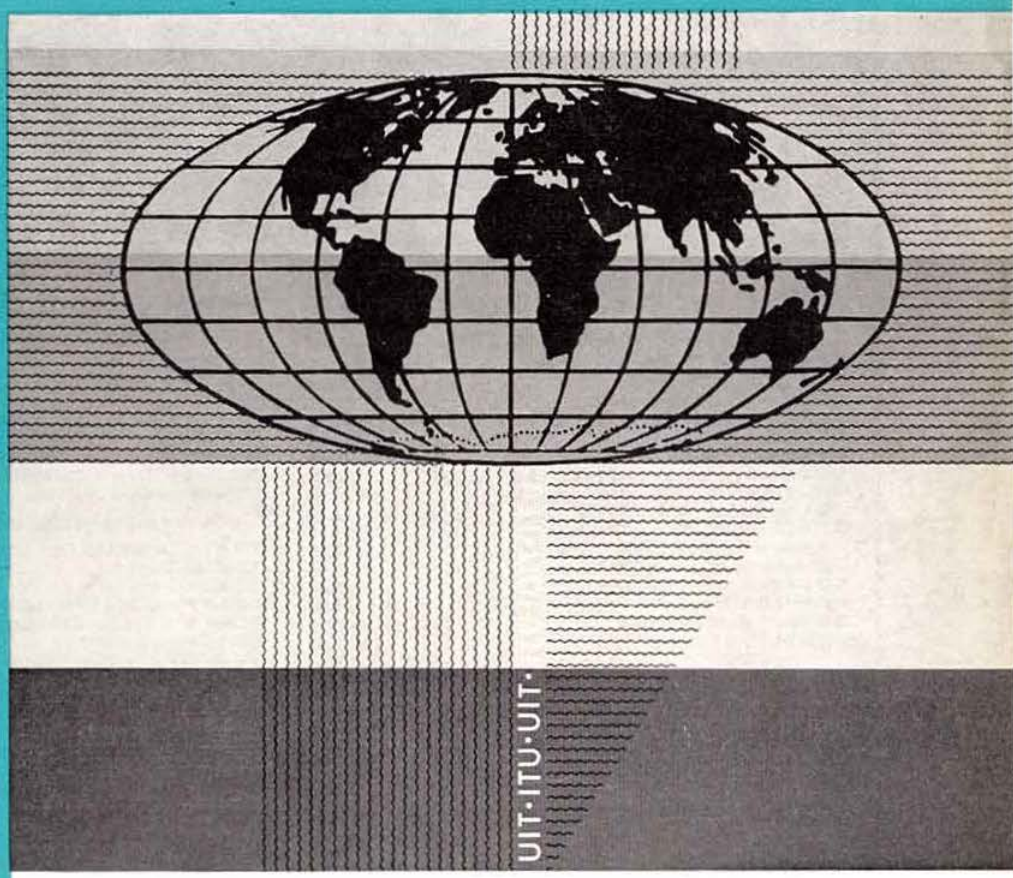
radio communication

May 1972

Journal of the Radio Society of Great Britain



WORLD TELECOMMUNICATION DAY

17 may 1972

ITU INTERNATIONAL TELECOMMUNICATION UNION

May 1972

radio communication

Volume 48 No 5 Price 30p

CONTENTS

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ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

OUR WESTERN AESU MUSEN MAIN DISTRIBUTOR

YAESU

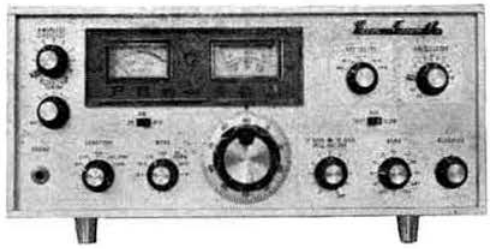
First to introduce YAESU to the UK. First to provide SECURICOR delivery on the equipment. Our aim is to provide the best and fastest service in the country. Naturally, having set the pace with our superb 24/48hr service, there are "hangers-on" who will try to follow our lead but one thing remains certain, THERE IS NONE BETTER!

FLDX400 (Ex Stock)

The **FL400 AM/CW/SSB/FSK TRANSMITTER** operates at 260W p.e.p. i/p on SSB and will transceive with its companion FR400 RECEIVER. If you're buying a new transmitter or transmitter/receiver combination don't forget to make sure that they will transceive together. With YAESU you get the facility, of course.

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

FRDX400 (Ex Stock)



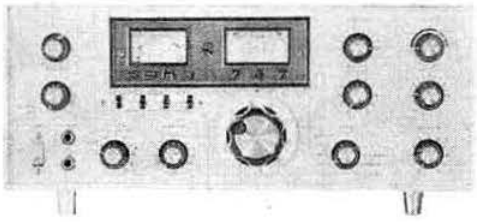
The **FR400 SDX (Super de-luxe) RECEIVER** with 4m and 2m is made by YAESU, especially for WESTERN ELECTRONICS. It is NOT available elsewhere. It features 4 mechanical filters for CW/SSB/AM and FM on all bands 160–10m plus 4m and 2m. Squelch and rejection tuning are standard. The FR400DX covers 160–10m only and has 1 filter fitted.

YD844 **FV200 (£38)** **FT200 (£132.00)** **FP200 (£38)**

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

The **FT200** is YAESU's high quality LOW priced unit. At **£172** complete with speaker and PSU it is the best buy in low priced units. It runs 260W pep and has receiver incremental tuning and 1kHz readout 10–80m. Can you tell us of any better buy with these features?!

FT560 (£195) Ex-Stock



NOW BEAT THIS FOR VALUE! 35p per watt! Even cheap kits cost 88p per watt! The FT560 operates SSB/CW on 10m–80m, at 560W p.e.p. i/p and has the following features: Built-in AC supply, VOX, 25/100kHz crystal calibrators, WWV to check the calibrator, 1kHz read-out on all bands and receiver incremental tuning. A CW filter can be fitted as an extra.

SPECIFICATIONS

Maximum Input Power: 560 W PEP SSB, 500W CW.
Sensitivity: 0·5 Microvolt for 20dB S/N (SSB 14 MC)
Selectivity: 2·3kHz (6dB down) 3·7 kHz (60dB down) six pole crystal filter nominal shape facto 1·6 : 1. Optional 600Hz CW filter is available.
Frequency Range: 3·5 to 4. 7 to 7·5, 10 to 10·5 WWV, 14 to 14·5, 21 to 21·5, 28 to 30 (Megahertz).
Unwanted Side Band Suppression: 55dB down (at 1000Hz).
Carrier Suppression: 50dB down from full output.
Distortion Products: More than 25dB down.
I.F. and Image Ratio: More than 50dB down.
Frequency Stability: Less than 100Hz drift in any 30 minute period after warm-up.
Audio Output: 1·5 watts, 350-2200Hz, 8/600 Ohm impedance.
Power Source: 117 or 234 volts A.C. 50/60 Hz.
Dimensions: 15¼" wide, 6¼" high, 13¾" deep.

YAESU PRICES. CARRIAGE PAID BY SECURICOR. MANUFACTURERS 1 YEAR GUARANTEE.

FT101 fitted 160m	£255.00	FR400DX receiver	£120.00	AM filter FR400	£7.50	YC-305 Frequency counter	£99.50
FT101 transceiver	£240.00	FR400S DX Receiver, 160-2m.	£160.00	FT560 Transceiver	£195.00	FT2F 2m transceiver	£84.00
FV101 Remote VFO	£38.00	FL400 Transmitter	£140.00	FV400S remote VFO for 560	£38.00	FP2AC Ac PSU for FT2F	£25.00
FL2100 Linear Amplifier	£135.00	SP400 speaker	£10.00	FT401 Transceiver	£215.00	FP2AC/B AC supply with batteries	£34.00
SP101 Speaker for FT101	£10.00	FL2000B Linear amplifier	£135.00	FV401 Remote VFO for 401	£38.00	Crystals for FT2F	£1.60
Fan FT101	£8.00	FM Unit for FR400	£7.50	SP401 Speaker	£10.00	FP50DX Low pass filter	£6.60
FT200 Transceiver	£134.00	FC2 2m. converter	£12.00	FL2500 Linear amplifier	£118.00	Mobile mount FT101	£5.00
FP200 AC supply for FT200	£38.00	FC6 6m donverter	£12.00	YD846 Hand microphone	£5.00	CW filter FT1, FT401, FT560	£15.00
DC200 PSU for FT200	£45.00	CW filter FR400	£12.50	YD844 table microphone	£12.00		
FV200 Remote VFO for FT200	£38.00						

USED EQUIPMENT

KW2000's, several	£120-130	Trio 9R59OS, excellent	£42	Lafayette HA600, v. good	£35	Yaesu FT2F, mint	£65
KW2000A, excellent	£160	Trio JR500SE, excellent	£50	Heathkit RA1, good	£25	Sommerkamp FL200B, v. good	£85
KW Atlanta, as new	£160	Trio TS500, as new	£125	Hammarlund SP600, good	£75	Swan 508 VFO, mint	£45
KW201, v. good	£75	Lafayette HA500, v. good	£35	Yaesu FL2000B, as new	£115	Digital 500, mint	£225
KW202, mint	£110						

ELECTRONICS (UK) LTD

YC-305 30MHz FREQ. COUNTER

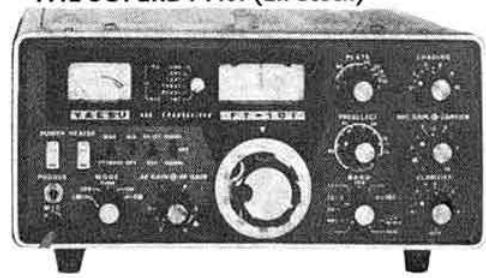
PRICE REDUCTION!

NOW ONLY £79.50

Since YAESU have reduced the price of the YC-305 we are pleased to pass this on to our customers.

This compact digital frequency counter which is equally suitable for laboratory, industrial or amateur applications has the following specifications: Compact design by advanced IC technique to count wide frequency range 5Hz-30MHz. Dual range system provides 8 digit measurement with MHz and kHz indicators. 240V. AC/12DC dual power pack built-in; accuracy ± time base stability ± 1 count, gate time 1 m.s. or 1 second; input Z 1MΩ, low 56Ω; input capacity = less 20pF; max. i/p 60 vp-p less than 10 sec. 20V. p-p continuous; time base frequency 1000kHz crystal controlled; stability 0·0005 per cent at 25°C, 0·0025 at 40°C. Dimensions 8½" × 3½" × 10½". Weight 8 lbs.

THE SUPERB FT101 (Ex Stock)



FOR BASE STATION OR MOBILE. This easy-to-service (with solid state; plus-in modules) comes complete with built-in AC & DC PSU's, speaker and microphone. There is no better value let alone quality! Size 13½" × 6" × 11½"; Wt. 30lb.

160m. model available to Yaesu recommended design.

The FT-2F opens the door to noise-free broadcast quality two metre FM operation. It is a highly advanced all solid-state unit. Channel capability of 12 simplex or duplex frequencies. Three channel frequencies included. Advanced cct design protects automatically from damage of transistors caused by antenna trouble or reverse connection power supply. Portable or home base operation can be achieved with the addition of the optional FP-2AC/B power pack which provides regulated DC power for the transceiver and charging voltage for the leak proof re-chargeable colloidal type batteries. Spec. frequency 144–148MHz., 12 channels, Frequency modulated, power drain, Rx 0·5A Tx 2A., Dimensions 6½" × 2½" × 10". Weight 4lb. Standard accessories, Dynamic mic., and mobile mount. Transmitter RF power 10 or 1W o/p. Stability < ± 0·001 per cent.

NEW YAESU PRODUCTS

The FT-75 10–80m. SSB TRANSCEIVER for ONLY **£80.00**. This is a 80–10m. SSB low power transceiver for mobile or base station use. It has provision for 3 channel crystal control on each band with VXO (variable crystal oscillator) and external VFO provision (the FV50C remote VFO).

The FP-75 is the AC PSU/speaker unit at only **£20.00** and the DC-75 is the 12V DC PSU at **£20.00.**

THE FT-2 AUTO 2m. FM SCANNING TRANSCEIVER. This new unit automatically scans 8 channels and indicates on which channels signals are present. You just press that channel button to establish communication. Price: **£129.00.**

THE FR50B 10-80m. SSB/AM/ CW RECEIVER. This is Yaesu low priced amateur bands receiver at only **£52.00.**

The FL50 10-80m. SSB TRANSMITTER. This unit functions either on its own VXO controlled channel, will transceive with the FR50B or as a VFO controlled transmitter with its FV50C remote VFO unit. Price: **£61.00.**

NEW VHF POWER AMPLIFIERS/TRANSVERTOR

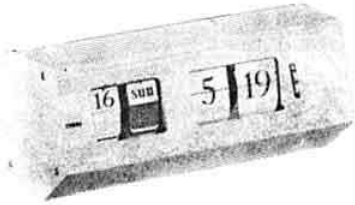
The **FMB-20C.** This is a 240V AC mains operated amplifier switchable from linear to non-linear operation for SSB/AM/FM. The drive required is 1W/10W for 50W/90W output (approx.). This unit also provides 12V DC to enable your 12V FM transceiver to be mains operated. It features IC regulation of the DC output. Price: **£105.00.**

The **FMB-200C**, as above but 100W output. Price: **£119.00.**

The **FMB-2F.** This is a 12V DC operated FM amplifier giving nominally 90W output for 10W input. Price: **£86.00.**

The **TA10-CN** is a 144 to 432MHz transvertor. On the transmitter side your 144MHz transmitter frequency is tripled to give 432MHz ↑. For receive, 288MHz is mixed with 432MHz to provide output at 144MHz. Power required is 11·6-16V. Price: **£77.63.**

MORE PRICE REDUCTIONS! CASLON CLOCKS. Model 601, only £14.95



The finest digital clock available

The CASLON 601

Features: 24hr. 220v. a.c. 50c. Built-in diffused light. Noiseless operation. Superb styling. Easy-to-read digital face indicates date, day of the week, hour and minute. 5 second intervals marked on rotating wheel. Different colour for each day of the week.
Price: **£18.50.**

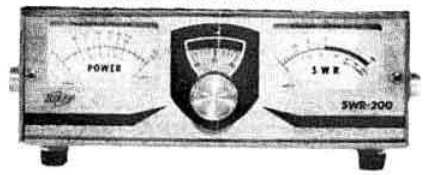
CASLON model 222, 24hr clock, now ONLY **£7.50**
Trade enquiries invited.

Midlands Agent: ANDY MARTIN, G3UDR, Shipston-on-Stour 61839 after 6 p.m.who has most Yaesu gear in stock for demonstration.

Hours of business: Monday-Friday, 9–5.30 p.m. Saturday, 9–12.30 p.m.

CATALOGUE. You ought not to be without your copy listing towers, masts, antennas, rotators, Yaesu equipment and a host of other items. Send 15p only (no s.a.e.)

OSKER POWER METER



DO YOU KNOW YOUR POWER OUTPUT?

(No! You're not the only one!)

Then **YOU** need the **OSKER POWER METER**

Features: Switchable for 52 or 75 ohm systems. Each instrument is individually calibrated. Four ranges: 0–2, 0–20, 0–200 and 0–2kW., 3–200MHz. Excellent styling. Price: **£18.50**

OSBORNE ROAD, TOTTON, SOUTHAMPTON, SO4 4DN, ENGLAND.
TEL.: TOTTON 4930 and 2785. CABLES: 'AERIAL, SOUTHAMPTON'

TOWERS (Up to 500′ FOR Ex-stock off the Shelf)!
ANTENNAS—GALORE!
ROTATORS . . . . consult the only 'one-stop' single source in the U.K.

NEW FROM JAPAN

A5-3340

The ASAHI range of ANTENNAS

A great new 10–15–20–40m. beam, the AS-3340 at **£76.50** only.

All ASAHI antennas are rated at 2kW pep.

AS-3340. 10–40m. 3 ele. **£76.50**

AS-33 10–20m. 3 ele. **£62.25**

AS-23 10–15m. 3 ele. **£42.00**

AS-203W. 20m. 3 ele. widespaced, **£56.70**

AS-154. 15m. 4 ele. **£40.50**

AS-153W. 15m. 3 ele. widespaced, **£32.70**

AS-104. 10m. 4 ele, **£33.90**

AS-103, 10m. 3 ele, **£29.95**

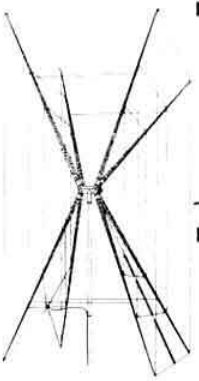
ECHO-8G. 10–40m. Vertical 1kW., **£17.25**

AS-2HG. 2m. Ground plane., **£7.50**

AS-303A 10–80m. Mobile, **£33.00**

SWR/POWER METERS

ME-11B, **£7.20.** ME-11N, **£13.00**



NEW FROM CANADA

£65.00 (Carr. pd.) The GEM-QUAD for 10, 15 & 20m.

- ★ Weighs only 21lbs.
- ★ Withstands 100 mph winds.
- ★ Forward gain up to 8dB.
- ★ Balun included.
- ★ Converts to 3 or 4 element quad.
- ★ Fibreglass tri-dectic spreaders.
- ★ Front/back ratio 25dB.
- ★ Low angle radiation.

HY-GAIN (Carr. pd.)

HY-TOWER, 10–80m tower	**£99.50**	TH3 Jnr. as above, but 600W pep	**£48.00**	12RMQ. Roof kit for 12AVQ	**£8.50**
18V, 10–80m vertical	**£10.90**	TH2MK3. 10–20m. 2 ele beam	**£48.00**	14RMQ. Roof kit for 14AVI	**£9.50**
12AVQ, 10–20m vertical	**£16.50**	Hy-Quad, 10–20m. 2 ele.	**£62.50**	LA1, lightning arrestor	**£14.50**
14AVT, 10–40m vertical	**£18.50**	DB10/15. 10–15m. 3 ele	**£51.00**	LA2, lightning arrestor	**£2.50**
LC-80Q 80m coil for 14AVT	**£6.70**	204BA, 20m. 4 ele beam	**£80.00**	18TQ. Reeltape portable dipole	**£41.00**
18AVT/WB. 10–80m vertical	**£33.00**	203BA, 20m. 3 ele beam	**£67.50**	C1 Centre Insulator	**£2.50**
TH6DXX, 10–20m. 6 ele beam	**£88.00**	153BA. 15m. 3 ele beam	**£33.00**	E1 End Insulator, pair	**£1.50**
TH3MK3 10–20m 3 ele beam 2kW	**£69.50**	103BA. 10m. 3 ele beam	**£26.50**	BN86 Balun	**£8.00**

MOSLEY (Carr. pd.)

Mustang, 10–20m. 3 ele 2kW	**£41.50**	TA33 Jnr 'E' for 2" mast	**£35.00**	TA32 Jnr. E for 2" mast	**£25.00**	Atlas Vertical 10–40m guyed	**£20.90**
TA33 Jnr., 10–20m 3 ele	**£34.50**	TA32 Jnr 1–20m 2 ele	**£24.50**	TA31 Jnr. Rotary dipole	**£15.40**	SWL 7 Listeners dipole	**£10.90**

BANTEX FIBREGLASS MOBILE ANTENNAS (Carr. 50p.)

70/¼. 70MHz, ¼ wave	**£3.00**	BGA, 144MHz, ¼ wave	**£6.15**	Magnetic mount	**£4.95**	Note. Deduct 50p. from price of aerial if
144/¼. 144MHz, ¼ wave	**£2.75**	B5, 144MHz, ⅝ wave	**£4.35**	All aerials complete with base.		base is not required.

ANTENNA ROTATORS

AR20 (p & p 40p) **£20.00** AR22R (p & p 65p), **£25.00** TR44 (p & p 75p) **£40.00** HAM-M (p & p 80p), **£70.00** HY-GAIN, 400 (p & p £1), **£98.00**

For Towers, masts, please see April ad.

CATALOGUE. 15p. please (no sae required).

★ Your 'one-stop' single source for masts, towers, rotators, antennas and equipment

★ Largest stock range in the U.K. ★ Money-saving packaged deals.

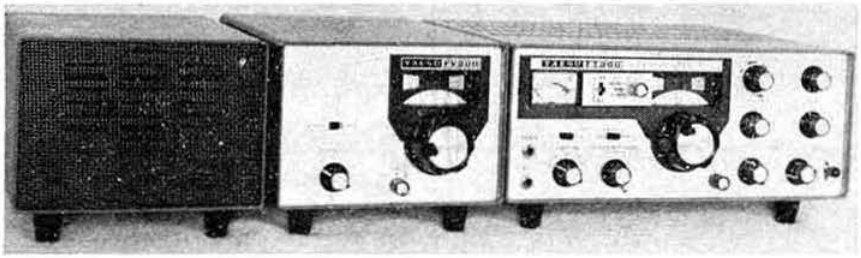
WESTERN ELECTRONICS (U.K.) LTD.
OSBORNE ROAD . TOTTON . SOUTHAMPTON

TELEPHONE: TOTTON 4930 or 2785
CABLE: 'AERIAL, SOUTHAMPTON'

LOWE ELECTRONICS

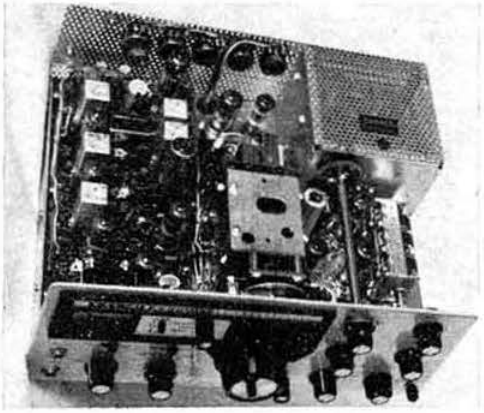
119 CAVENDISH ROAD, MATLOCK, DERBYSHIRE, DE4 3HE
TELEPHONE: MATLOCK 2817 or 2430 9 a.m. — 9 p.m.

BILL G3UBO — MAIN DISTRIBUTORS FOR YAESU MUSEN EQUIPMENT — ALAN G3MME



There are several reasons why we feel the Yaesu FT-200 is such a good buy. No attempt has been made to permit a CW filter to be fitted. The designer has not allowed any switching around the filter and thereby achieves maximum isolation between filter input and output. This accounts for the incredibly good skirt selectivity of the FT-200. Skirt selectivity which, in our estimation is, for SSB, the best of the Yaesu range. We also like the pre-mixed oscillator chain which gives the superior signal handling and low noise capabilities of a single superhet while at the same time retaining a 9 MHz I.F. with its superb image rejection. Lots of other things add up to an unmistakable best buy. Stable, accurate, gear-driven solid state VFO, VOX, break-in CW, CW sidetone monitor, RIT, 100 kHz marker, 300W SSB speech peaks, half microvolt sensitivity, etc., etc. All in all, at **£250** it would still be a good buy. At **£134** (plus A.C. p.s.u. **£38**) it's INCREDIBLE.

FT-101 Transceiver **£240**
FT-101 fitted 160m **£255**
FT-101 fitted 160m & new PA coil **£255**
SP-101 matching speaker **£10**
FV-101 remote VFO **£38**
FT-101 mobile mount **£5**
FL2100 Linear **£135**
FRdx400 Super de Luxe Receiver **£160**
FL-400 Transmitter **£140**
SP-400 Speaker **£10**
FL2000B Linear **£135**
FT-2F 2m FM **£84**
FT-2 Auto **£129**
FT-200 Transceiver **£134**
FP-200 A.C. p.s.u./speaker **£38**
FV-200 Remote VFO **£38**
DC-200 mobile p.s.u. **£45**
FTdx401 Transceiver **£215**
FV-401 Remote VFO **£38**



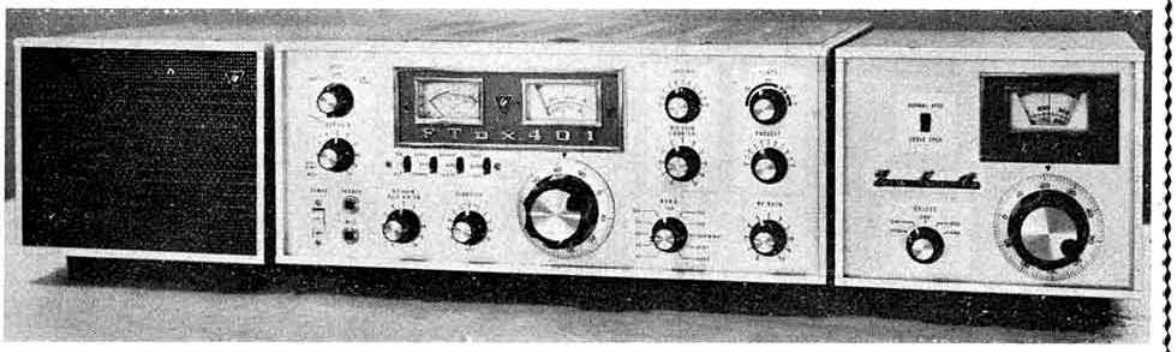
SP-401 Speaker **£10**
YC-305 Counter **£79.50**
FT-75 **£80**
FP-75 **£20**
DC-75 **£20**
FR-50B Receiver **£52**

The above equipment is ex stock and 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, nor for the fact that all equipment is thoroughly checked before despatch. Plus of course our unbeatable 12 month guarantee and our money-back guarantee.

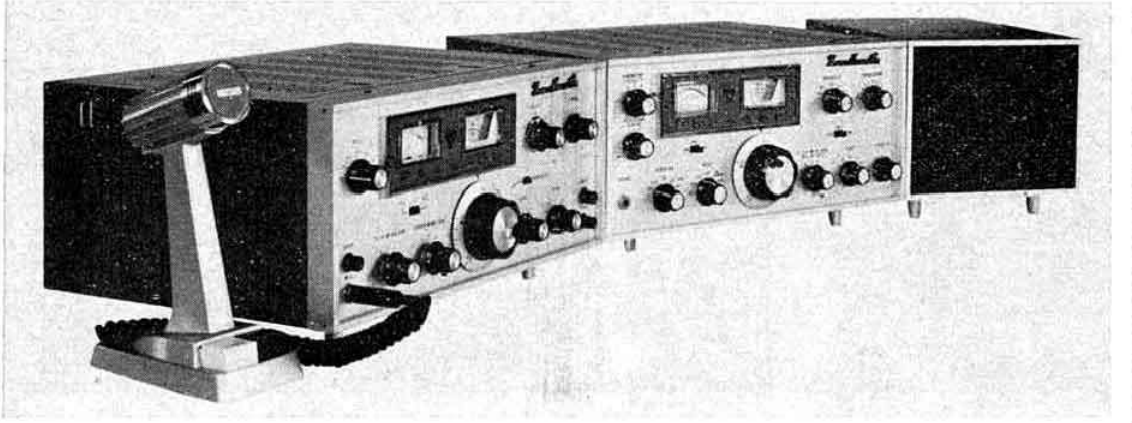
Other new equipment
Plain morse keys, ball bearing pivots £1, Katsumi EK-9X electronic keyers **£8.20**, Asahi twin meter SWR meters **£6.80.**
Dummy Load/Wattmeters: please do no confuse these with the cheap and cheerful so-called power meters which are frequency conscious, impedance conscious and of dubious accuracy. These are Wattmeters (a horse of a 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 3MHz to 500MHz. 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 **42p**, 6U8A **80p**, 6CL6 **50p**, 6AN3 **74p**, 6EW6 **75p**, 6EH7 **45p**, 6BM8 **50p**, 6AW8A **£1.75**, 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.

Digital clocks:
Copal 222 **£7.50**, Digitor **£5.50.**
Mikes, filters, mobile whips, connectors, coax, rotators, etc., etc. Everything for the complete station.



The new FTdx401. In addition to the beautiful Yaesu XF3A sideband filter, it has a built-in multi-crystal filter for extremely sharp CW. It also has a very effective built-in noise blanker (not to be confused with a noise limiter please!) and a fan-cooled PA. 560W. p.e.p. SSB and 500W CW.



The well-tried, proven, and still, to my mind, the best fixed station rig, FRdx400 and companion FLdx400 Tx. There is of course a matching linear, the FL2000B. For the man who wants the best at a reasonable price.

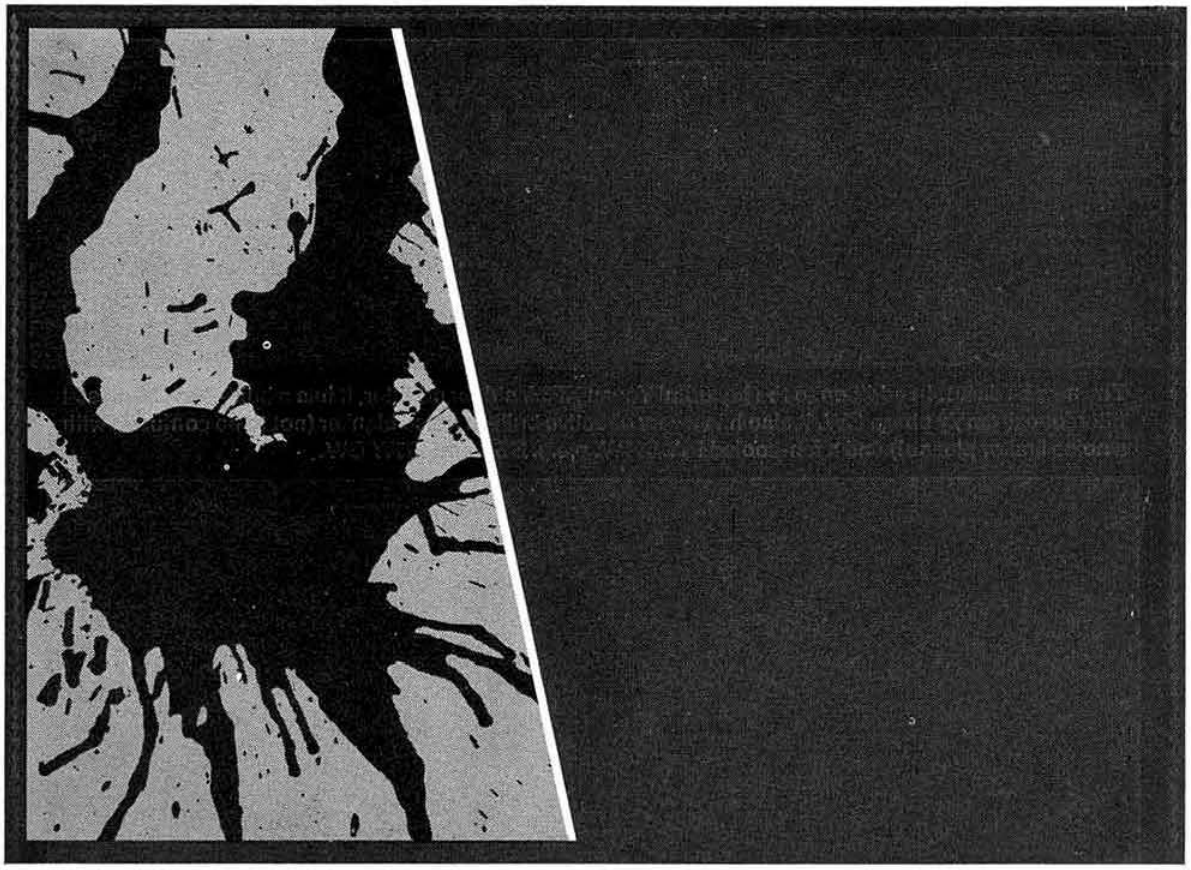
Second-hand gear:
Receivers: Lafayette HA-350 **£50**, Inoue IC-700R **£65**, KW-201 **£75**, Star SR-200 **£32**, Eddystone 740 **£20**. SB301 Extra A.M. filter and 2m converter **£95**.
Transmitters: Sommerkamp FL-200B **£80**, KW Vespa Mk II **£70**, Yaesu Musen FL-100 **£65**, KW Vespa Mk I **£70**.

Transceivers: (with p.s.u's): National NCX-5 **£175**, National NC-200 **£95**, National NCX-3 **£85**, KW2000 **£120**, KW2000A **£150**, KW2000B **£175**, KW Atlanta **£140**, Trio TS510 **£125**, Inoue IC-700 **£100**, Codar AT5 T28 mobile psu and remote switch **£35**, Swan 500 **£175**, SB101, CW filter **£155**.

LOWE ELECTRONICS, 119 Cavendish Road, Matlock, Derbyshire. DE4 3HE. Tel. Matlock 2817/2430.
Hours: Tuesday to Saturday 9-5.30 (closed for lunch 1-2 and all day Monday).

Service and Sales: A good range of our equipment is available (evenings & weekends only) at the following: John G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex. Tel. Ringmer 812071. Sim GM2SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. Tel. 041-771 0364. Alan GW3YSA, 35 Pen y Waun, Efail Isaf, Nr. Pontypridd, Glam. Tel. Newtown Llantwit 3809.

Service only (evenings and weekends): Dave Dryden G3BKQ, 205 Main Street, Thornton, Leics. Peter Ward, G3XWX, 47 Radstock Avenue, Ward End, Birmingham, B36 8HD.



SSB-ers:

increase talk power, cut "splatter"

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INTERNATIONAL AMATEUR RADIO UNION

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QTC AMATEUR RADIO NEWS

Licence regulations

Several enquiries have been received at RSGB HQ concerning reception of wireless transmissions following the prosecution of persons listening to transmissions by the London Fire Brigade.

Under Section 1 (1) of the Wireless Telegraphy Act 1949 "No person shall establish or use any station for wireless telegraphy or install or use any apparatus for wireless telegraphy except under the authority of a licence in that behalf granted by the Postmaster General . . ."

Statutory Instrument 1970 No 548 which came into operation on 1 May 1970 provides (Section 3) "On and after the 1st April 1971 there is hereby exempted from the requirement of a licence under section 1 (1) of the Act the installation or use of wireless telegraphy apparatus used only for the reception of messages sent by telephony from authorized broadcasting stations broadcasting for general reception and messages sent by telephony or telegraphy from licensed amateur stations . . ."

It is, therefore, an offence to listen to transmissions other than those mentioned in Section 3 unless a licence or similar authority is held by the listener.

GB2ITU

The founding of the International Telecommunication Union will again be celebrated by a special event station, using the callsign GB2ITU, for the period Friday 28 April to Sunday 7 May. Located at Tonbridge School, Kent, it will be operated by members of the school's radio society.

All bands from 3·5MHz to 28MHz (on A3J) will be used, and it is hoped that there may be some A3 activity on 144MHz. Special QSL cards will confirm every contact made. The President of RSGB, Tim Hughes, G3GVV, is the member of staff in charge of Tonbridge School Radio Society.

QSL Bureau

Users of the bureau are reminded of the new postal rates: 2nd Class letter post is now 2½p for 2oz, 3½p for 4oz, 5½p for 6oz. A pamphlet giving the new rates can be obtained free of charge from any Post Office.

Callsigns in the series G4BAA are now being issued. Please note that the sub-manager for this series is Mr R. F. Rawlings, G3WBV, 74 The Lindens, Field Way, New Addington, Surrey.

RAE course, Newcastle upon Tyne area

Mr G. W. McDonald, G2OX, 55 Cherrytree Drive, Whickham, Newcastle upon Tyne, NE16 4TQ, is trying to interest a local education authority in providing facilities for a course of lectures on the Radio Amateurs' Examination syllabus with himself as lecturer.

Anyone interested should contact the above address or telephone Whickham 883926. YLs and XYLs who are prepared to try and beat the OM at his hobby are welcomed.

Woburn Abbey Rally—6 August, 1972

Arrangements are going ahead rapidly in connection with the RSGB National Mobile Rally to be held at Woburn Abbey on 6 August. Bookings already received for trade stands would seem to indicate that this year's rally will be bigger than ever before and trader members and others who have not received booking forms should get in touch with Norman Miller, G3MVV, at "Avon", Gardiners Lane, Crays Hill, Billericay, Essex. In order to accommodate what will obviously be an attractive trade show, the RSGB Mobile and Exhibition Committee has arranged for a much larger marquee than last year to be erected.

All the usual attractions have been arranged, including the traditional raffle and the bring and buy stands, and there will be displays of equipment by Raynet and BARTG. There will also be a large RSGB bookstall and an RSGB enquiries section.

Fuller details, including information as to the best approach roads, will be published in the July issue of *Radio Communication*.

BARTG Convention, 1972

The first UK Amateur Radio Teleprinter Convention, to be held in Meopham Village Hall on Saturday 20 May 1972, is being organized by the British Amateur Radio Teleprinter Group. The location will be sign-posted from the A20 and A2 roads, and there will be ample parking facilities. There is also a frequent train service from London Victoria Station to Meopham Station, and arrangements are being made to meet trains from Victoria and provide transport to the hall. NGR is TQ 644655.

The convention will be open from 11am until 7pm, and an entrance charge of 15p will be made.

Attractions will include G4ATG operating on the hf bands, trade stands, bring and buy stand, raffle, lecturettes on rtty topics, and demonstrations of adjustments on common rtty equipment.

Light refreshments available.

It is hoped that the convention will provide a meeting place for discussion among those with rtty as a common interest.

Intruder watch

Following the half-yearly summary published in the April issue, advice has been received from the MPT that five unwanted transmissions in the 28 to 30MHz band emanate from Radio Moscow and that the Soviet administration has been approached and asked to clear the interference. A further six reports by the RSGB Intruder Watch have been confirmed and a transmission by Iran International Airlines on 14,000kHz has been the subject of an approach to the administration concerned.

In order to provide the MPT with reports giving the frequencies of intruders to a close tolerance, the Intruder Watch organizer, G3PSM, has been equipped with a frequency counter, RCS type 501. The assistance of RCS Electronics Ltd with the supply of this equipment is gratefully acknowledged.

75th Anniversary—Marconi-Kemp tests

The Barry College of Further Education Radio Society is organizing an ambitious programme to commemorate the Marconi-Kemp Bristol Channel tests of 1897.

Commemorative stations will be set up for operation in May and an award will be made for communication with these and other specified stations over the next 12 months.

A commemorative luncheon will be held on 19 May at which 100 guests are expected, including representatives of the Post Office, BBC, Marconi Company, Italian Embassy, RSGB and civic authorities. Principal guest will be Huw Weldon. It is hoped that radio amateurs and friends will also attend.

The college radio society will be host at a social evening on 20 May for local radio clubs and visiting amateurs at the Lavernock Point Holiday Estate. The society will also be delighted to welcome visitors to the Lavernock Point station which will be operational from 13 to 21 May.

As a direct result of a request by the college society, the Post Office will issue a special stamp on 13 September marking the anniversary, at the same time as three other stamps commemorating the 50th Anniversary of the BBC. The Post Office has also agreed to issue special postmarks from the sites of Lavernock Point, Flatholm Island and Bream Down, and the college society intends to issue its own First Day Cover.

For full details of these events, write enclosing an sae to Barry College of Further Education Radio Society, College of Further Education, Colcot Road, Barry, Glamorgan.

The University of Lancaster, where the North-West Amateur Radio Convention will be held on 23-24th September

The Cheshire Homes Amateur Radio Network Fund

The fund was finally closed on 21 January 1972, a total of £840.21 having been raised. From this amount 16 Homes were equipped with a receiving station, and a balance of £162.81 remained.

A new Home in the Torquay area is nearing completion and is expected to be open for residents in the near future. The Torbay Radio Society has undertaken to equip the Home with a complete station and provide an operator to work it until such time as a resident can be trained and licensed.

It has been agreed to donate £100 to the Torbay Radio Society to assist them in this project.

The balance of £62.81 has been given to the Cheshire Foundation to be held in reserve for any repairs or replacements that may be required by the Homes equipped by this fund.

Aluminium wire supplies

We are advised by Mr H. Barnett, G3DAM, that the Westbro Aluminium Wire Co Ltd, Brandon Close, West Bromwich, Staffs, can supply aluminium wire of all thicknesses and temper. He can thoroughly recommend the firm for courtesy, consideration and promptness—his order for 2·7kg of 2·03m (14swg) could not have been handled better if it had been one of 100 tons.

NRSA Convention 1972

Sunday 7 May

Belle Vue Zoological Gardens

(Open to the public at 11am)

The venue is located on the main A57 two miles east of the centre of Manchester.
Talk-in stations will operate on 160m, 4m and 2m. HF bands exhibition station in operation. Local club display stands, demonstrations and trade stands.
Licensed bar and snack bar in the hall, plus all the amenities of Belle Vue itself.

Electronic switching in amateur radio equipment

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

(Part 1)

Introduction

Despite the somewhat grandiose title it is not intended that this article be encyclopaedic, and no doubt many readers will find that their pet switching ideas are not included. What is intended is that some circuit ideas which have been found useful by the author will be discussed with a view to stimulating further discussion on the subject. The main interest of the author is in the field of miniaturized vhf equipment of the "take up thy set and walk" variety and this naturally colours the choice of circuitry by dictating the type of problem which has to be tackled.

Now that the use of transistors and integrated circuits has made possible really miniature radio equipment, it has become more and more difficult to procure relays of a size commensurate with the rest of the circuitry. While such relays certainly exist, even in TO5 cans or dual-in-line packages, their price is out of the question for most amateur purposes. Quite apart from this, relays are aesthetically a little unsatisfactory in solid-state equipment, relying as they do on mechanical action which is inherently less reliable than most other electronic components. This is not to decry relays completely and there are situations, such as the switching of the low impedance output of an audio amplifier, where a sub-miniature relay, if it were available, would provide a more elegant alternative to the solid-state solution; at least, that is, to the author's solid-state solution which is described later. On the other hand transistors are tailor-made for dc power switching and are far more versatile than relays in this context.

Several different types of signal have to be switched in transceivers and they may conveniently be sub-divided into the categories: dc, audio frequencies, and radio frequencies; each of which may be further subdivided into low power and high power classes. It is proposed to consider each of these in turn and mainly to discuss circuits which have been used and tried out by the author.

DC switching

Transistors are ideal for use as switches for dc and a very wide range of current and voltage levels can be handled. The characteristics of importance are the very low on-resistance of a transistor and the very high off-resistance of modern silicon transistors. With low-power silicon planar devices this may be of the order of $10^9\Omega$. A further point which is very significant in the amateur context is that even a cheap "surplus" type of device will often perform perfectly adequately as a low-speed switch and therefore transistors may be used in this way with very little greater expense than that of adding another resistor.

* 11 Moor Park Avenue, Leeds, LS6 4BT.

Perhaps the most common requirement is to switch the power supply to a stage. This can be done either by a common emitter or a common collector stage and these are shown in Figs 1 and 2, respectively. With silicon planar devices it may be assumed for most practical purposes that if the base of the transistor is open-circuited the current in the load will be negligible, even at the higher ambient temperatures. With good quality low-power devices (eg BC109) it will in fact be in the nanoamp region, whereas with surplus planar types of unknown pedigree it may be microamps.

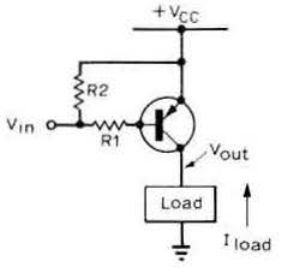


Fig 1. Basic common-emitter transistor switch

In some situations the rough rule of thumb given above is insufficient and even a cut-off collector current of microamps may be too much. In such cases it is advisable to connect a resistor between base and emitter of the transistor concerned. The value will normally be between, say, 10 and 100kΩ. With germanium transistors, which have collector cut-off currents several orders of magnitude greater than silicon, one never operates a stage without such a resistor. One of the great advantages of silicon devices, however, is that in most practical situations the adverse effects of high temperature are relatively slight and easily allowed for. In the case of junction-gate and insulated-gate FETs, the resistance between source and gate can be as high as desired from the point of view of temperature stability, but the

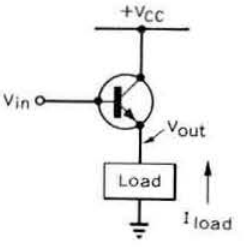


Fig 2. Basic common-collector transistor switch

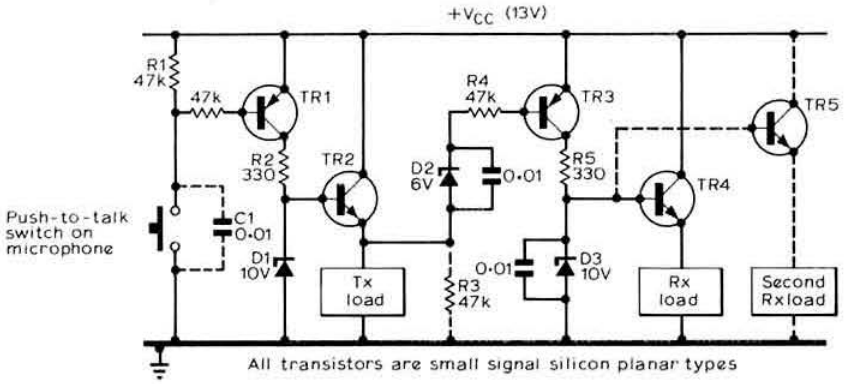


Fig 3. Circuit suitable for carrying out all the necessary power supply switching in a low-power transceiver. The switched supply voltages to transmitter and receiver are stabilized but this feature can be omitted simply by disconnecting the two zener diodes D1 and D3

susceptibility of a fet amplifier to stray signal pick-up is obviously greater the higher the input impedance, and it is sometimes desirable to reduce the input impedance by connecting a resistor from gate to source.

Another reason why it may be desirable to have a resistor connected between the base and emitter of a transistor is that the collector-to-emitter breakdown voltage of a transistor is lowest when the base is open circuited, and highest when the resistance between base and emitter is zero (as it is in, for example, a conventional rf power amplifier stage). Provided that the value of the parameter V_{CEO} (the collector to emitter voltage rating with base open circuited) is safely above the worst-case supply voltage at the operating current, the transistor will be safe against voltage breakdown with any value of base to emitter resistance.

The load current will also be effectively zero if for any other reason the current into the base of the switching transistor is zero. In the case of the circuit in Fig 1 this will require that V_{in} be closer than about 0·5V to $+V_{cc}$, and for Fig 2, that V_{in} is within about 0·5V of the negative line. This value, 0·5V, represents the typical knee voltage of a silicon transistor.

The choice between these two circuit configurations depends on their other properties. The transistor in Fig 1 is best operated either fully on or fully off because a change in load current will be larger than a change in base current by the ratio h_{FE} (the large signal common emitter current gain) which may be a hundred or more. The value of R1 will be determined by the maximum current which is to be taken by the load, thus the required minimum base current is $I_{load}(max)/h_{FE}(min)$ and therefore the value of R1 is given by

$$R1 \leqslant ((V_{cc} - 0{\cdot}5) - V_{in})\, h_{FE}(min)/I_{load}(max)$$

Provided R1 is less than this value the switch will be "on" and the lower limit of R1 is merely determined by the amount of supply current that one can afford or, in extreme cases, by excessive power dissipation in the transistor. Because of the high gain of the stage it is desirable not to leave the input floating if any long leads are connected to it; resistor R2 can then be added and its value can be, say, 100kΩ.

The circuit in Fig 2 is that of an emitter follower and one can assume that V_{out} is equal to $(V_{in} - 0{\cdot}5)$. The base current taken is automatically adjusted by the load current and no input resistor is needed or is desirable. For this switch, therefore, the output voltage stability is nearly as good as that of V_{in} and if V_{in} comes from a stabilized source, the switch can be used as a voltage stabilizer as well. Or, if V_{in} is well decoupled, V_{out} will also be decoupled to the same extent but the output current available will be greater. In contrast, the output from the circuit in Fig 1 is

$$(V_{cc} - V_{ce}(sat)).$$

A basic send-receive switching scheme will now be discussed and possible refinements suggested. Initially we assume that only the current supply to low current stages is to be switched (say, <50mA) and that stabilized supplies are desired (say, for reasons of oscillator stability or gain stability). A suitable circuit is given in Fig 3. TR2 and TR4 act as emitter followers and supply their loads with a constant voltage closely equal to half a volt less than the zener diode voltages. When the press-to-talk button is not pressed, TR1 is off and, therefore, the base of TR2 is effectively open-circuited and only negligible leakage current flows in the transmitter circuits. A further slight current also flows, however, equal in magnitude to the base current in TR3, approximately $(V_{cc} - 0{\cdot}5 - 6)/R4$. This renders TR3 conducting, and D3 maintains the ht to the receiver at its desired value. If now the transmit button is pressed, the ht to the transmitter is raised to the breakdown potential of D1 minus about 0·5V (the base-emitter drop in TR2), the breakdown potential of D2 is no longer exceeded, and therefore TR3 has an open-circuited base and so has TR4. The net result is that the receiver is switched off. D2 is necessary since the input end of R4 cannot go within the desired half-a-volt of V_{cc} because of the presence of D1 and the non-zero V_{sat} of TR2.

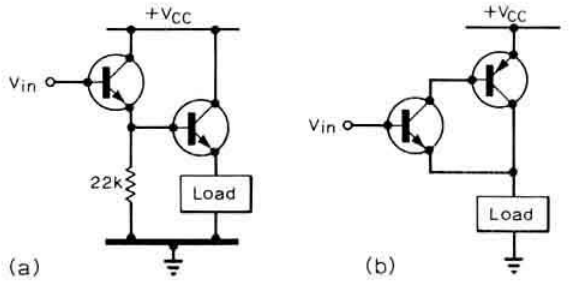


Fig 4. Compound emitter-follower suitable for use as a higher current switch than the circuit of Fig 2

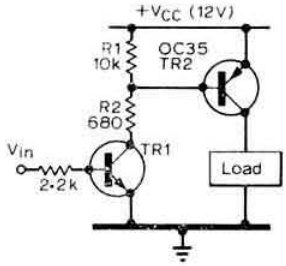


Fig 5. Higher current version of Fig 1

In constructing the circuit it is convenient to put TR2 and its components on the transmitter board and TR4 etc on that of the receiver. Then to allow operation of the receiver, if for any reason the transmitter unit is removed, R3 can be added to provide base current for TR3. Capacitor C1 ensures that pick-up on the microphone lead does not affect the t/r switch.

If there is a possibility that two or more circuits in, say, transmitter or receiver will require supply decoupling between them, it is often simpler and less space is required if additional emitter followers are added, such as TR5. A further advantage of this over RC decoupling is that no extra time constants are added; this is important for fast push-to-talk operating.

For higher current switching the same principles can be used but higher current transistors will be required, together probably with appropriate current amplification. The compound emitter-follower, Fig 4(a), or its complementary version, Fig 4(b), is suitable and is of course widely used for this purpose in stabilized power supplies. A problem when these circuits are used with battery operated equipment, however, is the extra half-volt of precious supply voltage which is lost in each additional stage. In this case the circuit of Fig 5 can be used and in fact TR2 being pnp could conveniently be germanium and the "lost" voltage would then only be around 0·2V instead of 0·5. Resistor R1 would then be essential to ensure that TR2 is fully cut-off when TR1 is off, especially at high junction temperatures.

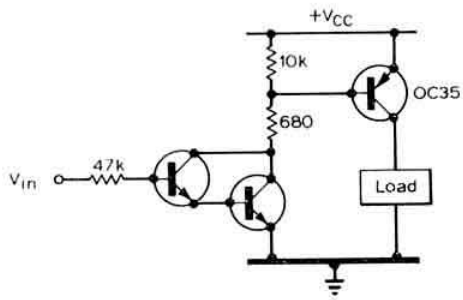


Fig 6. Version of Fig 5 with increased current gain through the use of a Darlington pair for the driver transistor

If, for the sake of illustration, 4A have to be switched by TR2, and if TR2 is an OC35 with h_{FE} of 30, TR1 must pass 4/30A when conducting and R2 would be chosen accordingly. Thus in this case R2 would be given by $(V_{cc} - 0{\cdot}5 - 0{\cdot}2)(4/30)\Omega$. If TR1 is a silicon planar device such as a BFY50 with an h_{FE} of, say, 50, the input current to TR1 would only be around $4/(30 \times 50)$A, or, say, 4mA. This could be reduced to the microamp region by use of a Darlington pair for TR1 as in Fig 6. Usually when such high currents have to be switched, good stabilization of the output voltage is not required since the load will usually be a radio or audio frequency power output stage for which the maximum possible supply voltage is required. If switched voltages to low-level stages are required as well, it is almost essential to use a separate switching transistor to supply them, otherwise the "on" impedance of TR3 would be common to the two circuits and instability would occur.

In battery operated equipment it is essential that the last ounce of battery power be utilized. The circuit of Fig 3 is not ideal in this respect because if the main supply voltage (V_{cc}) drops to $V_{D3} + V_{CE}$(sat, TR3) the zener diode ceases to conduct and the output stabilization fails; this will probably result in motorboating and frequency drift. The former effect can be alleviated so that in an emergency the receiver could still be used by connecting an electrolytic capacitor in parallel with D3. If this is done a resistor of, say, 2·2kΩ is needed between base and emitter of TR5 otherwise the capacitor will take too long to discharge when TR3 is cut off.

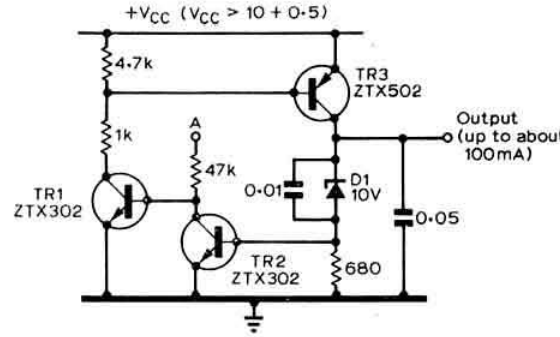


Fig 7. Gated voltage stabilizer circuit with simple gating requirements and capable of operating with a very small difference in voltage between the main supply and the stabilized output from the stabilizer

A circuit which will allow a stabilized supply to be obtained at a voltage as near as 0·5V to the main supply voltage is shown in Fig 7. Although more complex than the circuits so far described, the stabilization is better. It is a gated version of a design described in [1]. The output voltage is equal to the breakdown voltage of the diode plus the base-emitter drop of TR2.

If point A is open circuited or returned to the negative line, the output voltage drops rapidly to zero; if point A is raised to above plus two or three volts the full stabilized output is obtained. The capacitor across the output is necessary to allow self-starting and also for stability purposes. The main advantages of this circuit over the previous ones, therefore, are (a) simple gating requirements, (b) better stabilization, (c) greater utilization of the battery voltage, (d) protected against short-circuits at the output (the output transistor in an emitter follower type of regulator will "die" instantly if the output is shorted).

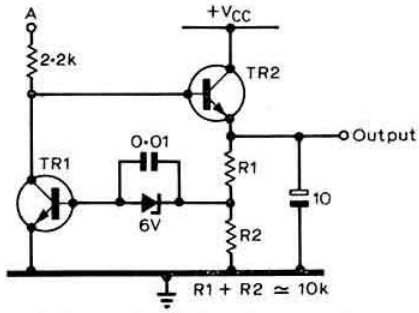


Fig 8. Basic two-transistor voltage regulator circuit

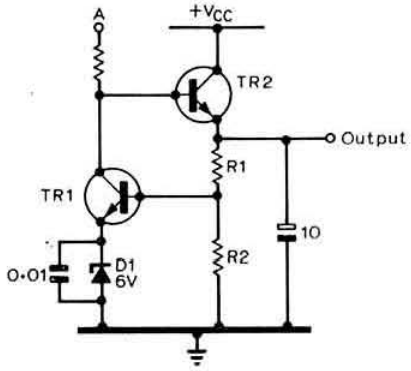


Fig 9. Variant of Fig 8

Yet another stabilizer which will operate with its output voltage close to the input voltage is shown in Fig 8, together with a closely similar version in Fig 9. These enable the output voltage to be set to any desired value by making the ratio of R1 to R2 variable. In both cases the output voltage will be approximately ($V_{D1} + V_{BE(TR1)}$) . (R1 + R2)/R2. The circuit in Fig 8 has the slight advantage over Fig 9 that the current through the zener diode tends to be more constant since it comes from the stabilized output. Both the circuits have the disadvantage compared with the previous circuit that point A must be taken to the full supply voltage if the minimum differential between input and output voltages is to be obtained. The reason being of course that TR2 is being operated as an emitter follower. If point A is supplied from a stage such as Fig 1 or 2, this is not possible because of the drop across the control transistor.

Often one needs to be able to operate only part of a transmitter at the same time that the receiver is in use. This is the case when netting with a vfo or "checking one's own channel" when crystal controlled. Interboard wiring is simpler if the majority of functions needing to be switched require only a single-make contact and this is easily arranged by feeding the main ht to such a stage through a diode as indicated in Fig 10. Then when ht is applied to that stage only by the netting switch, the diode ensures that the rest of the transmitter remains unenergized. Also in a similar vein, and also illustrated in Fig 10, if a particular stage needs

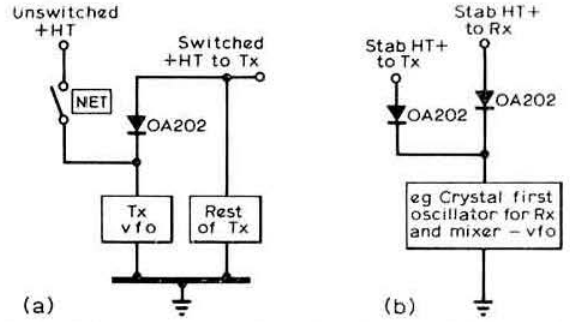


Fig 10. Method of using a single "make" contact instead of a single-pole change-over switch for a function such as "netting"

to operate on both transmit and receive and needs a stabilized supply, it is necessary merely to feed the two switched ht lines to the stage through diodes. Then when only one supply line is energized the other remains unaffected because the other diode is reverse biased. This scheme is better than using an extra zener diode solely for the stage concerned since less power is wasted and less noise is generated.

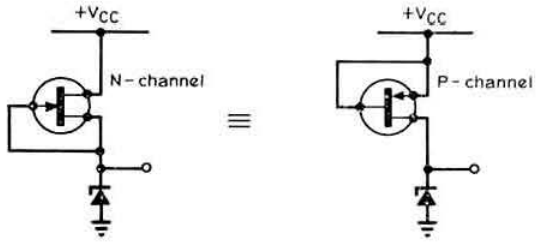


Fig 11. Use of a junction-gate fet as a constant current source to feed a zener diode

Concerning zener diodes, it is often difficult to choose a suitable series resistor to drive the diode when the supply voltage is likely to vary widely and is near to the zener voltage. Thus if a reasonable current flows when the supply voltage is at its low point (ie flat battery) the current flowing in the zener diode when the voltage is high can be quite large and is wasteful. In such cases a suitable fet can be used as a constant current source. It is unfortunately necessary to select a device with a value of I_{DSS} (ie the current which flows from drain to source when the gate is connected to the source or open circuited) which gives the desired zener current. For the wealthy, constant-current diodes based on this principle can be bought commercially, and in this case one specifies the current value desired in exactly the same way that one specifies a breakdown voltage for a zener diode. Fig 11 illustrates the simplicity of the technique. With the N-channel fet circuit the current flowing could be controlled to any value less than I_{DSS} by returning the gate to the slider of a potentiometer connected across the zener diode.

To be continued

Some improvements in digital frequency measurement technique

by DAVID J. TAYLOR, BA, G8ARV, G6SDB/T*

WHILE the basic principles of frequency measurement using counting techniques and integrated circuits have been fairly well documented [1], more advanced forms of measurement up to the vhf range and computing type counters have previously only been the realm of the professional.

It is the purpose of this article to suggest some circuits for counters up to 100MHz and to describe how direct readout of a 2m frequency can be obtained.

Oscillator 1MHz

It will clearly be advantageous if all of the logic and linear circuits in a counter work off a common 5V supply. A suitable oscillator using 1MHz crystals is shown in Fig 1. If this is used with the counter [1], an additional decade counter will be required between the 1MHz oscillator and the 100kHz input to that counter's timebase. This can be connected in the same way as the other decade counters in the timebase.

The oscillator circuit is one which has been published by Arthur Critchley in *CQ-TV*. It uses three inverter gates which can be half of a hex-inverter package or three gates from a quad-two input package, as shown in Fig 1. Use of a 1MHz crystal is recommended as those tested by the author have better temperature characteristics than 100kHz units, and are cheaper.

Operation

Bias for the whole oscillator is provided by the 2·5mH rfc, damped with the 560Ω resistor. Two inverters provide zero phase shift (I1 and I2) and hence positive feedback governed by the series resonance of the crystal.

Frequency setting of the crystal resonance is achieved by means of the 100pF variable capacitor C1. Inverter I3 merely provides buffering of the oscillator from external load changes.

For best stability the crystal should be housed in a crystal oven.

20MHz input interface

While the interface for the counter described works satisfactorily, it has the great disadvantage of complicating the power supplies required. It is possible, using an ecl integrated circuit, to build a combined preamplifier and Schmitt trigger.

The device used is the MC1035, a Motorola "MECL II" family device. The only snag with using this device is that the logic levels are not equal to those of ttl, and five diodes and a transistor are required to convert the levels. The circuit is shown in Fig 2.

The first two amplifiers in the MC1035 are used as straight amplifiers and have a bandwidth greater than 40MHz. The third section is used with positive feedback as a Schmitt which will work up to 80MHz. Interface between ecl and ttl logic levels is achieved by three voltage shifting diodes D1, D2, D3 and a non-saturating transistor switch, D4, D5, TR1.

Resistor R5 sets the bias point for maximum frequency of counting. This is achieved by feeding in an rf signal generator and checking the maximum count frequency. R5 is then altered and the improvement (or otherwise!) noted. Hence the best value of R5 is found.

This interface will work up to at least 50MHz, and with the counter [1] the maximum frequency of operation is limited by the decade counter and display.

The counter could thus be modified to give a maximum frequency of 50MHz, if the first signal decade counter were replaced by a 74196, a 50MHz decade. However, this is not pin for pin compatible with the 7490 and readers would be advised to consult the data sheet before attempting such a modification.

It would be necessary to incorporate time base switching to avoid first digit ambiguities, and it would be better to make the first digit a proper decoder-Nixie, rather than a flashing neon.

Vhf construction techniques should be adopted. No protection against voltage transients is provided.

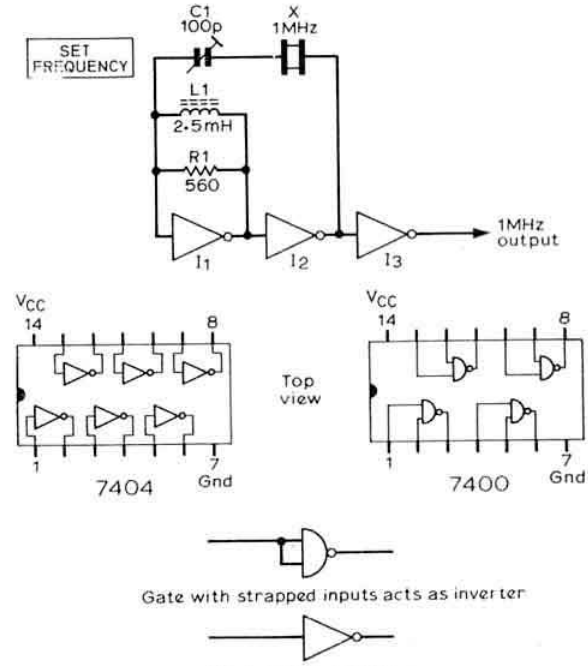


Fig 1. 1MHz oscillator

* "Crestwood", 8a New Rowley Road, Dudley, Worcs.

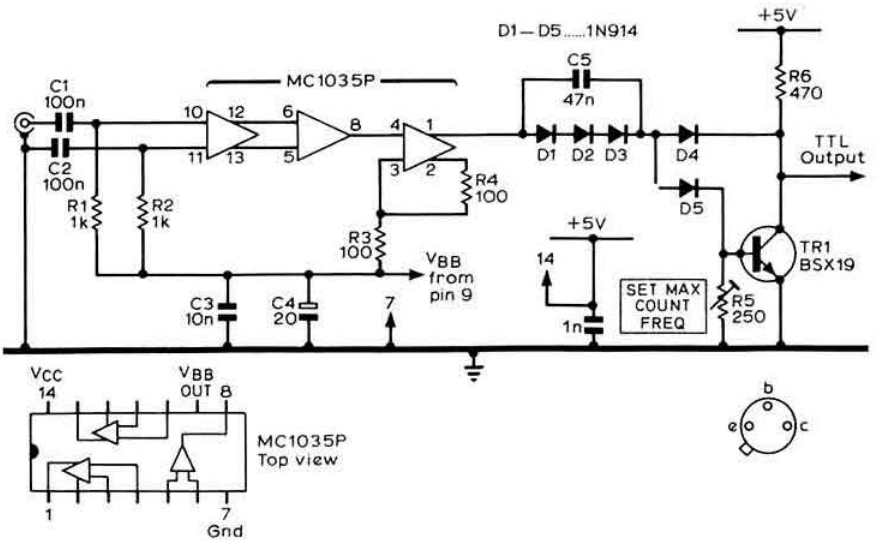


Fig 2. 20MHz interface

Computing counter—or how to get direct readout of a 2m frequency

It is possible to display a frequency which is a harmonic of the input frequency.

Consider a 2m transmitter. The oscillator is conventionally on 8MHz, with following multipliers to 144MHz, a multiplication factor of 18. Hence one cycle of 8MHz generates 18 cycles of final output frequency.

Now consider the counter timebase. For measuring kilohertz the gate is held open for 1ms, and, if an 8MHz signal is being measured, some 8,000 cycles will be counted.

As the 2m output is on 18 times the 8MHz oscillator frequency, consider what happens if the gate is held open for 18ms. Each cycle of the 8MHz signal will be counted 18 times, hence the number of pulses counted will be

$$18 \times 8{,}000 = 144{,}000$$

and the frequency of the eighteenth harmonic of the 8MHz frequency being fed to the counter will be displayed.

As the maximum reading of the counter [1] is 19,999, the readout will show 04000 for a 144MHz signal, 05000 for a 145MHz signal, and so on. The only disadvantage is that counting takes 18 times as long, so that to measure hertz an 18s gate pulse would be required.

The circuitry to implement this is shown in Fig 3. The position of the circuitry within the counter [1] is indicated, for any other counter it can be positioned within the timebase at such a point where the input frequency does not exceed 1MHz (above 5MHz propagation delays can cause errors in this sort of divider-gate combination).

Operation

Consider the decade counters D1 and D2 both being set to zero. After 18 clock pulses the A line of D2 will be high (more than 10 pulses) and the D line of D1 will just have gone high. Hence both inputs of A1 will be high and 10ns later the output will be low; 20ns later the output of the inverter and hence the reset zero inputs of the decade counters will be high. After a further 40ns the counter has reset and the reset zero line goes low. Thus a 40ns pulse is generated on the reset zero line at every eighteenth input pulse, which can be used to drive the timebase.

In this way the timebase frequency is reduced by 18 times and the timebase period increased 18 times.

A suitable divide by 54 circuit for measuring 8MHz and displaying 432MHz is also shown. The components within the dotted lines could perhaps be mounted on a plug-in board and various divider units built.

80 and 150MHz prescalers

Having built a 20MHz counter, a possible way of extending its capability is to provide an interface capable of, say, 80MHz operation and two divide by two bistables, which will

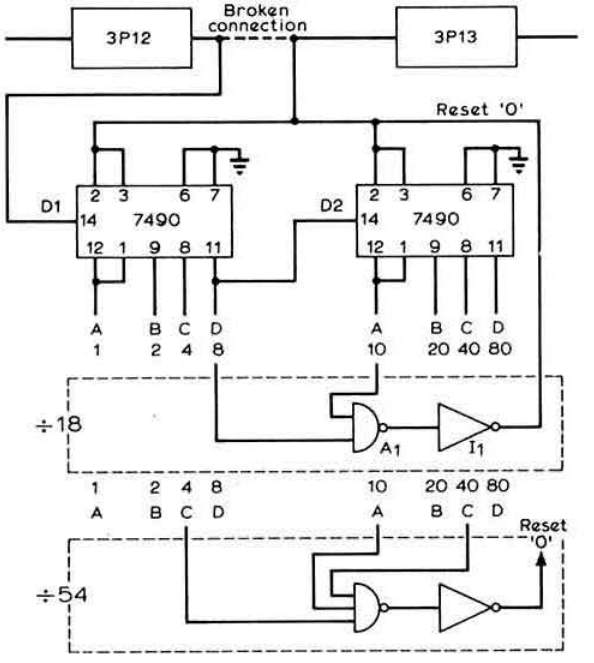


Fig 3. Computing extension

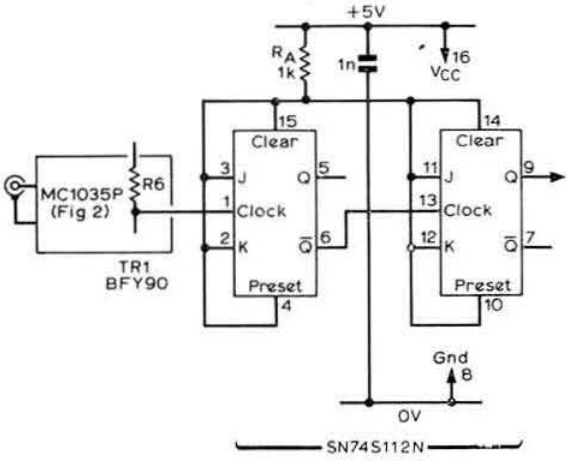


Fig 4. 80MHz prescaler

convert an 80MHz signal into a 20MHz one. By using a divide by four circuit in the timebase as described above, the 20MHz signal can be displayed as an 80MHz readout.

To get to such high frequencies it is necessary to use different integrated circuits to the standard ttl 74N series. Two possible families exist, 74S and MECL 10000† series.

80 MHz and 74S series

Using the MECL II amplifier and Schmitt trigger described above, 80MHz performance can be achieved. The interface to ttl will work with a BFY90 replacing the BSX19. A dual JK flip-flop, 74S112, is used with each half as a toggle bistable (ie J = K = 1, divides frequency by two) so that the net frequency division is by four times. The circuit is shown in Fig 4.

As the maximum frequency of operation is 80MHz, it is important to employ vhf constructional techniques. In the prototype the ICs were mounted on a ground plane connected to the Vcc supply (omitting RA). This was insulated from the tobacco tin containing the prescaler.

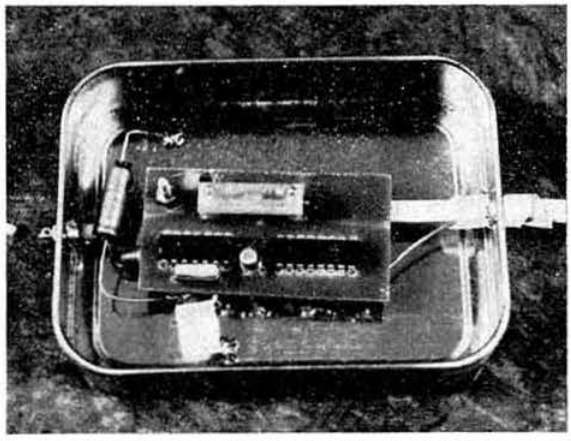


Photo 1. Construction of 80MHz prescaler

† Motorola trade mark.

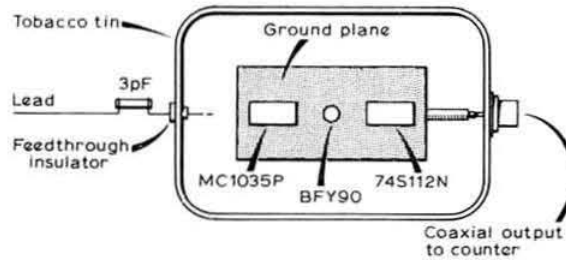


Fig 5. Prescaler construction

At the input connector a 3·3pF capacitor with one 10mm lead will suffice to pick up enough rf off valve transmitters or crystal oscillators merely by touching the lead on to the crystal can! The construction is illustrated in Fig 5 and Photo 1.

150MHz and MECL 10000 series

Using MECL 10000 series which has a 2ns per gate propagation delay it is possible to get dual flip-flops which will toggle at more than 150MHz (MC10131). A similar device to the MC1035 is available in this high speed series, the MC10116. Thus, in principle it is possible to build a prescaler which will work up to 150MHz, and measure a 2m transmitter directly.

For a 144MHz input the output from the prescaler would be 36MHz, so that a further divide by two circuit would be required to bring the frequency down to 18MHz, within the range of standard ttl integrated circuits. Either a further ecl bistable (MC1027) or a high speed ttl bistable (series 74H) could be used, with the ecl-ttl level converter at the appropriate point.

The arrangement is sketched in Fig 6. Here a divide by eight would be needed in the timebase to show the true frequency readout.

250MHz prescaler

Motorola make a 250MHz prescaler (÷ 8) and ecl-ttl converter on one chip.

Data sources

For information on the various integrated circuits used in the circuits described it is best to get in touch with the semiconductor manufacturers directly. Their addresses and those of distributors are given in the appendix.

It is worthwhile writing to the various manufacturers for applications information which is mentioned in national electronics magazines. There seems little point in designing circuitry that someone else has already sweated over.

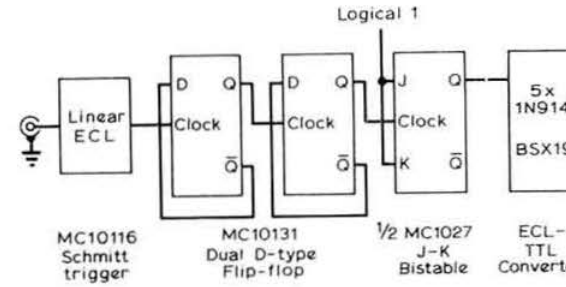


Fig 6. 150MHz prescaler block diagram

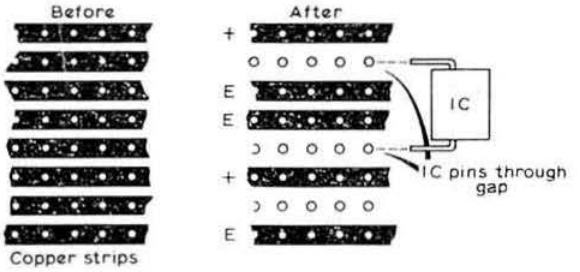


Fig 7. Veroboard adaptation

Some hints and tips

In constructing digital circuitry the author has found it convenient to use Veroboard with certain copper strips removed. The ICs are then placed along the gaps remaining. This is illustrated in Fig 7 and shown in Photo 2. A 30MHz seven-segment readout frequency meter constructed using this technique is shown in Photo 3.

The single strips between rows of devices can be connected to +5V, and the pairs of strips underneath individual devices can be connected to earth, so that any ic pin can be connected to zero or +5V merely by bending the pins.

Interpin wiring can be achieved with thin stranded wire, or tinned copper wire with heat resistant silicone rubber sleeving for short interconnections.

It is useful to have a 6·8V zener across the supply line to suppress transients.

Standard decade counters (7490) are rated higher in speed (32MHz) if bought from National Semiconductors.

For portable use it is convenient to have a complete counter (or digital clock) which works off 5V. To do this, seven segment indicators can be used, together with 7447 decoder/drivers. These indicators give adequate brilliance when driven from 5V, and offer suppression of leading or trailing non-significant zeros.

For further information obtain the Texas msi/ttl book from the address in the appendix. The indicators can be obtained from K.G.M. It is best to shop around the various advertisers for the cheapest ttl drivers. Finally, a complete 5V 1A regulator is obtainable in a TO5 can from National Semicondictors—the LM309K; an extremely useful device.

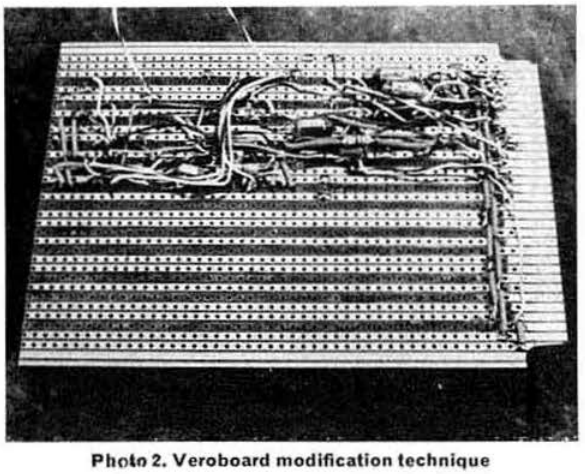


Photo 2. Veroboard modification technique

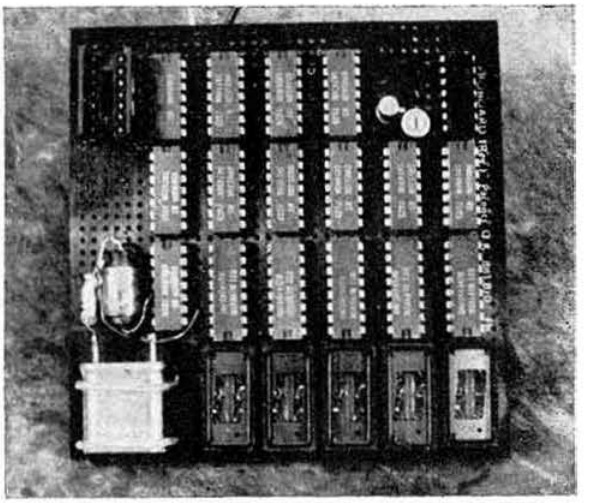


Photo 3. 30MHz—5V only supply—frequency meter

Conclusion

It is the author's belief that in about five years' time digital readout of frequency will be the normal thing for any vfo built, whether for a receiver or transmitter. He hopes that the ideas presented here will help to bring forward that time.

References

[1] "A 20MHz digital frequency meter using integrated circuits", I. D. Brown, BEng, AMIEE, and S. L. Norman, BTech, AMIEE, *Radio Communication* July/August 1971 pp 458 and 522.

Other useful works

TP1158, Mullard Ltd, FJ series applications booklet.
Texas Instruments, Data Book 2.
National Semiconductor ttl catalogue.
Texas Instruments, msi/ttl application book.

Appendix

Manufacturers' addresses

Texas Instruments Ltd, Manton Lane, Bedford.
Motorola Semiconductors, York House, Empire Way Wembley, Middlesex.
Mullard Limited, Mullard House, Torrington Place, London WC1. Ask for booklet TP1158.

Distributors' addresses

Texas Instruments Ltd, Supplies Division, 165 Bath Road, Slough, Bucks.
Motorola: A. M. Lock & Co Ltd, Distributor Division, Peel Street, Chadderton, Oldham, Lancs.
K.G.M. Electronics, Clock Tower Road, Isleworth, Middlesex.

Speech processing

Condensed from an article in VHF Communications *and reprinted by kind permission of that publication.*

by D. E. SCHMITZER, DJ4BG

THERE are two main types of speech processors: dynamic compressors and amplitude limiters (clippers). Both have advantages and disadvantages. The aim is to increase the mean depth of modulation, to avoid overmodulation and to improve intelligibility under interference conditions. However, the bandwidth of the signal should not increase over that of unprocessed speech, eg 0·3kHz to 3kHz.

Dynamic compression

Such circuits operate according to the principle of an automatic gain control (agc) using a feedback link from the output of an af amplifier to keep the output voltage relatively constant. The advantage of this type of processor is that an ideal circuit will not produce any distortion. However, it is very difficult to obtain the required rise-time and fall-time constants. With those compressor circuits known to the author, these time constants are too long, which means that they are only able to compensate for volume variations and operate as an agc circuit. Between words the gain is increased, so that a large amount of background noise and echo effects are heard. The first sound of the following word will cause overmodulation since a control voltage cannot be generated instantaneously due to the long rise-time. Furthermore, weak tones will not be heard after strong ones due to the long fall-time constant.

Amplitude limiting

There are two main methods of limiting the amplitude of a voice transmission: rf limiting and af limiting. Both are capable of providing good results, even though the required expense differs considerably.

RF limiting

RF clipping is, as its name implies, made at rf level. The audio frequency is transposed into an ssb signal which is limited and then passed via a second crystal or mechanical filter. Since the harmonics (distortion) resulting from the limiting process are at multiples of the carrier frequency and not of the audio frequency, these are suppressed easily in the following sideband filter. The only disadvantage of this system is the high amount of filtering required which makes it only really practical for ssb applications where at least one of the two sideband filters are available.

AF limiting

Audio clippers offer excellent results at moderate degrees of limiting. They are far more simple and cheaper than rf clippers but offer virtually the same results when correctly designed. A certain amount of distortion is unavoidable. However, the purpose of this article is to describe how the distortion can be reduced to an absolute minimum.

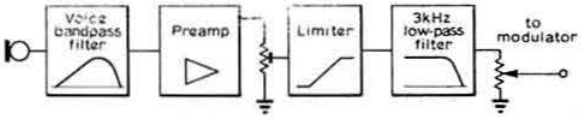


Fig 1. Block diagram of an af amplitude limiter

The bandwidth previous to the limiter must be kept within approximately 0·3kHz to 3kHz with a pre-emphasis around 1kHz together with a bass frequency response of minus 6dB per octave. The bass rejection is very important to ensure that the harmonics from this unwanted frequency range are attenuated and do not fall into the frequency range of interest. Of course, only harmonics of the medium and higher frequencies will be suppressed in the low-pass filter after the limiter.

A practical speech processor

An audio limiter based on the above considerations will now be described. It has been called a speech processor since it is felt that the tailoring of the voice response, etc, takes it out of the class of clippers as we know them. It improves the speech characteristics considerably even when not driven up to the limiting threshold. It is built on a printed circuit board 90mm by 65mm.

Circuit description

Fig 2 shows the circuit diagram of the speech processor. An integrated circuit type CA3046 and two transistors are used. The operating voltage can be in the range of 9 to 18V, and the current consumption only amounts to approximately 1·7mA. The maximum gain of 2,500 (68dB) is suitable for use with dynamic microphones whereby a signal-to-noise ratio of over 50dB is achieved. A limited and filtered output voltage having a peak-to-peak value of 3V is available at a source impedance of approximately 50Ω.

Preamplifier and bandpass filter

Three individual transistor systems of the integrated circuit CA3046 are used for the preamplifier and the first low-pass filter. They are designated in Fig 2 as TR1, TR2 and TR3. The microphone signal at connection point Pt 13 is amplified in the first two transistors. The signal is then fed to the galvanically-coupled active low-pass filter which suppresses all non-required frequencies above approximately 3kHz. The base bias voltage of transistors TR1 and TR2 is taken via the voltage divider comprising R11/R12 from the emitter of transistor TR3. Together with the negative current feed-back of the first two transistors and the mentioned galvanic coupling between transistors TR2 and TR3, a very good stabilization of the operating points of these three transistors results. The RC link R1/C1 suppresses any rf voltages induced into the microphone cable. The very low capacitance value for the coupling capacitor C3 of 270pF forms, together with the connected resistors, a low-pass filter that attenuates frequencies lower than 4kHz by 6dB/octave.

The active low-pass filter is formed by the resistors R7, R8 and R9 together with capacitors C4, C5 and C6 and

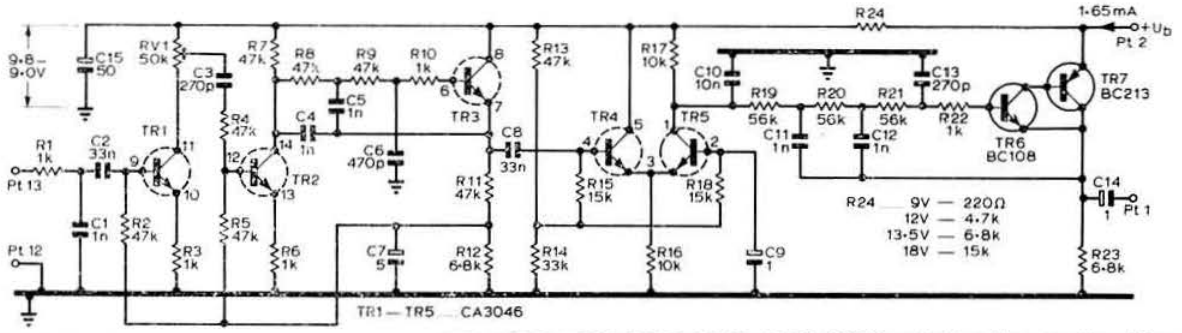


Fig 2. Circuit diagram of the speech processor. TR6—BC108, BC148, BC168, BC183, BC238, 2N3904 or similar silicon npn transistor. TR7—BC213, BC158, BC178, BC2N308, 3906 or similar silicon npn transistor

transistor TR3. The dimensioning of such low-pass filters was given in [1]. In addition to this, the coupling capacitors at the input and output of this circuit (C2 and C8) are dimensioned so that frequencies of less than approximately 300Hz are attenuated. The actual limiter is therefore fed with a signal whose bandwidth and spectral energy distribution is most favourably dimensioned for the highest speech intelligibility.

Limiter

The amount of unavoidable distortion can be reduced considerably by correct design of the actual limiter stage. This is because a squarewave signal having a duty cycle of 1 to 1 only consists of the fundamental wave and odd harmonics. Even the slightest unbalance will cause additional even harmonics to be generated which will reduce the intelligibility. This means that half of the possible harmonics can be avoided if the limiter is completely balanced.

Transistors TR4 and TR5 form a differential amplifier which operates as a balanced limiter. Under rest conditions, eg without drive, the current flowing via the emitter resistor R16 distributes itself equally to the two transistors. A prerequisite of this is that the two transistors have virtually the same characteristics, which is the case with the integrated circuit used. It is, therefore, not advisable to use individual transistors for the construction of this clipper. According to whether a voltage of positive or negative polarity is fed to the input of the limiter stage (base of TR4), the current distribution will be shifted in favour of transistor TR4 or TR5. When feeding an alternating voltage to the base, the current distribution will alter with the frequency of the alternating voltage. With a signal of 100mV peak-to-peak or more, transistors TR4 and TR5 alternately take over the whole current which means that one of the transistors will always be blocked. The current through transistor TR5 and thus the voltage drop across the collector resistor has more or less a squarewave form. The input signal is therefore available at resistor R17 in an amplified and limited form.

The value of resistor R17 is sufficiently low (10kΩ) that transistor TR5 also receives enough collector-emitter voltage when it takes over the whole current flow. This means that the limiter cannot be saturated. Except for this, the limiter circuit corresponds to the description given in [2].

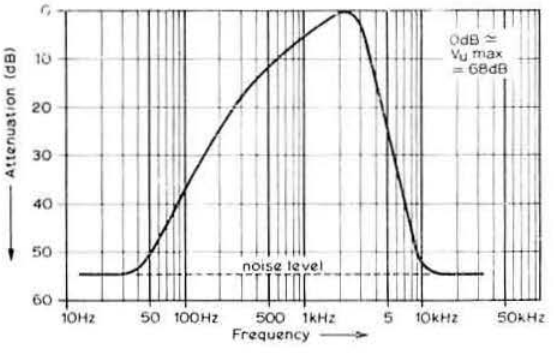


Fig 3. Overall frequency response of the circuit at low levels

Low-pass filter

It is important that the harmonics caused by the limiting process are attenuated as far as possible. If a simple, steep-skirted 3kHz low-pass filter is used, the squarewave oscillation generated in the limiter will cause a large "overshoot". This effect is exhibited by both LC and active low-pass filters and will cause over-modulation if the drive level is not decreased by the value of the overshoot. However, the overshoot can be suppressed using a special filter circuit as used in pulse technology (eg in video amplifiers) [3].

So-called Chebyshev filters are suitable for this application. In its simplest form, a normal active low-pass filter—which has been dimensioned for an especially large overshoot—is combined with an RC link. This arrangement possesses a certain amount of ripple in the passband range, but it has a far steeper transition into the stopband range together with a very small overshoot.

A limited and filtered audio signal of 3V peak-to-peak is available at the output (Pt 1). This means that a modulator (or varactor diode for fm) can be driven directly. The terminating impedance should be at least 5kΩ in order to ensure that the output stage is not overloaded. A neutralizing resistor of approximately 100 to 500Ω should be connected in series with the output capacitor C14 if a long cable or large capacitance load is to be connected to the output.

Power supply

Operating voltages of 9V to 18V can be used with the processor by changing the value of resistor R24. The values are given in the circuit diagram.

The power supply voltage for the clipper should be well filtered, but not stabilized, particularly in the case of battery operation. The clipper should be fed with the same voltage as the modulator and transmitter output stage. This has the following advantage. When the operating voltage falls, the drive range of the transmitter and modulator stages will be reduced, which means that if the af drive remained constant, overmodulation could be caused. However, since the operating voltage of the clipper is also reduced, the af output voltage of the clipper will also be decreased so that any predetermined drive level is maintained.

Alignment

The preamplification of the clipper is adjusted once for the microphone to be used so that a slight limiting occurs when speaking into the microphone at normal volume at a distance of 10 to 20cm. This means that no dynamic compression will occur but only that the highest amplitude peaks will be limited. This degree of clipping is suitable for communication under low-noise operating conditions; it limits the bandwidth of the signal and ensures that overmodulation cannot occur, but does not force the receiving station to listen to clipped speech.

Under poor communication conditions, it is then only necessary to speak louder and/or to speak closer to the microphone in order to obtain compressed speech. Since this is a natural reflex under poor operating conditions, the operating of a correctly adjusted clipper is extremely foolproof.

Note

It has been found that some integrated circuits CA3046 possess a relatively high noise level and are therefore not suitable for use in this circuit. The integrated circuits offered by the publishers of *VHF Communications* have been selected for their low-noise characteristics.

A far more detailed description of speech processors as a whole and this one in particular is given in editions 4/1970 and 1/1971 of *VHF Communications*, from which this article has been condensed.

Available parts

The publishers of *VHF Communications* have this speech processor in their programme of kits for vhf amateurs. The printed circuit board (designated DJ 4 BG 006), the semiconductors or a kit are available in the UK from their representatives: Microwave Modules, 4 Newling Way, Worthing. Tel: 0903 64301.

References

[1] "Active Audio Filters", by D. E. Schmitzer. *VHF Communications* 1 (1969), Edition 4, Pages 218-225 + 226-235.

[2] "Speech Processing", by D. E. Schmitzer. *VHF Communications* 2 (1970), Edition 4, Pages 217-224.

[3] "Steep-skirted Active Audio Filters", by D. E. Schmitzer. *VHF Communications* 2 (1970), Edition 4, Pages 210-216.

Phased verticals

by TRYGVE TONDERING, OZ1TD*

IT is the dream of most amateurs to get an enormous tower with a Yagi or a quad for 10, 15 and 20m at the top, but, unfortunately, such an arrangement suffers from the following disadvantages:

(1) The costs are high.
(2) Many people do not like to climb high towers, and tilt-over or telescopic masts are expensive.
(3) A tower with an aerial does not look very pretty; that at least is the opinion of the neighbours.

The vertical aerial is, therefore, often an interesting alternative. It will probably never be as effective as a beam or quad, and it will be a bit more apt to give tvi problems. Two of the disadvantages, namely its tendency to pick up too much noise and the lack of directivity, can, however, be limited by using two or more phased verticals. With such a system excellent dx results can be obtained because, among other things, of the low radiation angle of this type of aerial.

The author has been working for a couple of years with a system consisting of two 12AVQs for 10, 15 and 20m and has obtained good results. The principle is very simple. The two aerials are placed $\frac{1}{4}\lambda$ apart, and the signal to one of them is delayed $\frac{1}{4}\lambda$ (90°) simply by making the coaxial cable to this aerial $\frac{1}{4}\lambda$ longer than the other cable. When the signal from the second aerial (not delayed) reaches the first, this starts radiating and the two signals are in phase and are added, which gives a more forceful signal. When the signal from aerial No 1 (delayed 90°) reaches aerial No 2, the signals will be 180° out of phase and the result will be a weaker signal. In principle the same thing happens during reception.

In this way the gain in one direction is about 5dB and the attentuation in the other direction is some 20dB.

In calculating the length of the coaxial cable that will delay the signal $\frac{1}{4}\lambda$ it must be remembered that electromagnetic waves travel more slowly in such cables than in the air; generally the factor is 0·66. Thus at 14·2MHz one cable must be

$$\frac{300 \times 10^6}{14{\cdot}2 \times 10^6} \times 0{\cdot}66 \times \tfrac{1}{4} = 21{\cdot}2 \times 0{\cdot}66 \times \tfrac{1}{4} = 3{\cdot}48\text{m} = 11{\cdot}4\text{ft}$$

longer than the other one.

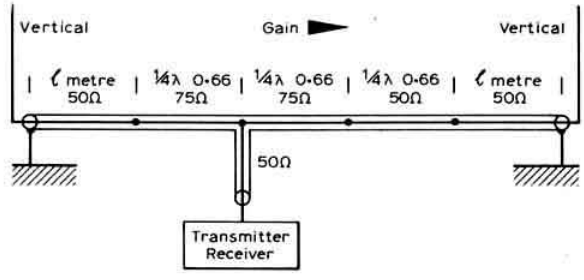


Fig 1.

* Solbakkevej 8, DK-2820 Gentofte, Denmark

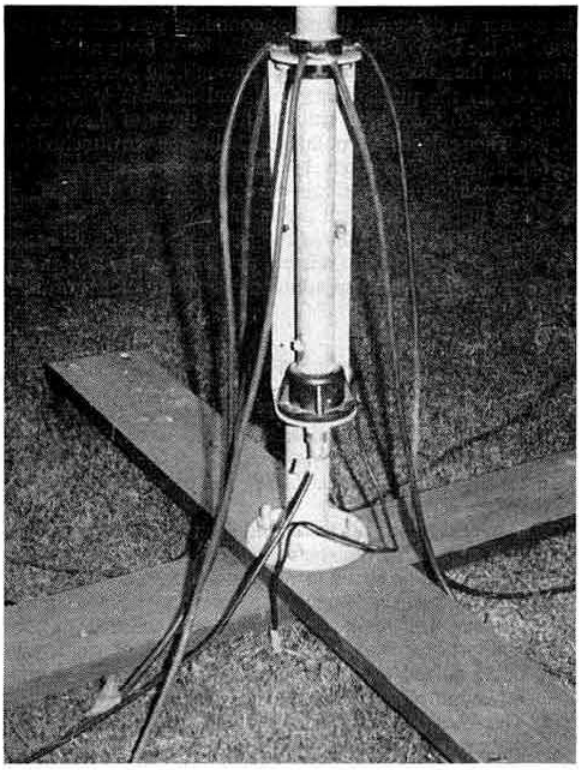


Fig 2.

Assuming that the normal 50Ω cable is used, and assuming that 50Ω is needed at the transmitter, an impedance matching where the two coaxial cables meet is necessary (see Fig 1). This is done by using a quarter-wave transformer. A 75Ω cable $\frac{1}{4}\lambda$ long (11·4ft at 14·2MHz) is inserted in each cable leading to the aerials. Consequently each coaxial cable at the junction point shows 108Ω ($75 = \sqrt{52 \times Z}$ which gives us Z = 108Ω, and as they are in parallel the impedance in the common coaxial cable will be 108Ω ÷ 2 or approximately 52Ω.

The author's method is as follows. One vertical is permanently mounted on a piece of pipe, which is concreted into the ground; the other is mounted on a wooden foot and can be placed so that the correct distance ($\frac{1}{4}\lambda$) between the aerials (namely 17·3ft at 14·2MHz, 11·6ft at 21·2MHz, and 8·6ft at 28·6MHz) can be obtained. Change in direction can also be made. It is essential to have a good ground connection, preferably supported by radials, and this is easily accomplished with a permanently mounted aerial. With a mobile aerial the author uses two radials per band, and at different locations which he uses frequently, ground-rods are hammered into the ground. These rods can be connected to the aerial by a terminal, and the ground rods and terminals are completely concealed by the lawn (Fig 2).

In the shack the author has three variations (for 10, 15 and 20m) (Fig 3). They are neatly rolled up and placed on a hook in the wall. By changing the connections he can change the direction of the gain without changing the position of the aerials.

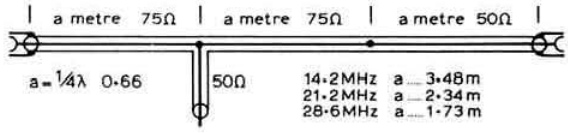


Fig 3.

There are also other ways to use phased verticals. Using three aerials it is possible to transmit in six directions simply by changing coaxial connections. It is possible, of course, to make it all much more elegant (and more expensive) by using coaxial switches. Two verticals may also be fed simultaneously or 180° out of phase. In this way "broadside" or "end fire", respectively, can be obtained.

A cap-it-al(l) job

by W. E. CAUGHEY, GI2DZG*

OLDER members may recall that early editions of the *ARRL Handbook* showed how a broken halyard on an aerial mast could be replaced without the need to lower the mast. The method, as shown at **a**, was to form a rope, with replacement pulley and halyard attached, into a loop. The looped rope was then draped around the guy wires and by pulling on the free end of the rope, raised into position.

Some time ago the author was faced with a similar situation, except that there were no guy wires. The mast, fortunately, remained in its vertical axis, but was, nonetheless, hazardous. Something had to be done? But what?

Four possible solutions to the problem were:

(a) lash an extending ladder to the mast, which, by the way, consists of two 21ft lengths of 2½in o/d galvanized water-pipe screwed together and sunk in a 3ft "sleeve" imbedded in concrete.
(b) hire builders' platforms of the type that fit on top of each other.
(c) hire from the local authority the hydraulic platform vehicle used for street lighting repairs and
(d) take down the mast.

These, in turn, were rejected for the following reasons:

(a) risk, because one was not certain as to what weight could be applied against the mast by someone mounting the ladder.
(b) cost; besides the fact that such platforms are difficult to manoeuvre above, say, 20ft.
(c) cost; also not sure whether the local authority would grant permission.
(d) task not relished as it took, because of its weight, quite a few persons to erect the mast some years ago.

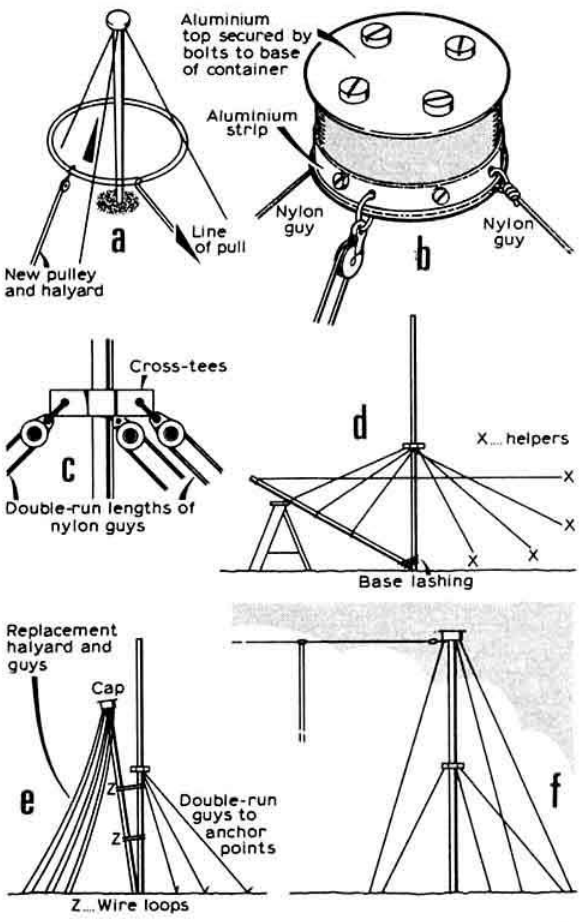
* 35 Gilnahirk Park, Belfast BT5 7DX

When it seemed that solution (d) was the inevitable outcome, this was discarded as a result of a chance visit to a local hardware shop. There, a large deep and round plastic food container was purchased. Next a call was made at a store specializing in yachting equipment where the following items were obtained: four ¼in cheese-head bolts and nuts (brass); four 1in diameter lightweight, but strong, pulleys (annealed, preferably); quantity of nylon rope (cordage) suitable for the pulleys and sufficient to provide replacement guys from top of mast and double lengths for guys from mid-mast as well as replacement halyard; four hooks, spring opening type. The remaining items needed, being small sheet of 16-gauge aluminium and four 2BA nuts and bolts, were found in the junk box.

Making the cap

The lid of the plastic container was discarded and a strip of aluminium 1in wide and the length of the outside circumference of the container was cut. This strip was secured by means of the 2BA nuts and bolts to the outside of the container and next to the rim which had secured the lid. Four holes similar in diameter to the hooks were drilled through both the aluminium strip and the container, at equidistant points from each other. Following this, a piece of aluminium 1in greater in diameter than the container was cut and secured to the base of it by the four ¼in brass bolts and nuts. After this the hooks were passed through the holes already provided in the aluminium strip, and suitable lengths of nylon rope to form guys running from three of them were affixed. The replacement pulley and halyard were attached to the fourth hook. The finished product is shown at **b**.

The remaining three pulleys were attached to the existing cross-tees fitted midway up the mast and which were easily accessible by ladder. Each of the pulleys had a double-run length of nylon guy rope affixed, as shown at **c**, and these were tied temporarily to adjacent anchor points in the ground.



Hoisting the cap

This was accomplished with the aid of four other persons as follows:

(a) The second mast of the QTH, which is 32ft in length and of dural construction, was taken down, all guys on it being removed. It was then laid on the ground and its base temporarily lashed to the base of the vertical mast.

(b) One of the guys of the second mast was re-affixed to it at a point 2ft from the top of the mast and the mast then raised on to a pair of household steps.

(c) The double-run length of nylon guys situated midway up the main mast were detached from their temporary anchorage points, one end of each guy being affixed to the second mast as shown at **d**, the other end of each being held by one of the helpers.

(d) The fourth helper held the end of the guy secured 2ft distant from the top of the second mast.

(e) The cap, complete with fittings, was placed over the top of the second mast.

(f) The author, mounting the household steps, raised the second mast some distance, the four helpers assisting by pulling on the guys they held. By taking this operation slowly and carefully, the second mast was raised to the vertical position as shown at **e**.

(g) With the second mast in the vertical position, loops of galvanized wire were wound tightly round the main mast and loosely round its neighbour. At this point the midway guys were firmly anchored and the lashing to the bases of both masts detached.

(h) As will be seen, **e** indicates that the cap was not yet in its final position, the mast supporting it being somewhat shorter than the main mast. To achieve the end result, three persons each took one of the guys of the secondary mast and stood some distance away from the main mast. The replacement halyard was loosely anchored, due allowance being made for final position of cap, and the fourth person held the guy attached to the second mast.

(i) The final result was quickly achieved by raising the second mast to a sufficient height and inserting a length of bamboo rod into the base. The cap was then gently lowered on to the top of the main mast. All guys were then firmly secured and the aerial raised into position on its new halyard, the second mast first being lowered. Diagram **f** shows the completed job.

Members similarly placed but having no lightweight second mast to hand could, it is considered, achieve the same result by borrowing a suitable mast. Alternatively, a set of chimney sweep's rods might do the job.

The "peg antennameter"

by M. R. IRVING, G3ZHY*

A PROBLEM the author is sure every amateur will have had at some time or another while making aerial measurements is the need to make a physical or electrical connection to the aerial at a given point along its length in order to examine the conditions at that point. Clearly it is not desirable to break the aerial and it is, therefore, usual to insert a meter at a pre-determined point, eg the feed point. This will tell you about conditions at that point but it will not tell you about conditions elsewhere along the aerial or, for instance, where the current antinode lies. This latter point is of paramount importance when experimenting with vertical aerial systems. There have been numerous articles published on aerials and aerial measurements, and there is also a welter of mathematical equations for those academically endowed. Nevertheless there remains one infuriating fact about aerials, and that is that despite all this information they seldom seem to behave exactly as the text book suggests: possibly due to geographical or topographical considerations which prevail at a specific QTH.

The search

Therefore, the search began to find a device which would enable relative current measurements to be made at any point along an aerial system, eg on the feeder, or on the aerial itself, whether the line used was coaxial, single wire, or open wire. Furthermore, this must be achieved without breaking into the line at any point to insert the measuring device. Scores of magazines were scanned, and the nearest thing that satisfied most of these requirements was an rf meter which was driven by current from a ferrite ring toroidal transformer. The circuit of this meter is shown in Fig 1.

However, there still remained one major problem unsolved; to use the meter it was necessary to thread the aerial or feeder wire through the ferrite ring in order to induce rf current into the transformer winding, and this would not be very practicable with porcelain insulators at the ends of the aerial, and possibly spreaders every few feet along open wire transmission lines. And so it was back to the drawing board to start all over again!

The solution

Inspiration came with the sight of washing on a line—split the ferrite ring into halves, mount each half in the finger of

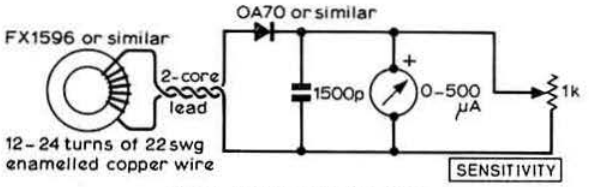


Fig 1. Ferrite ring rf meter

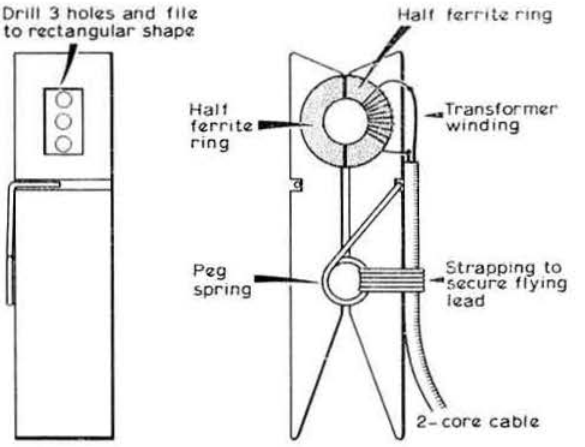


Fig 2. Basic constructional details of the peg sensor

a household peg, and then simply clip the peg to any point on the aerial system at will. No fuss, no trouble; in fact as simple as abc.

Within a couple of hours the peg antennameter had been born, tested, and given its certificate of worthiness. Fig 2 shows the basic construction of the sensor, and very brief constructional details are also given. The author has no doubt that an amateur with access to wood-working and/or metal-working machines could elaborate on the basic device and produce a more professional item, but on the grounds of cost and simplicity the common or garden household peg suffices handsomely.

Constructional considerations

The only items needed are those components shown in Fig 1, some fixing cement such as Plastic Padding, together with a hand-drill, hacksaw and a small file. A little patience is required when cutting the ferrite ring, and two attempts were necessary by the author before obtaining a satisfactory clean break. Those seeking perfection should try to obtain the use of a jeweller's diamond saw.

With the peg in one piece it should be drilled through both fingers as shown in Fig 2. The peg should then be dismantled and filed to receive the two halves of the ferrite ring. One finger of the peg will require a little additional filing to accommodate the transformer winding, the ends of which should be brought out of the opening for connection to a flying lead. Once the ferrite ring halves have been cemented into position the peg should be re-assembled as normal to allow the cement to set with the two halves of the ring making as perfect contact as possible under the pressure of the peg spring. All that then remains is to wire up and solder the meter assembly, and to join it to the sensor unit using a convenient length of twin-core cable. To prevent the finer wires on the transformer winding from fracturing with movement, the flying lead should be strapped to the side of the peg using the hole through the centre of the peg spring as a convenient anchorage point.

(Continued on page 301)

* 22 Wheatley Way, Chalfont St Peter, Gerrards Cross, Bucks.

EQUIPMENT REVIEW

by P. SIMPSON, G3GGK
and
B. ARMSTRONG, G3EDD

The Heathkit solid-state receiver Model SB303

ANY all-transistor communications receiver has been treated with some suspicion by amateur radio enthusiasts, and quite rightly so. Over the past four or five years several examples from well-known manufacturers have been examined by the reviewers, and the results have been abysmal in terms of unwanted signal handling. Since these examples were not formally submitted for review no mention of them has been made in *Radio Communication*; if a report had been written it is probable that no reader would have bought them.

To design a receiver with first-class linearity over the very wide dyamic range necessary on the hf bands has been a serious problem to the professional designer. A major step forward was made with the introduction of the field effect transistor, but even now great care is necessary to achieve results with the choice of optimum gain distribution and selectivity.

When Heath (Gloucester) Ltd submitted the SB303 receiver for review, it was of great interest to test this fully-transistorized receiver on the bench and on an aerial. The price is £175, plus 90p post and packing, for the kit; or £225, plus 90p post and packing, fully assembled and tested. The optional crystal filters SBA301-1 and SBA301-2 are £12 and £11 respectively, plus 30p post and packing each. The sample submitted was fully assembled and, being a demonstration model, had already been subjected to quite a lot of use and test.

General description

The presentation of the SB303 is the same as the rest of the Heathkit family in two-tone green crackle paint, but the inside is entirely different. All the circuit is on printed circuit board modules which plug into sockets mounted on the chassis. It is thus quite easy to remove modules for servicing, although with those containing the switched rf circuits the switch shaft has to be withdrawn before the relevant modules can be withdrawn.

One of the useful controls on the front panel is an rf attenuator. Most professional receivers are fitted with rf attenuators whether the circuits are valve or transistor and are all the better because of it. The fact that the SB303 has one is certainly not an admission of failure on the part of Heathkit designers, as the tests show; the receiver is that much more professional. Another useful function is the ability to switch in two external vhf/uhf converters. The rear panel carries a number of inputs and outputs on 14 phono sockets, one octal socket, and a tip and sleeve socket for phones. Of the 14 phone sockets, which provide all functions anyone is likely to want, four are spare. An interesting feature is that an overload cut-out is used on the mains output in place of the conventional fuse.

Circuit description

The single rf amplifier is a fet with built-in protection diodes. Similar FETs are used for the first and second mixers and first i.f. amplifier. The first i.f. is 8·395 to 8·895MHz and contains an RC band-pass filter. The lmo tunes over the range 5 to 5·5MHz to produce an i.f. of 3·395MHz. A choice of crystal filters is available with switch selection. A 2·1kHz bandwidth ssb filter is supplied as standard. The 400Hz cw and 3·75kHz a.m. filters are available as optional extras. No details of the lmo are given, but the comment "Since internal circuitry may vary between units due to temperature compensation, a schematic of this circuit is not included" is given. However, a varicap diode is used to "side swipe" the lmo frequency when switching from usb to lsb in order to keep the calibration correct. Varicap controlled fsk is also used when on rtty.

A bridge diode product detector is used for ssb; a conventional diode detector is switched in on a.m. The audio output stage is a complementary pair and is transformerless. The connection to the loudspeaker can be broken by a pull switch on the rf gain control.

A plastic dual in-line integrated circuit (the only ic in the SB303) is used for the 100kHz calibrator oscillator and its division by four to give 25kHz calibration is selectable by a front panel switch.

Bridge rectification is used in the power supply which has outputs of −10V zener controlled, 115V with transistor regulation for the majority of the circuits, and +35V unregulated for the audio output pair.

Manufacturers' specification

Frequency range	3·5 to 4, 7 to 7·3, 14 to 14·5, 15 to 15·3, 21 to 21·5, 28 to 30.
Intermediate frequency	3·395MHz.
Frequency stability	Less than 100Hz drift per hour after 10min warm-up under normal ambient conditions. Less than 100Hz drift for ± 10 per cent line voltage variation.
Frequency selection	Built-in Imo (Linear master oscillator).

Modes of operation

SSB	Single sideband (Suppressed carrier, with selectable upper or lower sideband).
CW	Keyed continuous wave.
AM	Amplitude modulated continuous wave.
RTTY	Radio teletype (frequency-shift keyed continuous wave). Wide shift, narrow shift, and narrow cw shift identification.
Sensitivity	Less than 0·25μV for 10dB signal-plus-noise to noise ratio for ssb operation.
Overall gain	Less than 1·5μV input for 0·5W audio output (single tone ssb).

AGC characteristics

Blocking	Greater than 3V cw/ssb/rtty.
Dynamic range	Greater than 150dB cw/ssb.
RF attenuator range	0–40dB nominal.
SSB	2·1kHz 6dB down, 5kHz maximum at 60dB down (crystal filter supplied).
CW	400Hz at 6dB down, 2kHz maximum at 60dB down (crystal filter available as an accessory).
AM	3·75kHz at 6dB down, 10kHz maximum at 60dB down (crystal filter available as an accessory).
RTTY	2·1kHz at 6dB down, 5kHz maximum at 60dB down (uses ssb crystal filter).
Image rejection	60dB or better.
IF rejection	
3·395	Greater than 55dB.
8·595	Greater than 50dB.
Spurious response	All below 1μV equivalent signal input.
Temperature range	10°C to 50°C ambient.

Dial accuracy

Electrical	Within 400Hz after calibration at nearest 100kHz or 25kHz point.
Visual	Within 200Hz.

Variation in rrty shift as Imo frequency is changed (shift can be adjusted to nominal value at any point within the band)

CW shift (50Hz nominal)	Less than 10Hz/100Hz.
Narrow shift (170Hz nominal)	Less than 20Hz/100Hz.
Wide shift (850Hz nominal)	Less than 100Hz/100kHz.
Calibration	Every 100kHz or 25kHz.
Dial backlash	Not more than 50Hz.
Aerial input impedance	50Ω nominal unbalanced.

Audio response

SSB	350 to 2,450Hz nominal at 6dB.
CW (with accessory filter)	800 to 1,200Hz nominal at 6dB.
AM (with accessory filter)	200 to 3,500Hz nominal at 6dB.
RTTY	1,840 to 3,940Hz nominal at 6dB.
Audio output impedance:	Matching speaker—8Ω; Matching headphones—low impedance.
Audio output power	4W at less than 10 per cent distortion.
Muting	Open external ground at mute socket.
Power requirements	105 to 130 or 210 to 260V ac, 40W maximum.

NOTE: Specifications measured with 120V ac line voltage at 25°C.

Front panel controls
Main tuning dial, function switch, mode switch, band switch, AGC switch, converter switch, AF gain control/power on-off, RF gain/speaker disable, preselector, RF attenuator.

Circuit boards

IF/audio	Bias adjustment; Meter zero, meter full scale.
PS/BFO	+15V adjust, 100kHz adjust.
RTTY	Wide shift, narrow shift, CW shift.

Rear panel connections: Phones, HF aerial, VHF aerial # 1, VHF aerial # 2, mute, anti-vox, speaker, HFO out, LMO out, BFO out, CW shift, 4 spare sockets, 3-wire line cord socket, accessory socket (rtty and vhf converter connections).

Cabinet dimensions	12¼in wide by 6¾in high by 13in deep.
Overall dimensions (With knobs and feet installed)	12¼in wide by 7⅛in high by 14in deep.
Net weight	15¾lb.

Tests

Sensitivity and signal to noise ratio

For this test a Marconi Instruments TF2002 was used as the signal source. Since the Heathkit sensitivity figure of less than 1·5μV input for ½W output was exceeded by a considerable margin, no figures are reported. The following are the ssb figures, ie no amplitude modulation

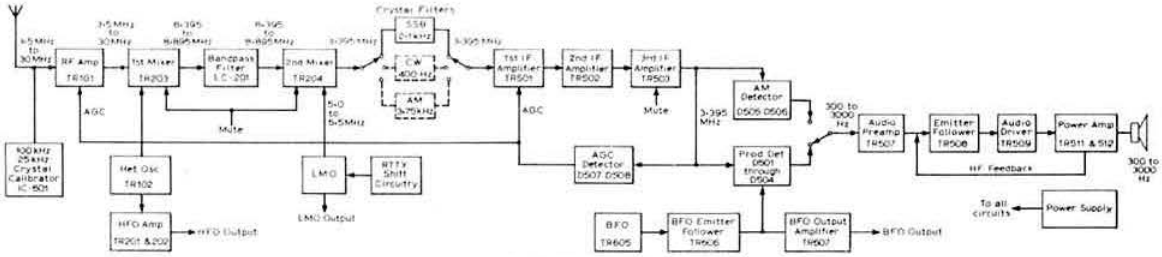
Band	Signal plus noise to noise ratio at 0·25μV pd
3·5	16dB
7·0	17dB
14·0	11·5dB
21·0	17dB
28·0	17dB

For this test, the agc was switched off. The figures recorded showed good consistency apart from on 14MHz. A cross-check on the 15MHz band (for WWV) returned a figure of 12dB. In comparing these figures with previous reports it has to be remembered that in most reports the signal level is 1μV pd and not the 0·25μV pd used in this test. Theoretically one should add 12dB to the above figures to obtain the 1μV figure. By any standards the performance of this test was very good.

AGC characteristics

Heathkit do not quote the agc characteristics as such, which seems odd. They certainly have nothing to hide, as the following results show—measured at 14MHz.

Signal input relative to 1μV pd	Audio output relative to that at 1μV pd
+20dB	+3½dB
+40dB	+4½dB
+60dB	+5dB
+80dB	+5½dB
+100dB	+5⅝dB
+120dB	+6¼dB



Block diagram

RF attenuator

Heathkit do say 40dB nominal, so the 44dB at 14MHz figure measured shows that they are in the right court. The only criticism of this otherwise excellent feature was that the law of the potentiometer could have been better—the attenuation was rather cramped to the high attenuation end of the travel.

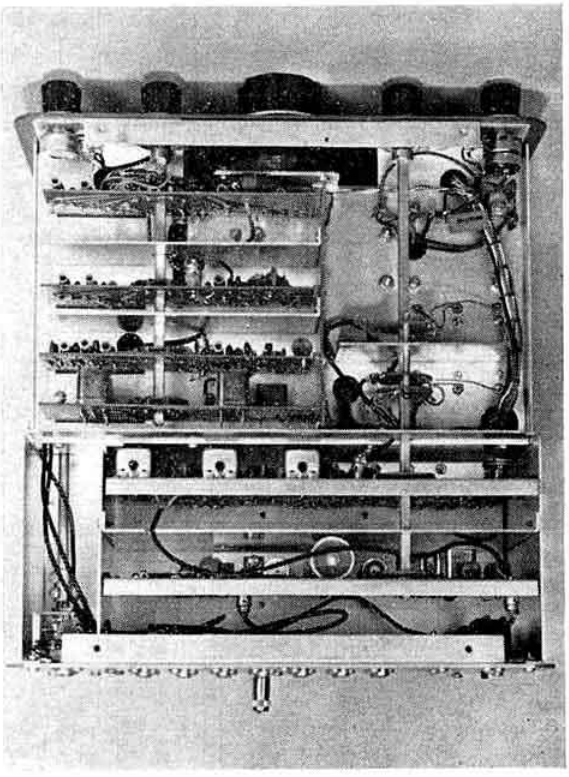
Selectivity

The Heathkit claims were met with margin, the measured figures showing very good correlation with the claims.

Image rejection

Heathkit seem to be rather modest with claims of greater than 55dB for 3·395MHz and 8·595MHz respectively. The measurements showed so much better than these figures that they were repeated to make sure.

Band	3·395MHz rejection	3·595MHz rejection
3·5MHz	89dB	91dB
7MHz	120+dB	87dB
14MHz	120+dB	90dB
15MHz	120+dB	91dB
21MHz	120+dB	88dB
28MHz	120+dB	95dB



Underside view

The LMO

The particular model of the SB303 reviewed has been used as a demonstration model, and somewhere during its travels the drive assembly had been damaged. In consequence the drive was rough and did not have the feel normally associated with a good product. The reviewers decided to have a go and, much to the benefit of their egos, achieved success. In the *QST* review a problem in this area was reported. However, since the dial was removed from the capacitor drive shaft and in fact the whole lot was stripped, the following results should be read with these facts in mind.

Linearity

Dial reading (kHz)	LMO frequency (kHz)	Error (Hz)
0	5,489·238	1,762
50	5,448·173	1,827
100	5,398·385	1,615
150	5,348·540	1,460
200	5,298·346	1,654
250	5,248·548	1,452
300	5,198·749	1,251
350	5,148·755	1,245
400	5,098·488	1,512
450	5,048·646	1,354
500	4,998·865	1,135

These figures indicate that the dial needed to be rotated on the shaft by the equivalent of 1·5kHz. If this were done, calibration would have been within 400Hz, without reference to the internal calibrator, which is a first-class performance. Calibration is achieved by shifting the dial cursor, and although 1·5kHz error is well within the range of adjustment, the suggestion of dial rotation was made to avoid having the cursor permanently off centre.

Backlash and resetability

Backlash was measured by approaching a particular point on the dial several times from each direction and recording the difference in lmo frequency. The Heathkit figure of no

more than 50Hz was found to be pessimistic since less than 10Hz was achieved. By comparing the figures from one direction of approach, the resetability was found to be within 10Hz also.

Frequency stability

It may be remembered that the review of the SB101 showed an excellent frequency error of only 85Hz for an hour after switch on, and it says something for the reputation of Heathkit lmo stability that when 338Hz was recorded on the SB303 something was definitely wrong. Investigation indicated that the temperature compensation had been upset since manufacture. However, all was not lost since the results recorded by an independent authority were made available to the reviewers as follows:

Time from switch-on (min)	Frequency (Hz)
5	+54
10	+60
15	+65
20	+73
25	+78
30	+82
40	+87
50	+85
60	+84

One point that should be mentioned. The rear panel lmo socket is normally terminated in 47Ω. If this termination is removed, there is a tendency to instability.

When the equipment was returned to them, Heath (Gloucester) Ltd confirmed that the lmo was at fault and required replacement.

S-meter

The generally accepted figure for the signal level corresponding to S9 is +34dB relative to 1μV pd. The SB303 S-meter is somewhat optimistic by these standards at 14MHz.

S-meter	dB relative to 1μV pd
1	−10
2	−2
3	+2
4	+5
5	+9
6	+13
7	+17
8	+21
9	+25
9 + 20	+35
9 + 40	+44

Unwanted signal handling

Heathkit claim a blocking level of 3V on ssb/rtty/cw, but do not give any indication on the method of measurement or what in fact happens at 3V. The reviewers carried out the normal review tests of feeding the receiver with two signal generators in parallel through a matching network. The first has an output such as to produce 14dB signal to noise ratio, the second has its frequency adjusted to plus or minus 25kHz and its level increased to the point at which the 14dB ratio is degraded to 10dB. The relative level of the unwanted signal at 14MHz was +76dB which compares very favourably with the best of the valve receivers previously reviewed.

Intermodulation performance was measured by feeding in two signal generators at such a level as to produce the equivalent of 1μV pd at the intermodulation frequency. The level measured on 14MHz was +68dB—again comparable with good valve receivers.

In use

Measurements were carried out before the receiver was connected to an aerial, consequently when listening tests were carried out very good performance was expected. The reviewers were not disappointed. The 7MHz band demands a good receiver to sort out amateur signals among the broadcast stations; one transistor receiver tried, but not reviewed, produced an unintelligible roar. The SB303 performed very well on this band particularly with the aerial attentuator in use.

In spite of the measured out-of-spec lmo drift, the stability in practical terms enabled the receiver, when used as a tunable i.f. on the vhf band, to monitor GB3DM for several days without touching the tuning. This in spite of an outside shack and switching the receiver off when not actually monitoring.

Assembly manual

This is 182 pages of information plus a separate circuit. Of this, 110 pages are devoted to assembly, the remainder dealing with alignment and trouble-shooting. Excellent, with one exception—no lmo circuit.

Guarantee

See *Radio Communication* October 1970.

Conclusions

By any standards a very fine receiver, not the lowest cost maybe, but a standard by which other amateur bands receivers can be judged. Few will equal it.

The "peg antennameter"

(*Continued from page 297*)

Conclusion

The author has found the peg antennameter a most invaluable device while performing tests on 160/80m, and its very modest cost has already been repaid many times over. None of the components seem particularly critical either in value or type, and almost any parts from the junk box will probably perform satisfactorily. The shunt potentiometer across the meter was found to be necessary with the meter that was to hand (an old radio altimeter) because greater than fsd occurred with 10W input.

With the ferrite ring specified, only the thinner type of coaxial cable will permit the sensor to close completely around the cable, and if it is desired to make measurements on larger diameter coaxial cables it will be necessary to substitute a ferrite ring with a larger internal diameter.

No experiments have been carried out above 80m or with high power although there seems no reason why the basic principles adopted should not apply. It may be necessary, however, to change component values on the higher frequencies.

MICROWAVES—1,000MHz and up

by DAIN EVANS, G3RPE*

Microwave activity periods

At the time of writing, I have little information on the level of activity over the weekend of 25-26 March. Not much was really expected judging from the effectively zero response to requests for advanced notice of intended operation. The writer went out to Brill and got more experience of operating /P in high winds, which will no doubt give him an advantage in the coming microwave contests. He was also strongly reminded of all the things he had *sworn* to do after the last contest but had not actually got round to doing. One interesting contact on 13cm was with G5FK, 40 miles away in Wembley. Signal strengths this time were two S-points higher than on any previous contact, even when conditions had been apparently good, and phone signals were exchanged for the first time. G8APP and G3THQ went out to Woodcote near Reading only to find that someone had borrowed their aerial mounting clamps to mount a commercial aerial!

The next activity period is on 27-28 May. As this is the last one before the June contest it will cover all bands between 13cm and 15mm inclusive. Details of sites, including NGR, and the bands to be operated, should reach the writer before mid-May to be broadcast by GB2RS on 21 May.

Gunn diode psu

An error crept into the circuit of the Gunn diode psu given in the March column: the 50μF electrolytic capacitor decoupling the microphone preamplifier is shown with its polarity reversed.

A worthwhile addition to the circuit may be a zener diode across the output to protect the Gunn diode from voltage spikes. The zener should have a breakdown voltage about 0·5V greater than the working voltage of the particular Gunn diode in use.

Crystal control on 3cm

A problem with the 3cm band is that the internationally adopted sub-band for crystal-controlled equipment at 10,368MHz (derived from 9 × 1,152 or 8 × 1,296MHz) is beyond the tuning range of many currently available klystrons. Most activity using the latter devices is concentrated in the bottom 100MHz of the band. The question arises whether there should be a second crystal-controlled sub-band in this region. The main disadvantage would be the tendency for narrow-band operation to discourage the use of simple wide-band equipment in the same way as has already occurred to a certain extent on 13cm. However, it would seem that the big advantage of having a number of stations of precisely known frequency which would provide accurate frequency calibrations is worth the risk, especially if people can be encouraged to produce equipment which is compatible with wide-band seo gear.

One suggestion for the sub-band is from 10,030 to 10,040MHz, which is just wide enough to operate seo equipment in, yet narrow enough not to raise problems either in the design or tuning of narrow-band receivers. This band also straddles one of the two preferred operating frequencies on 3cm.

As mentioned above, it is most desirable that crystal-controlled equipment should be designed so that its frequency can be changed quickly from the region of 10,035MHz to 10,368MHz, and the bandwidth altered as appropriate. As regards the transmitter, probably only a few critical stages will have to be retuned as the shift in frequency is only about three per cent. For narrow-band receivers using a low i.f., perhaps in the region of 30MHz, the local oscillator will have to be retuned in the same way. If such a receiver is also fitted with a wide-band i.f. and fm detector, then it would be compatible with all equipment operating within a 10MHz band, which is a step in the right direction.

To be of greater value the receiver should tune over a wider range so that the receiver is tuned to the transmitter rather than vice versa. Its tuning range should be at least 10,020 to 10,080MHz so that the spot frequencies for common-i.f. working, 10,035 and 10,065MHz, are covered with something to spare, and preferably 10,000 to 10,100 MHz. This range is difficult to cover with a low i.f., but is quite practical with one in the region of 100 to 200MHz. Such an i.f. in conjunction with a local oscillator on 10,200MHz would enable the receiver to tune both 10,000 to 10,100MHz and 10,300 to 10,400MHz without any tuning of the first local oscillator. Again, if the tunable i.f. is fitted with both narrow-band i.f. amplifiers and detectors, then such a receiver system would be compatible with all equipment likely to be found on the band.

An elegant alternative, perhaps just of academic interest to those of us with limited facilities, is to build two similar 10GHz chains, one in the region of 10,035 and the second at 10,368MHz, either of which can be used as the transmitter while the second is used as the local oscillator of the receiver. In conjunction with a tunable i.f. covering 250 to 350MHz, such a system would also provide coverage of both parts of the band.

Band planning on 15mm

A number of people have already started building equipment for this, our "top" band. As the band at present allocated is the 1,000MHz from 21GHz to 22GHz, there is the risk that incompatible equipment will be built unless some sort of band plan is organized. One suggestion is to follow the 3cm practice in the following way:

(a) Restrict activity to the bottom 100MHz, that is from 21,000 to 21,100MHz.

(b) Concentrate activity on the spot frequencies 21,035 and 21,065MHz

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

(c) Use the sub-band 21,030 to 21,040MHz for narrow-band transmissions in the same way as proposed above for the 3cm band.

Unfortunately the 15mm band is not related harmonically in a simple way to the bands in use at lower frequencies, although the choice of the lower end of the allocation would reduce the range over which existing driver equipment would have to be retuned. On the other hand this also means that we do not have the conflict between wide-band and crystal-controlled equipment which is a nuisance on 3cm.

Those known to be building for the 15mm band are G3WDG, G8DEK, G3OAD, G3ZGO and G3RPE. Are there any others interested?

Errata

In the April issue printers' errors occurred twice in the formulae on p227. The expression $\geqslant \frac{a^2}{3\lambda}$ under (8) in both columns should have been preceded by the letter l.

AMSAT-OSCAR-C

by PERRY KLEIN, K3JTE, President of AMSAT

ON 6 January the AMSAT board of directors made an important decision affecting plans for the next OSCAR satellite. In view of the fact that several of the systems under development for AMSAT-OSCAR-B (A-O-B) have fallen far behind schedule and are not likely to be ready in time for the approved launch now scheduled for July, it was decided to prepare a second, more simplified spacecraft to meet the launch date. This simplified spacecraft, AMSAT-OSCAR-C (A-O-C), uses hardware already available or readily obtainable in the limited time left.

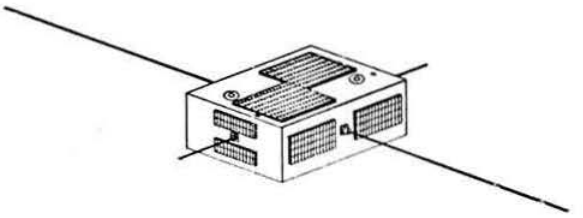
The 2 to 10m linear translator and 24-channel morse code telemetry encoders are planned for A-O-C, along with the WIA-Project Australis 35-function command decoder. The satellite structure, which is similar to OSCARs 3 and 5, is already available, and solar cell panels left over from A-O-B are being configured for A-O-C's 24V nickel-cadmium rechargeable battery system.

Also being readied for A-O-C is "Codestore", a shift-register memory device capable of storing messages in morse code for repeated retransmission on the 29·450MHz cw beacon. The memory length of A-O-C's Codestore unit is 768 bits, which is sufficient to permit storage of approximately 15 words in morse code. The unit is set to retransmit messages at 13·2w/min, a speed that will permit experiments of interest to teletype enthusiasts. At this speed, teletype characters can be recorded in Codestore and retransmitted to the ground at one-quarter standard 60w/min teletype speed. To decode the teletype, one need only decode the keyed "ones" as mark pulses by tape recording the message at 1⅞in/s and playing it into a teletype system at 7½in/s. It should be possible to store teletype messages up to 96 characters long by this method.

A 435·10MHz beacon transmitter with a power output of around 350-450mW is also under construction for flight, if it is completed in time. This beacon will be keyed with morse code telemetry or Codestore, as selected by ground command.

A-O-C is planned to have a useful operating lifetime of around a year, so that if all goes well it will hopefully last until A-O-B is launched. Notification concerning A-O-C has now been filed with NASA, concerning the launch, and with FCC requesting waiver of certain amateur regulations for OSCAR 6.

Given below is a table comparing the capabilities and characteristics of A-O-C with A-O-B. Details on the 2 to



10m repeater were given in the March 1971 issue of the *AMSAT Newsletter*, and a description of the principle of operation of Codestore was in the June 1971 issue.

AMSAT is currently collecting ideas on the types of messages to be used with Codestore. For example, all of the following messages are possible within the 768 bit limit of the Codestore memory:

"ORBIT 2109 1101Z AT 101W ADD 115R111 MIN AND 27R781 DEG PER ORBIT"

"HURR DONNA EXPECTED AT PUERTO RICO 9 SEP 21Z MONITOR 29R455 FOR EMERGENCY TRAFFIC"

"SERUM G URGENTLY NEEDED FOR INFANT AT MADRAS UNIV HOSPITAL ACK AVAILABILITY VIA CODESTORE"

System-level comparison of A-O-B and A-O-C satellites

	A-O-B	A-O-C (OSCAR 6)
Weight	50lb	35lb
Dimensions	12 by 14 by 10in	17 by 12 by 6in
Structure	Modular	Non-modular
Power		
Solar panels	90 per cent of surface	50 per cent of surface
Voltage	14	24
Battery	12-cell 6Ah NICAD	18-cell 6Ah NICAD
Average power	7W	3·5W
Telemetry	60-channel, teletype format	
	24-channel, morse code format	24-channel, morse code format
Message storage	768 bit programmable	768 bit programmable
Experiment control	Under voltage sensing, 4 internally controlled modes	2 modes, ground controlled
Command	35 pulse commands	15 pulse commands
Transponders		
Euro-Oscar	432MHz up/144MHz down, linear, 10W pep	
Australian	144MHz up/432MHz down, fm 4-channel hand-limited 3·5W pep	
AMSAT	144MHz up/29 MHz down, linear, 1W pep	144MHz up/29MHz down, linear, 1W pep

TECHNICAL TOPICS

by PAT HAWKER, G3VA

A FAIR MIXTURE of topics for those who use cw, ssb, a.m. or fm this month—and that surely covers just about everyone except those hardy souls who use pulse techniques; and we also pay some attention to the important link between aerial and receiver in the form of items on whispering gallery propagation and on sites. Then there are overtone oscillators and crystal checkers and a follow-up on earlier comments on the attractive $1\frac{1}{2}\lambda$ aerial. So much for the outline—now down to detail.

ICs simplify receiver construction

A couple of months ago, a brief note was included pointing out that the new RCA integrated circuit CA3088E could be used to form the heart of an a.m. receiver—at a quite attractive price (USA price under $2). Since then, I have been reading a more detailed account of this device in an article in *IEEE Transactions on Broadcast Receivers*. This makes it clear that the CA3088E is intended for high-performance rather than minimal-performance receivers. It can also be used as a straight i.f. amplifier or as a sub-system in a double conversion receiver. The author, L. Baar, quite specifically states "amateur radio receivers are a natural for the circuit". The UK price is about £1·08.

Basically, the device provides the functions of signal conversion (self-oscillating mixer), i.f. amplification, a.m. detection, audio pre-amplification, supply-voltage regulator, internal agc for first i.f. amplifier, agc voltage for optional external rf stage, and an amplified signal to drive a tuning meter. It is suitable for signal and/or intermediate frequencies up to 30MHz. Fig 1 shows how the device can be used in a high-performance a.m. broadcast receiver, but the circuit arrangement can be readily adapted for hf receivers.

Crystal checking—and overtone modes

Back in February 1971, *TT* reproduced a simple but effective "go/no-go" crystal checker, stemming from a design by Mike Kaufman in *Electronics Design*, and about the same time Eric Dowdeswell, G4AR, described a rather different but comparable device in *Practical Wireless*. Since then, these two circuits have been turning up in many overseas journals. For example, the arrangement given in *TT* forms the basis of a unit described in detail in *CQ-DL* (February 1972) complete with printed circuit layout and a BF224 as oscillator and BC107 as the lamp driver. Clearly a number of people are finding these simple crystal checkers extremely useful for sorting through quantities of surplus crystals.

There is, however, one warning which should be given about the use of this type of checker; this has been pointed out by David Rankin, VK3QV. The original circuit was claimed to be suitable for checking crystals throughout the range 3·5 to 90MHz; VK3QV has very strong reservations about using such aperiodic circuits on crystals above 20 or

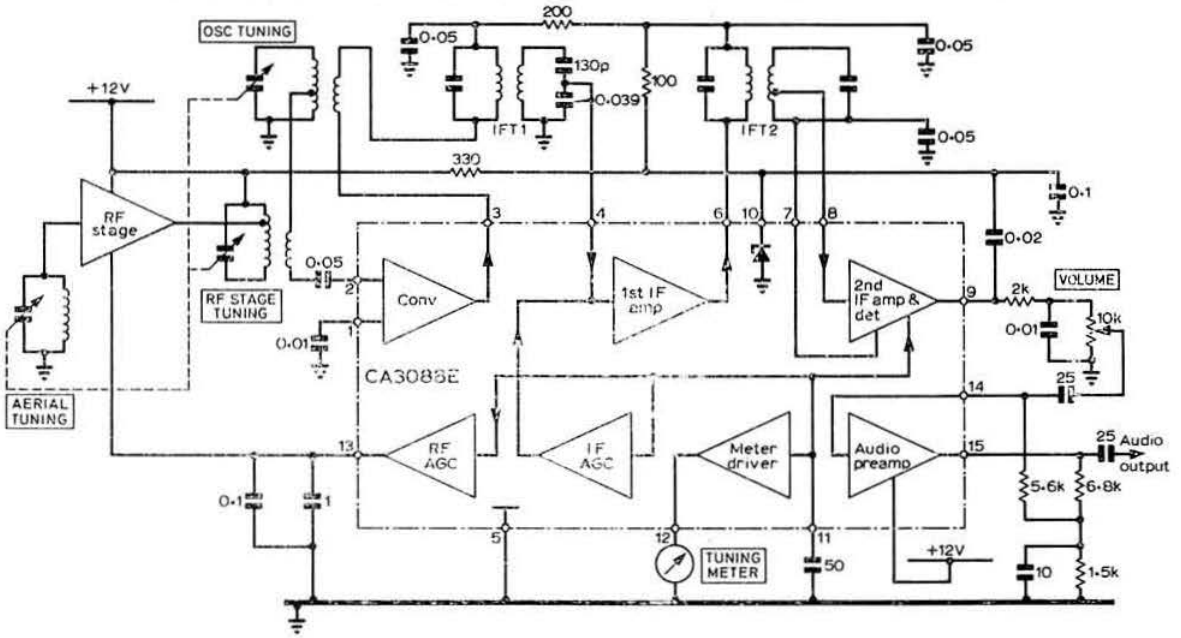


Fig 1. Typical cutline of high-performance a.m. broadcast receiver based on the CA3088E — only the rf amplifier and audio output functions are external to the ic

30MHz. The reason is that most crystals above 30MHz (and some in the range 20–30MHz) are intended for (and frequencies marked for) overtone operation. The basic untuned Colpitts oscillator, he points out, is really suitable only for testing crystals meant to operate in the fundamental mode. When an overtone crystal is plugged in, it will almost certainly tend to oscillate at the fundamental mode (for example a fifth overtone 90MHz crystal will oscillate at 18MHz). So what one is testing is whether or not the crystal will oscillate at this frequency. While this may be satisfactory as just a first-line check, VK3QV considers firmly that, in his experience as a crystal manufacturer, there is very little direct relationship between the ability of a crystal to oscillate on its fundamental and on its overtone frequency. While the higher the Q of the fundamental response, the more *likely* it is that the crystal will work on its overtone one cannot be certain. To check overtone operation, it would be essential to include a circuit tuned to the appropriate overtone frequency, preferably in one of the many overtone oscillator circuits.

VK3QV makes the point that most crystal checkers suffer from this failing. He believes that the only one that gives meaningful results is the technique involving a gdo—and only then when the crystal and appropriate coil can be used in the gdo circuit simultaneously.

In 1967 he wrote a two-part article in *Amateur Radio* on the overtone operation of quartz crystals, showing the differences between crystals intended for overtone work and those for fundamental. He recommended the use of third overtone crystals for frequencies between 20 and 60MHz; fifth overtone units for 60 to 100MHz. In such applications as vhf receiver oscillator chains, he considers that overtone operation is far less likely to result in birdies than with fundamental-mode/multiplier chains (though I do recall an article some years ago which showed that generally one achieved higher stabilities with fundamental mode arrangements). Among the various overtone circuits which he reviewed were the Butler, the grounded-grid oscillator, the Squier and "impedance inverting" oscillators of which valve and transistor versions are shown in Fig 2.

A considerable number of different overtone circuits have been described from time to time in *TT*, including two in August 1971 recommended by G3BY, and another stemming from the late Ernie Dedman, G2NH, in July 1970. A slightly different version of this arrangement turns up in *Wireless World* (May 1972) from L. V. Gibbs in New Zealand: Fig 3. He points out that the circuit works well with low activity crystals and can be used for fundamental as well as overtone operation. As in the G2NH circuit, the ratio of the series capacitors in the tank circuit controls the feedback; the tank circuit, of course, being tuned to the desired frequency of oscillation. Output can be taken by link coupling or from the emitter resistor.

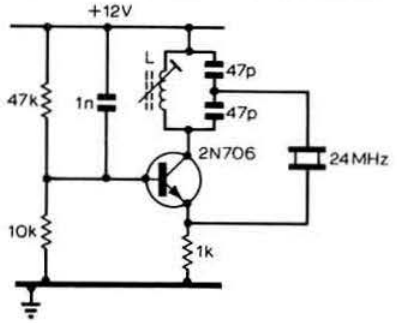


Fig 3. Overtone circuit suggested by L. V. Gibbs in *Wireless World*

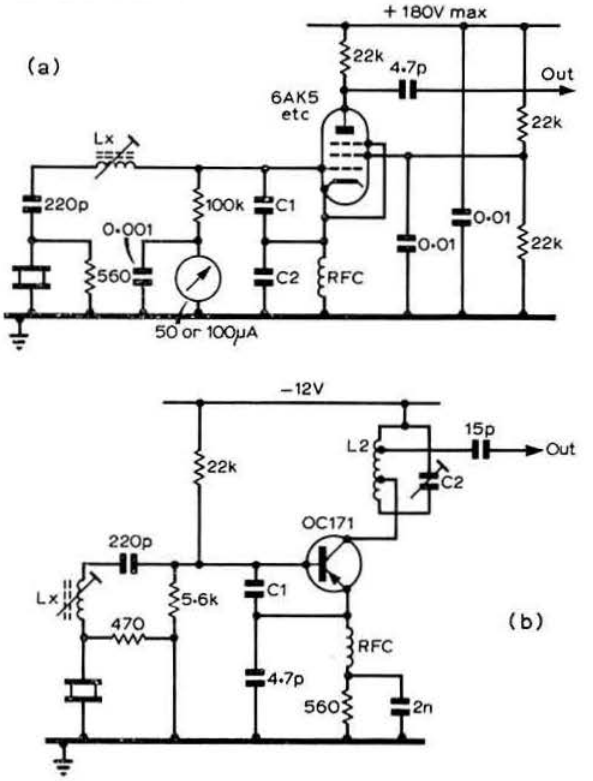


Fig 2. (a) Valve version of impedance-inverting overtone oscillator intended for operation between 25 and 70MHz. The anode load resistor may be replaced with tuned circuit at 2f or 3f (where f is overtone frequency) to obtain multiplied output. The meter and associated 0·001μF capacitor are needed only to check oscillator grid current, afterwards connect 100kΩ directly to earth. Note that without crystal, circuit oscillates at frequency determined by Lx, C1 and C2. Short-circuit crystal, adjust Lx until circuit oscillates at frequency near overtone frequency; remove short-circuit and tune Lx for minimum rf voltage across crystal. Values of Lx, C1, C2 shown in table. (b). Transistorized version. L2-C2 tuned to twice overtone frequency. If output required on overtone frequency replace L2-C2 with rfc or resistor: 25 — 35MHz C1 56pF; 35 — 45MHz C1 39pF; 45 — 55MHz C1 27pF. L2 taps adjusted experimentally. The circuits permit switching of crystal, but if this is done unused crystals should be short-circuited

f (MHz	Lx (μH)	C1 (pF)	C2 (pF)
25	6·7	10	22
30	4·7	10	22
35	3·5	10	22
35	3·5	4·7	10
40	2·6	4·7	10
45	2·1	4·7	10
50	1·7	4·7	10
50	1·7	3·3	6·8
55	1·4	3·3	6·8
60	1·2	3·3	6·8
65	1·0	3·3	6·8

Low-angle radiation and sloping-ground sites

In *TT* (May 1970) we drew attention to the work by Les Moxon, G6XN, on low-angle radiation (which appears to be one way of launching signals into some of the super-mode paths described above) as described in his *Wireless World* article of April 1970. G6XN later enjoyed an extended tour of VK and ZL and continued his experiments on low-angle radiation by taking along a little transistorized ssb rig putting out 1·5W pep (of course with rf speech clipping!). He reports finding no evidence indicating any practical requirement for radiation angles less than 5° (to achieve this low figure he makes use of ground sloping towards the target area). Among his contacts was one with G3DDN using a dipole supported by trailing it over a 10ft high bush, with ground sloping down to a lake but with a mountain which would have blocked off anything below 5°.

From other locations he was able to obtain up to eight contacts with Europe in a single session, and reports up to S8. Two sites were unaccountably dud, though three days' operation from one of them produced one G and one JA contact. Apart from this, the success ratio from sloping sites (12 days and 7 sites) was almost 100 per cent, with aerial heights 10ft to 24ft using thin-wire inverted-V dipoles.

G6XN considers that the really interesting and significant thing was the contrast between the results from these sloping sites and those from flat sites which produced almost nil results in dx; a couple of JAs, a dubious G contact and two marginal European contacts from one particularly good flat site with extra aerial height (30ft), though it was easy to work VK and ZL stations from these flat sites with aerials from 4ft upwards.

G6XN notes that some of the sloping sites from which good results were obtained were not very impressive, and as mentioned above, would not be expected to give radiation below 5°. The two best sites (Picton, VK2, and Stewart Island, ZL4) may have provided a site gain of some 12dB for angles between 6–10°—possibly even more at Picton. G6XN is hoping to continue this work using some really high sites. His findings so far—even if they refute some of my earlier suggestions that it would be useful to get down below 5°—go a long way to supporting the views on the variability of—and the enormous importance of—sites when it comes to dx operation.

Whispering galleries

The ability of the F-layer to trap signals and propagate them around the world with an incredibly small loss of only 10dB per circuit is today firmly established. The amateur can (and does) use this mode occasionally (probably much more frequently than he or anyone else believes) by means of ionospheric tilts and the disturbed conditions known as equatorial spread F. But—as implied by the low path losses—once the signal gets entrapped there is relatively little leakage back to earth except when the signal fortunately hits another suitable tilt.

Some of the implications of these super-mode, chordal hop or whispering gallery modes of propagation have been explored before in *TT* and appear in *Amateur Radio Techniques*. But this month we would draw attention to a series of theoretical papers by Hsi-Tien Chang, based on research carried out at the University of California. These are: (1) "The waveguide mode theory of whispering-gallery propagation in the F region of the ionosphere", *Radio Science* Vol 6, No 4, pp 475-482, April 1971; (2) "Whispering gallery propagation in the E region of the ionosphere at hf and vhf" (same as (1) but pp 465-473); and (3) "The effect of tropospheric layer structures on long-range vhf radio propagation", *IEEE Trans on Ant. & Prop.* Vol AP-19, No 6, November 1971, pp 751-756.

These papers all seek to show that whispering gallery propagation is better explained by waveguide mode theory rather than conventional ray-tracing theory—a fairly abstract and esoteric subject, but the papers do underline some practical implications. For example, it is noted that man-made ionization of the lower ionosphere is possible and ionized clouds of this type could be used to focus rays from a ground transmitter into the duct or to reflect energy out of the duct to a ground receiver. And the paper suggests (what many amateurs have found in practice) that the twilight girdle line is a preferred configuration for taking advantage of whispering-gallery propagation.

Hsi-Tien Chang also shows that the optimum frequency for this mode is about *six times* vertical penetration frequency of the F layer—in other words up to frequencies roughly 1·5 times conventional muf. This ties up with transequatorial propagation—but it also means that when the muf is, say, 21MHz, the 28MHz band is open for possible whispering gallery propagation. Indeed, times when 21 and 28MHz are written off as "dead" in fact offer some of the most interesting possibilities for exploring these super modes.

It sometimes seems to me that amateurs tend to place a little too much store on what is the state of the F layer. Admittedly, F layer governs the muf and those solid "openings" on 21 and 28MHz—but what the "dipole amateur" often wants to know is how much attenuation there will be on signals, the difference between poor, fair and good conditions, and that is largely a question of the state of the D layer. I believe that the Radio and Space Research Station has so far found no way of firmly cracking the tough problem of predicting in advance the D layer attenuation—but one wonders whether it would be possible to make some form of daily broadcast announcements on the current state of D layer attenuation? It would be nice to be alerted—though I suppose one can always listen on the bands and form one's own estimate!

The 1½λ dipole

When various radiation patterns by D. C. Cleckner were reproduced in *TT* (December 1971), we reported that John Brodzky, G3HQX, had drawn particular attention to the useful pattern provided by the 1½λ wire (ie about 102ft on 14MHz, 67ft on 21MHz).

This has prompted Alf Bruce, G5BB, to mutter hear-hear, and to relate his experiences with the version shown in Fig 4. For a number of years he had used a ½λ dipole on 14MHz, until Percy Heston, G5HS, recommended him to try a 1½λ—"I took his advice and have never looked back". Total length is 102ft of 16swg hdc fed at the first ¼λ current lobe (17ft from the house end) with 75Ω flat twin feeder. This has brought plenty of useful dx, with a radiation pattern that appears to be closely akin to that shown in the December diagram. G5BB is now firmly convinced that, at least for a UK station, this provides good all-round coverage of the main dx areas.

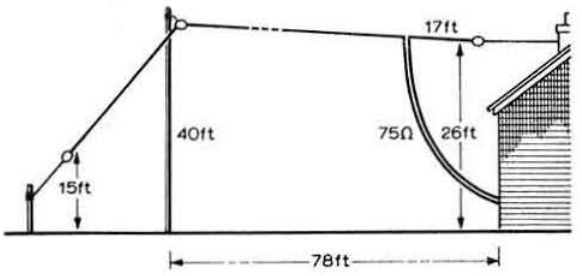


Fig 4. The 14MHz 1½λ aerial used at G5BB

Although essentially a single-band aerial, he has found it works quite well on 21MHz (though he has since put up a second 1½λ wire for this band) and by using one side of the feeder as a long wire also on 3·5MHz. Certainly the list of stations worked by G5BB on cw and ssb shows the day of simple wire aerials, even on highly competitive bands, is by no means over; particularly as they benefit from the beam receiving facilities so often used at the other end. Of course, one must always remember that almost any wire provided it is correctly matched to the transmitter can perform well on hf in good conditons. But there is no doubt that it is useful to have a radiation pattern that puts signals where they do the most good.

FM discriminator for low IFs

One mode that is certainly on the increase these days is fm. Dr S. C. Craddock, G8AGR, spotlights one remaining problem—and then promptly offers a solution. He points out that many vhf operators have receivers with a final intermediate frequency below 120kHz and are often deterred from building in fm discriminators by the problem of obtaining and possibly modifying inductors for these low frequencies. The conventional pulse-counting discriminator (eg *Radio Communication* September 1971, p 603 in a note by G3JGO) provides an inductorless approach, but G8AGR considers it suffers from two defects: (a) it is unbalanced and therefore throws away about 40dB of the a.m. rejection provided by the limiter; and (b) it generates high amplitude spikes which may appear elsewhere in the receiver.

G8AGR has developed an inductorless discriminator which is balanced and need not produce spikes. The basic circuit is shown in Fig 5 with a practical design in Fig 6. The discriminator uses a "pseudo bridge" circuit R2, C2, R1, C1, which is balanced with respect to amplitude only at the design centre frequency only, and becomes unbalanced as the frequency changes. The four diodes then generate the difference voltage, which in effect is the audio output. $R1 = 1/(\omega C1)$; $R2 = 1/(\omega C2)$.

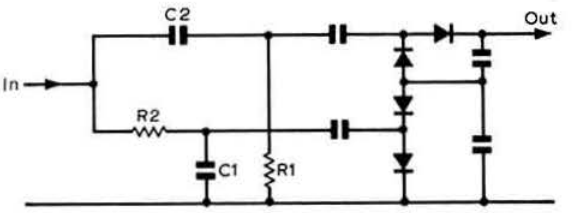


Fig 5. Basic circuit of G8AGR's balanced inductorless fm discriminator suitable for low intermediate frequencies

By using graphical methods G8AGR found that maximum output occurred when R2/R1 = C1/C2 = 1·4. He feels that the 1·4 found in this way should probably be $\sqrt{2}$ (1·414) and he would be interested to know if any reader can prove this mathematically. In practice, with reference to Fig 6, adjust R2 until test point (TP) has zero potential relative to earth; then $jX_{c1} = R1$; $jX_{c2} = R2\ C1/C2 = R2/R1 = 1{\cdot}4$ (but this is not critical); R3 ≺ R1, R2 ≺ R4.

Thoughts on cw

My recent remarks about cw types feeling a little neglected these days seemed to raise quite a few echoes—though it must be remembered that, certainly as far as *TT* is concerned, the vast majority of the information on basic circuits and aerials applies equally to all modes of operation. Personally, I would endorse some recent remarks by that highly-respected old-timer Tom Clarkson, ZL2AZ, who believes that "cw should be recognized as a worthy participant and all plans should provide for its welfare and growth. Established amateurs who concentrate on telephone and other modes should respect the claims for cw, and newcomers to our

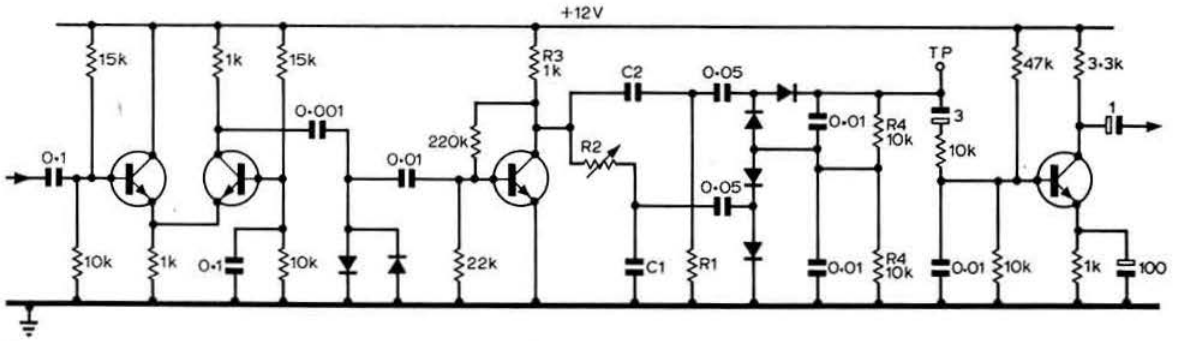


Fig 6. Practical arrangement of fm discriminator unit based on the basic circuit of Fig 5. All transistors BC108, diodes germanium point contact

ranks should be encouraged to become really skilled in it—to discover its special character—to find out why so many are drawn to work on the cw bands." He believes it is an error to try and evaluate cw in terms of telephony or vice versa and that unless this error is recognized and avoided, serious misunderstanding can result: ZL2AZ suggests there is something almost elemental in cw: "As a boy in Napier I was amused by seeing a notice on a signpainter's shop 'I made signs before I could talk'. Years later I came to recognize a powerful element in this simple observation . . . . the amateur using cw today is not so much a telegraphist as an exchanger of thoughts by means of signals . . . we are dealing with a system very closely knit with mental processes—the 'personal interest' aspect of the defined amateur service seems to apply to it in a very direct manner . . . . amateur cw has a secret weapon that will ensure its survival and prosperity."

On a rather different aspect, Ron Parrott, G3HAL, referring to the item on listening to A2 type cw (*TT* March), was reminded that when the RAF used Marconi SWB8 hf transmitters, these ran about 2½kW on cw and were equipped to use fm (about 400Hz with 1kHz deviation) applied to a diode coupled through a very small capacitance to the tuned circuit of the Franklin vfo, if G3HAL's memory serves him well.

The important point was that results at the receiving end were always much better with this form of F2 fm than with pure cw. On handspeed channels the receiving operator would soon complain if the fm was switched off, and on the automatics (120w/min from Creed, Wheatstone or GNT equipment), copy was always more solid with fm.

G3HAL wonders if the theory of selective fading might account for part of these results, with presumably filling the receiver passband also improving s/n ratio—though it would need an Information Theory type approach to really evaluate these reasons. G3HAL admits to being tempted to give the idea a try on 14MHz and ignore the T2 reports! Though he is not too certain about some of the claims made for the cw signal processor described in *Ham Radio:* does it really work three layers down? he asks.

Certainly the British amateur licence permits A2 and F2 on all bands, and some amateurs in the past have used it, even at the risk of making themselves unpopular. But it is a curious logic that says that it is OK to use 3 or even 6kHz for speech but only a few hertz bandwidth for cw!

Switching ic dividers

The next item, from Martin Farrell, G8ASG, is a follow-up to the G8BUQ programmable divider outlined in *TT* (February). G8ASG describes an alternative method of keeping rf away from the switches with a technique that has been used successfully in a club project of the Stoke Amateur Radio Society.

This ic calibrator (Fig 7) uses the G4ANQ oscillator and pulse shaper (*TT* October 1971). With the switch in position 1MHz both the counters are reset in the "9" count which means that a "1" level appears at the ouput of the counter and both gates allow the 1MHz marker through to the output. In the 100kHz position the 1MHz signals are gated at 100kHz and this is passed through gate 2 to the output. In the 10kHz position the 1MHz/100kHz signal is itself modulated by the 10kHz signal and appears at the output. The diode, D, which must be a germanium type for low turn-on voltage, is used to simplify the switching arrangement. The fact that the gates modulate the signal has, G8ASG suggests, two advantages:

(1) Even 10kHz markers can be heard well above 144MHz relying on only the 144th harmonic rather than the 14,400th harmonic.

(2) When listening to a 1MHz marker its power output is decreased by an absolute 3dB when the switch is turned to 100kHz and a further 3dB in the 10kHz position. This is because the gating signal allows only half of the signal through to the output of its gate.

G8ASG adds that if, as was originally thought advisable, the counters are operated not as symmetrical dividers but in the bcd (binary-coded-decimal) mode, this attenuation will be of the order of 4dB per step. The adoption of 3dB has obvious uses in the calibration of S-meters.

Despite the fact that the output of the calibrator is in the form of a square wave, no difficulty has been experienced in obtaining odd-order harmonics. The unit has been used successfully at 70cm with a 914 diode multiplier placed in the output.

RF clipping and tvi

It had been intended to give the topic of ssb speech processing a rest this month—but Phil Horwood, G3FRB, who was instrumental in starting us off on this subject last November, feels that something more needs to be said with reference to tvi.

He writes: "First, consider why we want clipping; more talk power—is that all? Surely not. More talk-power, yes, but without degradation of the signal by intermodulation products (IPS) and harmonics. I agree with recent comments on flat-topping in linear amplifiers; most operators overdrive to some extent, but in a busy dx band who can hear the distortion through the QRM?

"Except for really bad ones with whiskers 50kHz wide nobody notices—and to make a spectrum analyser measurement off-air in the presence of interference is quite impossible.

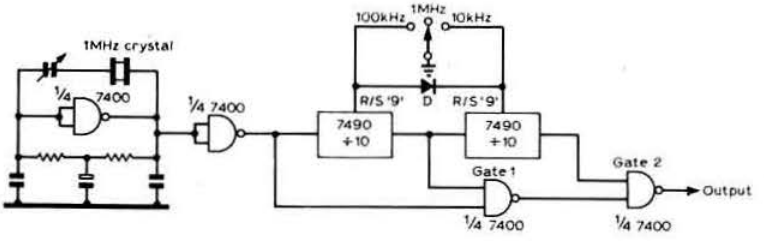


Fig 7. The ic calibrator switching technique used in the Stoke-ARS project

The amateur world is quite different from the commercial one; often we are working with signal/noise ratios far below those which a commercial system would consider acceptable, so IPs only 10dB are virtually inaudible.

"So why bother? Well, I hope I made it clear in my February article that my adoption of rf clipping, as much as anything else, was an *anti-tvi measure*. IPs are not usually responsible for tvi—but straight harmonics *are;* if one is able to talk up without fear of tvi then for that reason alone a clipper is worthwhile.

"An rf clipper and filter properly set to operate below the linear amplifier's overdrive level is the only way of increasing mean power without worsening tvi problems; with the clipper as a safeguard against tvi, the greatest gain may not be in output power, but in the ability to operate *at all* during tv hours.

"How many 'flat-toppers' run full legal power to an aerial with real gain, live in an urban location *and* operate in the evenings? On 14MHz in the evenings you can count G stations on the fingers of one hand. Short skip? Well in the London area one *ought* to hear dozens.

"So flat-topping buys perhaps 6dB of mean-power gain —but with tvi given away free."

"The question has been raised how bad does flat-topping make IPs? My table in *TT* (November) was for a small-signal amplifier producing −60dB with no clipping; it will be much worse with a linear capable of perhaps only −25dB, even when not overdriven. But operators should be much more worried about harmonics. Incidentally, while it is always assumed bad harmonics equals bad IPs, it is almost impossible to calculate one from the other. Langford-Smith refers to audio amplifiers and is often quoted for cases where harmonics are exclusively uneven orders. In practice, one accepts that a good valve linear will produce 2nd and 3rd harmonics about −40dB, and IPs about −30dB. But this is not a true case, because harmonics are reduced by the tank circuit. In an aperiodic transistor linear, harmonics may be only −18dB, but IPs may be no worse than the tuned valve amplifier.

"A surprisingly wide range of IPs can be generated in apparently identical transmitters. It is true that IPs generated in the exciter can in fact be *improved* by the linear, a case of two wrongs making a right; but I have seen a range of −20 to −45dB in quite unpretentious transmitters.

"As a parting shot—many of the critics have not tried clipping—as for waiting until the flat-toppers stop flat-topping, how can they? They don't even know they are doing it!

As a post-script, G3FRB comes up with a new definition of flat-topping: a friend over-drove his transmitter so long and so hard that the beam tubes softened and sucked in their anode caps. The amateur concerned now knows exactly what flat-topping means—literally!

G3FRB's remarks have raised at least one query in my mind. For years, on cw and a.m., one used or uses Class C amplifiers; driving the final well into grid current; accepting that there will be a high harmonic output; but then endeavouring, with varying success, to prevent this from being radiated on tv frequencies. Clearly it is *better* not to generate harmonic power in the first place—but surely we should not regard this as the *only* way of being able to operate during tv hours? Since reading G3FRB's letter I have been throwing some nasty glances at my cw rig!

Here and there

After reading my item on the Chowdhury multi-wire dipole (*TT* March) several colleagues ribbed me by demanding what was new in this idea; had not the caged dipole been around for years? And what about the old spider web technique of spreading out two wires to form each dipole element? I hope I was able to assure them that I was aware of both these forms of broad-band aerial (I should be, since I used caged dipoles in a non-amateur application many years ago, and I daily pass a double-V type dipole on an embassy building on my way to work!). My excuse—if excuse is needed—is that the Chowdhury technique seems to offer a broad-band approach that is very much easier to implement, by using flat feeder or multi-core cable, than the other techniques. And at least he—and *IEEE Trans*—regard it as a *new* idea!

As an additional note to the informative summary of printed circuit construction techniques provided in the last issue by F. W. Henshaw, G8BBO, readers may be interested in the Ambitrak technique for designing and producing one-off printed circuit boards. The feature of this proprietary system is that the copper-clad boards have a 0·1in matrix superimposed upon the surface and an alpha numeric graduation round the outside of the board. Then, with a pen containing an etchant resist ink you draw on the board your circuit using the matrix for a guide and so assisting the user to prepare an accurate circuit. The special boards are available together with other elements of a do-it-yourself kit from Technomark. Details can be obtained from Peter Coxhill, Technomark, Station Yard, Borough Green, Sevenoaks, Kent.

The RSGB News Bulletin Service

The RSGB News Bulletin, callsign GB2RS, is broadcast every Sunday morning. This bulletin can be received on either vhf or hf, which gives almost complete coverage of the British Isles. It keeps radio amateurs up-to-date about happenings in the world of amateur radio and gives information on coming events, supplementing and bridging the gap between successive issues of *Radio Communication*.

SCHEDULE

Time	Frequency (MHz)	Location and coverage (hf) or beam heading (vhf) of station
0930	3·6	Bromley, Kent (SE England)
1000	3·6	Cheltenham (SW England)
	145·8	Aberdeen (NNW)
	145·095	Farnham, Surrey (NE)
1015	3·6	Belfast (N. Ireland)
	145·8	Bangor, Co Down (N)
1030	3·6	Derby (N. Midlands)
	145·8	Aberdeen (SW)
	145·89	Bishop Auckland (N)
	145·3	Sutton Coldfield (NW)
1045	145·89	Bishop Auckland (E)
	145·095	Farnham, Surrey (SW)
1100	3·6	Bridlington (NE England)
	3·6	Aberdeen (NE Scotland)
	144·3	Sutton Coldfield (SW)
1130	3·6	Motherwell (S Central Scotland)
	145·5	Bradford (NE)
1200	145·5	Bradford (SE)

Exhibitions — Beacons — Conventions — Contests — Local events
Rallies — Scientific projects — Meetings — Licensing — Clubs
Propagation reports — Lectures — Field days — Expeditions

SWL NEWS

by BOB TREACHER, BRS32525*

SINCE the appearance of this feature in March the response has been really encouraging; in particular from listeners wishing to appear in the Countries Table. As a result there is a larger amount of listeners' news this time. Let us hope that the interest continues to thrive. I would like to take this opportunity of wishing all those taking the RAE in May the very best of luck and hope they obtain a licence in the near future.

QSLs

The question of replies to listeners QSLs has been raised by several reporters. There are some amateurs who quite simply do not welcome QSL cards from listeners, and others who will QSL all cards received. The return rate depends entirely on how much time, effort and useful information is used when reporting. Enclosing sae and IRCs also helps, as the recipient can see that the listener is really anxious to receive QSL proof of hearing his station. A 50 per cent QSL return rate is considered good but with that extra effort this figure could be much higher.

Mailbag

Tony Harding, A7499, writes enclosing some interesting literature regarding b/c band listening. Unfortunately we cannot incorporate the news here as this feature is specifically concerned with the amateur bands. However, I am sure he will forward the information to anyone interested in this type of listening, upon receipt of an sae. His QTH is 2 Rose Cottages, Duncan Road, Park Gate, Hampshire SO3 7BD.

The power cuts of February and the high winds of March seem to have disrupted the listening habits of some SWLs, but others like Simon Kalman, A7857, found other ways of providing power during the cuts.

Neville Spry, BRS17567, is a welcome contributor to *SWL News*. He has a Trio JR310 and a half size G5RV and is at present heading the Countries Table without, as he says, burning the midnight oil.

Alan Brignoll, A7262, is interested in Top Band dx but unfortunately knows little about where and when to listen. This is a topic which will be featured in a future *SWL News*.

A TA32jr at 76ft and a Drake R4A form the operating equipment at Colin Baker's QTH. A4463 also has impressive arrays for 4m and 2m and has also been interested in 160m df hunts. This is a very fascinating aspect of the amateur movement and one which appears to be growing more popular each year.

A7139, Kevin Archer, writes to say that G4ASB lives next door but one to him. He will QSL all useful listeners reports on receipt of an sae. He is on 3,632kHz at 1000gmt each weekend.

Norman Henbrey, BRS29198, and his son have recently been erecting a Hy-gain 18AVT/WB and first tests suggest a gain of three S-points over Norman's other aerials. This is a very good vertical aerial system and if the cash is to hand it is a really worthwhile investment.

C. K. Holdford, A7732, lives very near the M4 motorway and to combat the traffic noise has sound-proofed his shack; as a result cannot hear any external noise whatsoever. Plans for a Hamtower with a TA33jr perched on top are afoot at his QTH.

Sheffield appears to be a well-populated listening outpost. Graham Storey, BRS26864, lives quite near to Christina, A7783, and has achieved some good results on 80m having heard 70 countries on that band since 1 January 1972. This is a really competent effort considering Graham lives in a flat and has not the space to erect efficient aerials.

Turning now to Bernard Hughes, BRS25901, who seems to be a really keen dx listener. He has 105 awards and has heard 325 countries and has 289 confirmed. His best dx recently has been A51TY. Bernard has the whole of the African and European continents confirmed and only needs a couple more QSLs to have all North America confirmed. He reflects, however, that SWLing can be a very expensive hobby as he sends all his cards direct!

John Townsend, A7999, writes to say that he will send any swl keen on certificate or award hunting details of particular awards from all over the world upon receipt of an sae. John has also started publishing a fortnightly newsletter giving dx news, general information and British amateur news together with a 1972-73 counties table. This is free to all again if an sae is forwarded.

Very best dx to all listeners and keep those letters coming—to reach me by 2 June for the July issue.

1972 Countries Table

	10	15	20	40	80	160	Total
BRS17567	81	118	151	27	72	0	449
A7531	99	111	105	26	38	1	380
A7139	58	72	87	51	42	12	322
BRS25901	36	88	101	29	51	3	308
BRS33370	48	65	103	14	38	4	272
A6686	43	88	91	17	19	0	259
A7139	44	52	67	36	38	12	249
A4483	56	54	54	28	37	4	233
A7082	42	40	49	43	37	14	225
A7159	32	48	64	21	45	2	212
A7780	55	52	63	11	21	3	205
BRS32524	0	21	72	14	52	3	162
A7681	1	27	35	22	44	12	141
BRS33243	16	26	22	14	56	0	134
A7757	27	18	51	11	24	2	133
A7732	11	21	31	11	30	0	104
A7920	0	0	50	15	34	2	101
BRS32759	0	40	51	7	0	0	98
BRS32635	0	28	33	9	19	1	90
A7999	4	11	49	8	1	0	73
A7097	0	26	22	0	14	1	63
A7706	8	20	20	4	7	0	59
BRS32779	10	19	26	1	0	0	56
BRS30694	0	10	23	10	9	2	54
A7321	0	19	12	4	10	1	46
A7387	20	16	3	3	3	1	46
A7262	6	7	17	4	8	2	44
A7661	0	11	16	4	12	0	43
A7790	4	7	18	4	5	0	38
A7700	7	7	8	1	2	1	26
A7827	2	3	17	1	1	2	26
A7857	4	3	11	7	0	0	25
BRS33211	0	9	5	2	8	0	24

* 392 Rochester Way, Eltham, London SE9 6LH.

FOUR METRES AND DOWN

by JACK HUM, G5UM*

The shape of (vhf) things to come

There are three IARU world regions. Ours, Region 1, is a slice of the globe from the North Pole to the South Pole embracing Europe and Africa, which contains a tidy number of countries. Most of these countries have national amateur radio societies, and these meet from time to time at some convenient place to discuss the advancement of the art both in its widest aspects and in detail. Each society's vhf manager (if it has one) attends; which is as it should be, reckoning that vhf/uhf/shf is the fastest growing area of amateur radio activity, certainly in technology, probably in numbers.

If anything demonstrates the importance of having a strong national society, well financed and with the bulk of its amateur population belonging to it, IARU Region 1 does. It costs money to run, and there is the cost of sending delegates to its meetings. All this, the national societies will tell you, provides excellent value for money by enabling them to speak with one voice politically and to concert their activities technically and in other ways (eg, contests).

In mid-May IARU Region 1 delegates converge on Scheveningen in Holland for the triennial conference, and with vhf matters very much to the fore it may be safely predicted that the pattern of European metre-wave activity, which has been so significantly shaped by IARU in the past, will benefit further from the delegates' five-day stint.

Among the papers which national societies turned in ahead of the Scheveningen Conference, those for Committee B are of the most direct interest to readers of *FMD*. One document, submitted by RSGB, seeks co-ordination of beacons on 2m and 70cm, and recommends planning in respect of frequency and geographical spacing. And USKA reminds Committee B that 24 of the Region's 40 beacons are still out of zone.

Another RSGB paper details standards for the microwave bands above 1GHz. Other national societies have submitted papers on equally topical subjects, such as band planning, the use and misuse of repeater talk-through stations, and much else which is going to involve the metre-wave fraternity in the near future.

After Scheveningen, what then? To the national societies the delegates will report what was recommended and what was decided—not always the same thing. Implementation at local—and that means national—level follows.

Machinery exists to maintain continuity in metre-wave matters after these triennial Region 1 meetings have dispersed. This is the VHF Working Group, which liaises with member societies in between conferences, and has powers to summon extraordinary meetings of national vhf managers if something sufficiently urgent crops up.

This year's IARU contests

Every year there is a programme of IARU Region 1 vhf/uhf/shf contests, and a different national society has the responsibility for organizing them. In 1972 the turn of RSGB has come round.

The first of these IARU contests on 2-3 September runs concurrently with our own VHF National Field Day, with the difference that *fixed* stations as well as portables may compete, using 144, 432 and 1,296MHz. So our own VHF Contests Committee will be extra busy next autumn handling the load of contest logs that will pour in on them from European societies as well as from VHF NFD contestants.

Rules for IARU are basically as for RSGB. The only major difference is that scoring will be on the basis of one point per kilometre instead of our own concentric circles method. This involves little extra work for intending UK entrants; all they need do is take a photo-copy of their RSGB Field Day log, rescore each contact in terms of kilometres and insert the figure on the right-hand side of the log-sheet.

The leader in the 144MHz Fixed Station section will compete for the IARU Region 1 VHF Trophy, donated by Neal Crystals. The winner of the 144MHz Portable Section (and this could well be a British VHF NFD participant) competes for the PZK Trophy, donated by the Polish national society.

On 7-8 October comes the IARU UHF/SHF Contest, in which entrants will compete for the Vittoria Alata Cup 1, donated by I1XD, for the winner of the fixed station section; the Vittoria Alata Cup 2, donated by I1XD, for the top portable/mobile entrant on 432MHz; and the REF Cup, donated by the French national society, for the highest scorer in the 1,296MHz section.

Associated with both the September and October IARU events will be a listeners' contest open to all receiving members within Region 1.

"Shall we have a bash at the IARU as well as VHF NFD?" The thought will be in the minds of many groups and clubs now planning for the September battle. Answer: why not, while you are about it? You might establish your own group as not only the best in Britain but the best in Europe.

Anomalous at vhf

Tapping the barometer "to make conditions better" would seem to be a barren exercise, but no more barren than the faith many metre-wave men place in barometric pressure as an indicator of a probable "lift". Example: in early March while a biting east wind boomed across the land for days on end the pressure remained persistently high—and vhf propagation persistently low.

To G3ANQ of Wimbledon such relationships have a special fascination, for meteorology (with radio) has been a lifelong interest and subject for study with him. Writing to *FMD*, he says, "I am convinced that vhf has bred its own need for a highly specialized form of this vast subject which can be given to anyone interested in a very simple and practical way, provided that someone can direct him in the right manner. I have worked out a way of doing this, and if

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

anyone interested would like to get in touch with me I should be only too pleased to help him."

And in the context of many vhf men's almost obsessive preoccupation with barometric readings he adds that ". . . the barometer alone is no good. You want the basic knowledge first, then the map, and last of all the barometer."

Prompted to write to *FMD* by reading the reports of New Year's Day anomalous propagation experienced by G2UJ, G5NU and G8EYN (see February and March *FMD*), G3ANQ offers the following explanation for that particular phenomenon. An anticyclone of about 1040mb central pressure, centred just north of Scotland for the past four days, was beginning to drift SE and decline. In the easterly airflow on its southern side, advection stratus cloud, formed on the North Sea path, probably possessed incipient inversions on top at anything from 600 to 3,000ft, a very common occurrence in such conditions. Patchy refraction, plus meteor scatter, might explain the G2UJ/G5NU effect; pure refraction probably accounted for G8EYN's results. Meteor scatter would affect the cw and refraction would be very irregular.

Readers who wish to discuss further with G3ANQ this immense, fascinating and complex subject of wx and dx can reach him as follows: C. Edington Sutton, 3 Parkwood Road, Woodside, Wimbledon (01-946 6673).

Just as we in the UK wait on anomalous propagation to give us Scandinavia on 2m, so do our friends across the North Sea wait for US to appear; which brings us to. . .

With a G-man in Sweden

To work the dx it is necessary to pick a frequency that dodges the QRM on the way, as many people in England will tell you from their experience of trying to work GM and GI in the window at 145·85–145·95MHz. Some advice on how to work into SM (anomalous propagation permitting!) comes from John Attlee, G8DOS, now established in Malmo as SM7FZD.

The top end of 2m, being full of local a.m. and fm traffic, should not be used by UK stations calling SM or OZ. The Danes alone have about 1,000 active stations between 145·5 and 145·95MHz. But the 145·41 sideband channel should be productive; many OZ and SM stations run between 150–500W p.e.p. From here down to 145 is reasonably clear apart from a few repeaters. So is the lower 1MHz except for 144·9, a local repeater up-frequency, and 144·5, a calling channel.

With 75W of nbfm, vfo control over the whole of the 2m band, and an 8-over-8 more than 100ft above ground, SM7FZD has worked into Hamburg at 300km, with contacts over 250km as a fairly regular occurrence. There are frequent meetings on 2m with another Englishman, OZ3TQ, otherwise known as G3TPL.

On the same latitude as Edinburgh, Malmo is not far from the auroral belt. So far DOS/FZD has experienced three Ar openings, when LA, OH and northern SM stations were pounding in on Tone A telegraphy. "There were even a number of ssb Tone A signals. They had to be heard to be believed," he tells us.

Members wishing to arrange schedules with SM7FZD against the arrival of the next "anomalous" or aurora will find John Attlee at Strandgatan 50B, 216 12 Malmo, Sweden. He can arrange for information on fixed time skeds with the UK to be published in the SM amateur radio journal, and publicized on the local vhf bulletin on the air.

Expeditionaries

On 13-14 May or 20-21 May, depending on the weather, Rannoch School in Perthshire is making a charity attempt to scale all the Perthshire "Munroes", peaks over 3,000ft. From each peak Bill Jarvis, GM8APX/P, will call alternately to the south and the north on nbfm on various channels between 145·8 and 144·46, exact times determined by climbing ability!

Old-timer Fred Hoare will put G2DP/M and /P on 2m from Norfolk, 22 May to 2 June ". . . hoping to meet some of my QSL customers, the G3Y and G3Z".

Never worked GD on 2m? Try between 3-10 June, when G8BZY and G8DUE will be there during IOM TT Raceweek. With their Landrover they plan to penetrate the island's high spots, radiating on 145·53, 145·67 or 145·77. No skeds, but a special QSL card.

"*Très important*" says a note from F1UO, and it is: his group from Lyons will be at the summit of Mont Blanc on 1-2 July as F1UO/P on 145·55 *not listening on their own frequency* but indicating direction of tuning. With luck the 9-el Yagi might put a signal into the UK from its height of almost 15,000ft, particularly as many here will be on elevated sites themselves in the RSGB 144MHz Contest that weekend. A special QSL will be sent.

Caernarvon on 2m and 4m will be activated by GW3XIM/P from 29 May to 3 June. Ron Ratcliffe will be journeying from Liverpool to the Lleyn Peninsula to set up a 10 watter plus beam, A1 and A3.

Get "fourteens" under the belt

Last month we promised to offer a further word or two about learning the morse code, for the encouragement of Class B members wishing to extend the range of their activities to 4m and the telegraphy ends of the other metre wavebands, which they cannot do until the morse test has been passed and a Class A licence obtained.

Morse sending is simply a conditioned reflex that translates a visual impression (a letter, figure or symbol) into a hand movement (keying).

Morse receiving requires the brain to translate a heard sound into a hand movement (writing).

When sending, the operator's mind prepares a few milliseconds in advance what he is going to make his morse key say. When receiving, he has no idea what to expect, and a split second delay occurs in the brain while it translates what is coming in. This is why for most people receiving is a little more difficult than sending. And this is why plenty of receiving practice is so important if morse is to become second nature. A week or two copying at a steady 14 words a minute virtually guarantees a romp through the official test, with a bit in hand for examination nerves.

Difficulty in memorizing the morse characters? Regard them as very basic arrangements of dits and dahs, no more than four of them in any letter, no more than five in any figure. Commit half a dozen of them to heart each week and utter them aloud when you see them on motor car number plates. Passers-by will think you are a bit keyed up. They will be right.

Tell *FMD* your recipe for success in attaining "14 per". Did you get there solo or in groups of like-minded persons

determined to learn by visiting each other's QTH three times a week? The secret of *your* success may encourage the others. Which morse instruction aid did you find most useful and have you used the G3KGU service lately?

More on this subject next time, especially apropos what people say about morse before they have even studied it.

Parchment piece

The month's mailings of Four Metres and Down Awards demonstrate a number of things: first of all, the opportunities that exist for receiving members . . .

When A7929, Tim England of Kenilworth, erected his ground plane last May he found 2m wide open, a circumstance which produced cards from I4PVU and I1BUN, towards the five country-QSLs needed for the Listeners' FMD Certificate. Sending reports by letter brought a 50 per cent return; changing to a printed QSL boosted the rate to 80 per cent, the majority replying by return post ". . . and four of them even returned the postage stamp I sent for the reply!" adds Tim. Currently, A7929 has a 6-over-6 at 30ft feeding his transistor converter and B40, and now FMD Receiving Certificate No 22.

Next, if you move house start collecting for a fresh certificate. Billingshurst's G3WZT got himself 144MHz Transmitting Award No 119 back in 1968. Horsham's G3WZT now collects No 255, where 100W on all modes from home-built equipment did a good job from a site only 40ft asl. The QSL return rate was ". . . not bad, but unfortunately I still find there is a large portion of the amateur fraternity that seems to *collect* SAEs!"

From Walsall G8ENI, too, reports anomalies about the QSL situation: "Of about 450 stations QSLd, returns are about 37 per cent . . . still waiting for cards from many of my best contacts". Among these are 13 countries and all English counties, meaning that Mike Neville would be well on the way to claiming the 144MHz Senior if some of the sluggards would only cough up. For the time being the Standard 144MHz Certificate does duty. Its number: 257.

Certificates for "home and away": if you do much portable work start a separate collection of cards for /P claim. Lancashire's Ken Downs set up G8CFI/P on Winter Hill and did just this. Now he has 144MHz Transmitting Award No 256. And North London's Mike Pawley, radiating from G8AWV/P on a high spot in Worcestershire, nearly got the lot in one session: 33 of the 35 cards turned in to the VHF Certificates Manager were for QSOs made in the July 1971 contest. To make up the number he added Herts (May 1968) and Cornwall (June 1971). Now Award No 258 has reached him at Kilburn.

Also very active during portable contests are the Golden Valley VHF Group, well known as GW4ABR/P. To their 2m award collected last autumn they now add 70MHz Transmitting Award No 91. They positively *like* going to rare and difficult counties, especially to help boost other people's totals on 4m and 70cm.

Are you stuck on 145?

The mobile calling channel on 2m is 145MHz. With transmitter and receiver fixed-tuned to 145 and no variable tuning to bother about, both hands are left free to drive, except for an occasional quick flick of the press-to-talk.

Result: no contacts. The chance that another mobile will be within talking range, bearing in mind the poor radiation capability of 2m no-gain mobile aerials, is remote. Yet in the adjacent channels several powerful fixed stations, anxious to give the hapless mobileer a contact in return for his numerous CQs, go unheeded. Of course, they could give him one if they netted on to the mobile channel, but then they would clobber it for every other mobile for miles around.

Ideally, a tune-and-lock-on receiver that would scan the band continuously but stay locked to a desired incoming signal would be the best compromise between maximum road safety and maximum QSO rate. Does anybody use one?

Tech Corner

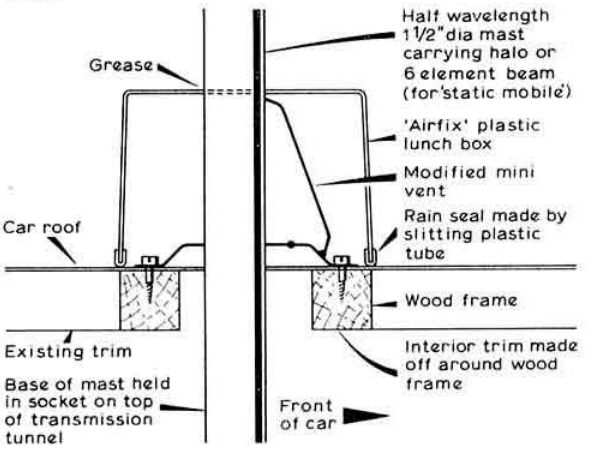
From G3ZXN (E. W. Earnshaw, of Newcastle upon Tyne)
Owners of the Eddystone 888A may find the following small modification worth trying in order to enhance its already creditable performance as an i.f. strip:

Simply, short the double-diode-triode cathode down to earth. Now the age will have a faster response and more control, and although it will have the small delay removed, this is no bad thing by making the 2m band sound a lot quieter when the 28–30MHz range is tuned. If a signal is heard the few volts bias will make virtually no difference; in fact, with nil bias the age will respond faster to a strong signal than it would normally have done. And if the thought of a few missing bias volts upsets the user he need only turn to "AGC off" and full sensitivity is immediately restored.

From G8DNF/M (Chris Eley, Nutley, Sussex)
The diagram shows a strong mobile aerial mount, capable of taking either a halo for use when on the move or a 6-element beam when one pulls up to become /P. The beam can be rotated from the comfort of the car.

This method solves the problem of passing a mast through the centre of the car roof without impairing the value of the vehicle. The roof vent is of the type found on most Mini-vans, and is obtainable as a BLMC spare. The catch is modified by removing two split pins; this allows the vent to open farther than usual. When the aerial is not required, the car appears as normal except for the roof vent, which can be used as designed.

The strength of the system shown allows a complete half wavelength of mast on 2m to be supported, so that the metal roof of the car acts more nearly as a true ground-plane.



Xtal xchange

"I have a 12MHz crystal HC25U adapted to HC6U coming out on 145·9 and will exchange for an HC6U crystal on 8 or 12MHz coming out between 145·5 and 145·65MHz, HC6U only". Those GI and GM operators wishing to appear in the window at 145·85–145·95 will welcome this offer by G3ZXN, and should contact him direct at 4 Keyes Gardens, N. Jesmond, Newcastle upon Tyne 2.

From John Roscoe, GM4QK, 39 Letham Rd, Strathaven Lanarkshire: "Have 8,090kHz decent modern crystal unit by Brookes, ⅜in spacing, an 8194 ⅜in rather older, and a 6030kHz war surplus. Want: 1·8MHz in ½in or ¾in."

"Next band up . . ."

"Yes, I'm preparing for 'Seventy' ". This declaration of intent is made sufficiently frequently on 2m to suggest that there is a widespread appreciation of the value of "the next band up" and a determination to try it, in spite of the accepted limitations of shorter range and lower system gain. Ideally the 432MHz band—or the communication part of it—should develop as 2m has done, with code at the bottom end and phone in the rest.

More must be said on this subject when more space is available. Right now we will leave you with two quotes:

"It was frustrating when setting up a QSO on 70cm from a 2m contact that the station I was trying to work had no facilities for plugging in a key (he was a G3), so no two-way was possible even though our respective carriers were audible"—G3NHE, Sheffield. To which we might add: Is your VHF NFD rig keyable on 432? You cannot afford gotaways in September with a multiplier of six. Next quote, now. . .

"We had considerable success, thanks to the publicity in *FMD*. Best contact on 432MHz was OZ9SW with whom we exchanged 59 reports, OZ5HA was also worked two-way, OZ1OF cross-band, he on 2m, we on 70cm, and SK6AB although unable to transmit on 432 heard us at S7"—GM8FFX, reporting the results of the expedition to Cairn o'Mount by GM3ZBE and himself. Many strong 70cm signals were received from south of the border; and a star turn was GM3OXX/P in Fife using 150mW, but still delivering S9 in Kincardine.

Change of plan for Oscar 6

Late June or early July is the target date for the launch by NASA of ITOS-D, the Improved Tiros Operational Satellite, and with it the latest Oscar package, Orbital Satellite Carrying Amateur Radio, to be known after launch as Oscar 6.

There will now be an up channel on 2m into a repeater delivering on 10m about 2W p.e.p., together with a 0·2W beacon on 29·45 and a 0·4W beacon at 435·1MHz. Ground stations operating on 145·95MHz with 8W out and a 10dB gain aerial should be capable of triggering the 2m repeater up to 2,000 miles. The down channel will be 29·5MHz, where a well-elevated turnstile or dipole aerial should have the edge over a beam with low angle radiation.

Watch GB2RS for latest info on Oscar 6.

"Variability" again

Emphatic endorsement of the views in last month's G3YED letter about VFOs on 2m comes from G3ZXN of Newcastle. He shares the belief that split frequency working at vhf has got to develop in the same way that it has already done at hf.

"The vfo is a fantastic device if used as a variable crystal—but not as a vfo, please!" he declares, adding that the more VFOs there are on 2m the more frayed nerves and bad feelings there will be.

Many other operators in expressing similar views to us make the point that the vfo trend has overshot itself and needs to be brought back to some sort of order if the metre wavelengths are to retain their reputation for civilized enjoyment in operating.

Part of the cure for the immoderate use of vfo/vxo lies in the hands of rare and/or wanted stations: it is *they* who can dictate the others' calling pattern by stating their direction of tuning; eg "No calls on this channel" or "No calls accepted out of zone" or "Tuning Zone B only" (Do you know without looking it up exactly where Zone B lies?). Given this information, the listener may park his drive source at the point indicated, ready to make a call—and in these circumstances if a flock of crystals is kept, cc and vfo become synonymous.

This should work nicely within the UK: on the Continent it is questionable whether enough operators are aware of the UK band plan to dictate the pattern of *our* activity when *we* call *them*. For they could keep us within zone if they did.

* * *

Writing from Barnet, G8CLY deplores the misuse of variable frequency devices but drops the thought that as an innovation they should be encouraged ("Self training in the use of wireless telegraphy"). "And anyway co-channelling saves frequency space and is essential for sideband transceive where split frequency working is impossible", adds John Lythgoe.

A further thought of his will find many seconders on 2m: "If one says 'Listening this frequency (or tuning high to low or low to high) for any possible call' then one should be able to cope with all modes, cw, fm, a.m. and ssb. If you cannot detect this lot do not use this silly expression." He is too polite to ask, as many have, what is an *im*possible call.

Although cw must be eliminated from the above mode list where G8s are concerned, this G8CLY comment endorses what was said here last month: that there is scope for more inter-mode communication on the metre wavelengths than exists at present. But "split" for sidebanders seems to be essential if they are to be able to work people using other modes.

Here and there

Another new beacon to look out for, HB9HB on 145·985MHz, is near Neuchatel in the Jura Mountains. It was peaking S6 with G3JHM on the south coast, during the big tropo lift of 18 March.

* * *

"You can get nylon nuts and bolts from Radiospares," said a note here in March. A reminder from G3OYU that this company is now known as R.S. Components Ltd. He helpfully adds: "If any readers have trouble in getting these items my company has an account with R. S. Components and would be willing to supply. We are not retailers, however. For example, the nylon hardware mentioned we can supply at around 75–80p per box. Nuts come in: 2BA 36 off, 4BA and 6BA 72 off, screws are packed in similar quantities." G3OYU, Brian Davies, can be reached at "Highcroft", Lusted Hall Lane, Tatsfield, Westerham, Kent.

"All our operating was done in the dx window 145·85 to 145·95 and this certainly seems to be working out very well" —GM8FFX, reporting the recent expedition to Cairn o' Mount.

* * *

"Pleased to read of the latest initiative to stir up more activity on 4m and down by reviving the call-on-the-hour principle"—G3NHE.

* * *

One of the first G4B– – men on 2m is John Boughton of Nuneaton. He now has G4BAI to replace his former G8CLL. Another local, G8CVD, is G4BBS on 2m cw.

* * *

Special QSL cards will be sent to all operators who turn in logs for the NE Essex TCARS vhf contest of 22-23 April. Standard RSGB scoring system; multiplier of two for 70cm, five for 23cm; logs to E. T. Jacobs, 26 Pondfield Rd, Colchester, Essex.

* * *

When submitting QSLs for portable operation to claim an FMD Award, ensure that all of them address you /P. Recently, two rare country cards had to be rejected because they failed to identify a portable station with the proper suffix. Memo to all men who work portable stations: check that outgoing cards are addressed "/P" where appropriate, to obviate jeopardizing the recipient's chance to make a certificate claim.

* * *

"Have you heard? Harold Beaumont's back." The flash went round 2m with great speed when G5YV reappeared on the band after many years' absence, a welcome return of one of the pioneers of vhf and a genial friend and helper of hundreds over the air.

* * *

So the band was dead when you took a look, was it? "Only the Sutton Coldfield beacon booming in and nobody about." Did you put out a call on the hour though? You might have had a surprise at how many were waiting just for that.

* * *

Final final: VHF Convention coincided with *Radio Communication* press date, so a report must wait until next time.

25 YEARS BACK

". . . a 3cm set was designed . . . to enable a 40mm-twin Bofors gun mounting to follow an aircraft target completely automatically . . . a magnetron is used to generate the 3cm R.F. pulses which are made only 0·5 microsecond long to discriminate between individual targets. The peak power to the magnetron during the pulse is approximately 130kW of which about 30kW is radiated"—from an article by G6OT based on a lecture he delivered to the Society at the I.E.E.

RSGB Bulletin, May 1947.

RFI FORUM

by B. PRIESTLEY, BSc, G3JGO*

READERS' letters and other comments suggest that to most amateurs tvi is the major, if not the only, rfi problem. The technical problem of interference between stations separated by many megahertz should be much less than rejecting a local station on the same band. The principles of tvi prevention were established some 20 years ago, but the information has not always been passed on to the latest generation of amateurs. Some old-timers seem to take a perverted delight in letting a newly-licensed operator struggle unaided; such people are doing amateur radio as a whole no good, since one bad case can damn all amateurs in the area.

Two amateurs who did tackle the monster have come up with novel ideas. G3ZPF found that wrapping the mains leads round a pair of FX1588 ferrite rings made a first-class mains filter for a tv receiver without making any permanent modification. An added attraction was the possibility of concealing the filter inside the set.

G8AGM found that the standard *Radio Communication Handbook* modification to reduce oscillator radiation from the HRO was inadequate and came up with the following recommendation.

(1) Decouple the following points to chassis with 560pF disc ceramics with minimum lead length:
   (*a*) both heater pins of oscillator valve
   (*b*) both heater pins of mixer valve
   (*c*) both loudspeaker terminals at points of exit from cabinet
   (*d*) all three power supply leads points of exit from cabinet.
(2) Replace lead to oscillator top cap with 4in length of 75Ω ¼in coaxial cable, earthing braiding at end remote from valve. (This necessitates retuning oscillator slightly).
(3) Ensure both oscillator and mixer valves are fitted with screen can and cap.

This sort of treatment may be useful on other receivers where local oscillator radiation is a problem.

Thank you 'ZPF and 'AGM, more power to your elbows!

Who has done it?

Reverting to the difficult problem of two amateurs in close proximity working on the same band, I did hear of one G8 who improved his 144MHz receiver from the stage where the local within 100yd wiped the whole band, to be capable of working only 100kHz away with no trouble. A major step was the incorporation of a crystal filter after the first mixer, and a tunable local oscillator.

At G3JGO, with a conventional converter this problem was reduced, but not to this extent, by substituting a 12AU7 cascode for the original high gain pentode in the following AR88. Attenuating the converter output was not as good; too much i.f. breakthrough. Any claim to do better than 100kHz at 100yd? If so, details, please!

Quotable comment

"Radio 'hams' were the first to experience intolerable mutual interference, and for a long time they have known as much about reducing unintentional interference as professional designers." Melvin M. Morris, US Army Electronics Command.

* 43 Raymond Road, Slough, SL3 8LN.

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

WITH the rapidly escalating cost of cards and postage the problem of QSL cards is becoming increasingly acute. Even moderately rare dx stations now find it impossible to afford the cost of confirming their contacts, and there are even instances of amateurs who do not come on the air very often because they generate such a problem every time they appear on the bands. It seems that there are two ways of getting round the difficulty of the cost—one is to have some simple blank QSL cards made, one of which can be sent to the station from whom a QSL is required, all he has to do is to fill it in and return it. An alternative is for the dx station to have a rubber stamp made which he can use to print suitable confirmation on the sender's card before returning it.

Your scribe would be grateful to anyone who could supply information on the present whereabouts of VP8HO, who was active from South Georgia in 1969.

Complaints have been addressed to the writer concerning alleged cases of interference to coastal stations by amateur signals on 160m. Readers will know that it is the duty of all to avoid such interference, but it must be made clear that neither the Society nor your scribe has any power to punish offenders, and that complaints must be directed to the proper authorities!

Dxpeditions

West Coast DX Bulletin reports that KA2AI was due to leave Tokyo at the end of March on a tour of Asia. His plans included visits to Hong Kong, India, Nepal, Thailand and Taiwan, and he was intending to investigate the possibility of operating from Sikkim and Bhutan.

The KC4DX expedition to Navassa Is (see March *MOTA*) hopes to be on the air continuously with two stations running simultaneously. The band to be used by the ssb station will be the highest open into the USA at the time, and the cw signal will go out on the next lower band.

WB2AQC and his wife, WA2BAV, began a visit to West Africa in mid-April with the intention of visiting Senegal, Gambia, Sierra Leone, Liberia, Ivory Coast, Niger and Cameroun. The only callsigns known at time of writing were TU4AB and TU4AC. They will be using an NCX-500 and Hy-Gain vertical aerial for use on 14, 21 and 28MHz.

KH6AG is expecting to travel around in the Pacific during May. He should have been on from KX6 during the last week in April and his May schedule is as follows: first week, KC6 (Ponape Is); second week, KC6 (Truk Is); third week KC6 (Yap Is); and fourth week, KC6 (Koror Is).

A team of Spanish expeditioners, led by EA7II, is planning an overland tour across Africa from the Atlantic Ocean to the Red Sea. The trip will take two months and will be made by a Pegasus mobile truck and two amphibious vehicles. They hope to be licensed from several of the countries they will cross.

Darleen, WA6SFC, is reported to be showing interest in plans to visit Bhutan and Sikkim, but there are no definite arrangements yet.

News from overseas

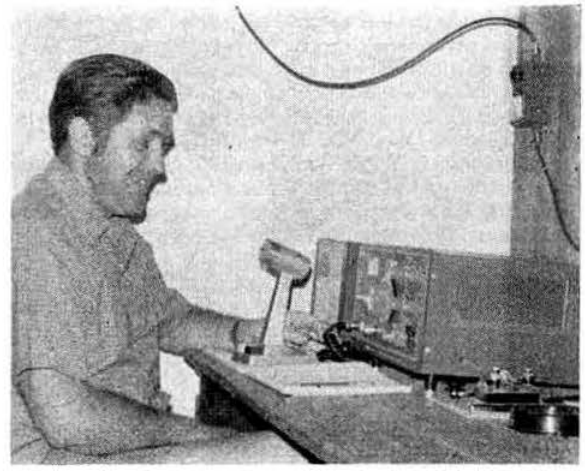
Colin McRae, 5R8AB (alias 9V1PM/G3WRN), left the Malagasy Republic on 25 February, having made well over 1,000 contacts during his eight-week stay. He reports that all schedules but one were kept successfully, and praises the behaviour of the pile-ups—especially those consisting of Japanese stations. Conditions were not as good as during a similar trip last year, with 10m very poor and heavy static on 40m. QSLs should be sent to G3WRN.

The manager of the Belgian/Netherlands/Canadian/UK Forces QSL bureau in Germany returned to the UK on 6 March and in future all QSLs for such stations should be sent to DARC, Box 88, Munich, Germany.

Bob Dilworth, 9H1BP/G3NWD, has written to say that the Luqa Radio Club station 9H1BA closed down in January when most of its members returned to the UK. Bob is now in Cyprus (Flt Lt R. L. Dilworth, Officers' Mess, RAF Akrotiri, BFPO 53).

G2MI reports a visit from John Smart (formerly VS9OC) who is living in Kent. He is anxious to QSL all outstanding contacts and will be pleased to do so on application to the address in *QTH Corner*, or via the bureau.

West Coast DX Bulletin reports that the 29 DX Club in Perth, Australia, has been offered the use of the TVW-Channel 7 television station mast for tests on the lf bands.



Colin McRae, 5R8AB

* 10 Knightlow Road, Birmingham B17 8QB.

A portable station signing VK6HD/P will be active on 7,005kHz from 1600 27 May to 0200 28 May (with a break for 160m operation from 2130 to 2330—see elsewhere). On the weekend of 3-4 June either 7,005 or 3,512kHz will be used (plus or minus a few kilohertz for QRM) and a special effort to work UK stations on NFD will be made. The aerial will be an inverted V with apex at 375ft. The venture may be repeated if it is a success.

Top Band news

As mentioned in "News from overseas", VK6HD/P will be on Top Band during the weekend 27-28 May. Between 2130 and 2330 on 27 May, VK6HD/P will call CQ DX for the first 2½ minutes of each five-minute period on 1,803kHz, and will listen between 1,825 and 1,835kHz for replies from Europe.

W1BB reports that HB9CM completed his WAC with his VK6HD contact, and that DL9KR completed his WAC in *three days* during January! Jan now lives in a block of flats and erected a 30ft vertical with six "umbrella" wires for top loading and over 2,000ft of radials (maximum length 70ft) laid out over the flat roof. This produced contacts with 21 countries and 20 states during the CQ WW 160 contest.

EP2BQ is on 160m and has worked G3s YUV, IGW/A, YMH, G4AMU and GM3YCB. He will be on for another year.

Readers will be sorry to hear that Ernie, K1PBW, who is a very well-known signal on the band, lost his home due to fire recently. He apparently managed to save his transmitter and receiver and says he will be on again for the next winter season.

DX news

There seems to be considerable activity from the two Taiwan stations BV2AA and BV2AB. The former has been heard at 0630 on about 14,275kHz and is said to keep a schedule with his QSL manager, JH3HWN, at 1300 on Sundays. BV2AB has been noted on 14,200kHz at times between 1200 and 1900.

Those looking for a contact with CR8AK may like to know that CT2AK has a regular contact with him at 0800 on Saturdays on 14,210kHz. 4W1AF is rumoured to have had to close down on 8 March—"due to difficulties with the Yemeni authorities". LA8YB/4W is thought to be still on the air.

There is a New Zealand County Hunter's Net for those working for the New Zealand Counties Award—this is held on 14,180kHz at 0900 and the net control station is said to be KR6IX (=JD6? now).

INDXA is endeavouring to supply CR5AJ with a Tempo One and TH3Jr beam so that he can operate on ssb. In Dahomey there is considerable activity by TY3ABF, who is often to be heard on 14,275 or 28,525kHz between 1200 and 1900. TY6ATE has skeds with K4SKI on 14,255kHz at 2100 on Wednesdays, Saturdays and Sundays and is sometimes accompanied by 5U7AK and 5U7GE.

Bob Snyder, formerly LA0AD, is now in Argentina and has the callsign LU5EVM. He is hoping to be active on all bands, including 160m.

The 9H3 prefix is allocated to visitors to Malta. It is believed that Tongan stations are now using the A35 prefix as A35FX appears to be the former VR5FX. Another strange prefix will be used by KD6USA who will be celebrating US Armed Forces Day from South El Monte, California, during the period 19 to 21 May. Ron, F5QQ, operated from French Somaliland as FL0QQ during the CQ WPX contest.

USSR50 is the callsign of the net control station which supervises the changeover of the special "50" prefix Russian stations at 0845 each Wednesday morning. HD1RF was HC1RF using a special prefix for the WPX contest.

Louis Varney, VK9LV (G5RV), is returning to the UK via VK4, VK2, FO8, CE0, LU, CX and PY and hopes to arrive home in July. He hopes to be on the air from some of these countries. Owen, VR2DK, has left Fiji and is now in Australia but will not be on the air until he has taken an examination for his VK licence.

Jim Baker, G3YHB, one of MOTA's most consistent reporters, runs this neat outfit from his QTH in Liverpool. He is a keen dxer and cw operator

OH2BH

Martin Laine, OH2BH, (well known recent dxpeditioner to Market Reef, Albania, Equatorial Guinea, and Annobon) is expected to be in the UK on Sunday 7 May, and it is hoped that he will be available to meet a limited number of interested members and possibly show some dxpedition slides during a visit to Birmingham in the late afternoon. The number which can be accommodated is limited and applications for tickets should be made to G3HCT(QTHR) or to your scribe.

Contests

The USSR CW DX Contest

2100 13 May to 2100 14 May.

All bands 3·5 to 28MHz, single-operator (single or multi-band) and multi-operator single-transmitter categories. Listeners may also take part. Stations exchange RST plus a progressive QSO number, starting from 001. Contacts count one point between stations on the same continent,

VE3GCO finds that amateur radio contributes considerably to the interest of his pupils in geography. His school made an extensive study of Antarctica and this display of QSLs illustrated the co-operation received from amateurs in all parts of the continent

three points if in different continents. QSOs between stations in the same country have no value. Stations may be worked on each band for QSO points but a multiplier is counted only once. Listeners score one point if one station is reported, three if both sides are logged. The multiplier is derived from the "R-150-S" list and in addition Oblasts Nos 02, 13, 14, 56, 84, 85, 86, 87, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 105, 128, 138, 139, 153 and 159 count. Final total is total QSO points times the multiplier, and logs must be posted by 1 July to Radio Sports Federation, PO Box 88, Moscow, USSR. A minimum of six hours participation must be shown to earn a country award, and 12 hours for a continental leader award.

The OZ-CCA DX CW Contest
1200 6 May to 2400 7 May.
All bands 3·5 to 28MHz. Single- and multi-operator. The former may only operate for a total of 30 hours and may take the six-hour rest period in not more than two breaks. Exchange RST plus QSO number (from 001). QSOs with same continent count two, and with others three points. Contacts with OX/OY/OZ count double. The multiplier is the number of countries worked on each band added together and the call areas in W/K, VE/VO, PY, LU, VK, ZL, JA, OX, OY and OZ each count as multipliers. Send a signed summary sheet and declaration and post logs to EDR Contest Committee, PO Box 335, 9100 Aalborg, Denmark, not later than 15 June.

The YL ISSB QSO Party
0000 to 2400 20 May (cw).
0000 27 May to 2400 28 May (phone).
The rules of these contests are somewhat complicated and those interested are advised to write to John Probst, W4AAA, 8618 W Park, Fort Myers, Fla, 33901, USA, for entry forms and information.

Awards

The Europa Diploma
Issued to licensed amateurs and listeners for working/hearing Europe on different bands in different years. Confirmed contacts of the current and preceding year count one point, older QSLs are devalued by $\frac{1}{4}$ point for each year (eg 1970 are now worth $\frac{3}{4}$ point, and 1969 $\frac{1}{2}$ point). The basic award is for a minimum of 100 points. Applicants must use the special ED application booklet which is obtainable from Walter Geyrhalter, DL3RK, Box 262, 895 Kaufbeuren, Germany. Please send IRCs for return postage.

The WAJA, HAJA, JCC and ADXA Awards
As mentioned on a previous occasion, the island of Okinawa will return to Japanese jurisdiction on 15 May and will use the JR6 prefix. From that date a QSO with JR6 must be included in the contacts required for the WAJA/HAJA, Okinawa cities count towards the JCC, and Okinawa is eliminated from the ADXA list.

The USSR 50 Award
As mentioned in last month's *MOTA* this special certificate is being issued to those who contact at least one of the stations using the special "50" prefixes in each of the 15 republics in the Soviet Union during the period 23 February to 7 June. In addition, 35 other Russian stations must be contacted during the same time. Log details should be sent to Box 88, Moscow, USSR, not later than 22 June 1972.

The R-15-R Award
This is being issued in special form for contacts with all 15 "50" prefixes as above.

The WGA 21 Award
For QSOs with Gotland (SM1) after 30 June 1970. Each counts two points and 21 are required for the award. A station may be worked more than once for credit provided QSOs are on different dates. Send log excerpt (certified by two amateurs) plus 10 IRCs to GRK, P.O. Box 461, S-621 04 Visby 4, Sweden.

Odds and ends

A7791 (T. P. Ellis, 13a Lower Edgeborough Rd, Guildford, Surrey) has asked for readers who have contacted "VK4SU" since January 1970 to send him the details as the genuine VK4SU is now on vhf only.

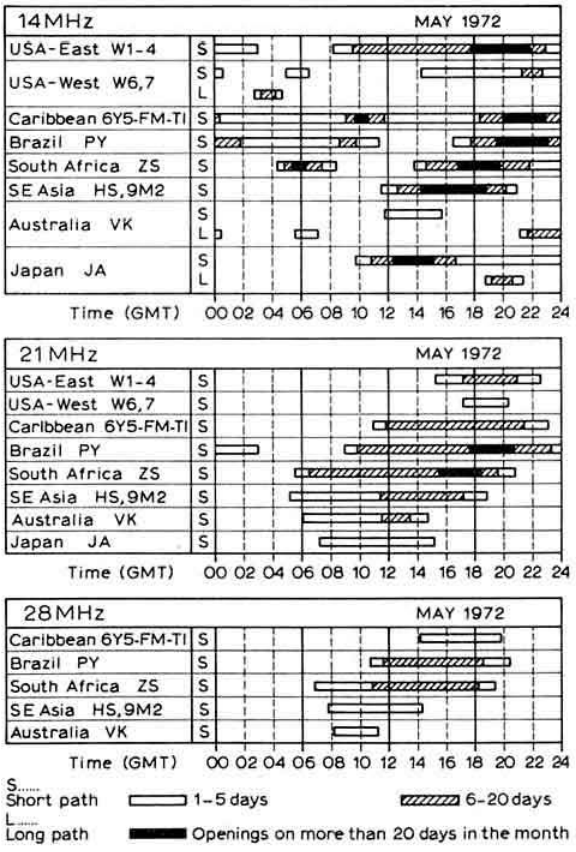
Propagation Predictions

High summer conditions begin in May in the ionosphere. This means relatively low F2 MUFs in the northern hemisphere, decreasing still further to reach their lowest point towards the end of July and beginning of August. Low F2 MUFs mean bad dx conditions on the high frequency bands, **28** and **21MHz**. These bands will not be very busy but sporadic short skip conditions will now and again liven them up over distances of about 2,000km. Therefore, only Africa and South America will be heard on **28MHz** on favourable days (days with above average F2 MUFs). On **21MHz** conditions will be slightly worse compared to last month, only South America and Africa will be heard with certainty.

Summertime conditions will improve dx conditions on **14MHz** during evening and night time. It may be possible that on favourable days the band will remain open for traffic with South America and Africa. However, traffic with South Africa might be interrupted as it is now winter in the southern hemisphere. There is also a possibility of dx on this band via the indirect path, eg to the west of North America, Japan and Australia. Traffic with Hawaii is possible on favourable days via the indirect path from 0700-1000bst exceptionally from 0530-0700 and 1000-1100bst.

Conditions on **7** and **3·5MHz** will change little from those of the previous month, only on **3·5MHz** will local traffic be interrupted by the dead zone.

The mean provisional sunspot number from the Swiss Federal Observatory for March 1972 was 84. High daily sunspot numbers were recorded between the 14th and the 25th of the month. During March the variation lay between 25 and 119. The predicted smoothed sunspot numbers for July, August and September are 49, 47 and 45 respectively.



QTH Corner

CR5XX	via WA3HUP, Mary Crider, 105 June Drive, Camp Hill, Pa, 17011, USA.
FK8AU	via I1PQ, V Le Dei Colli Portuensi 79, 00151, Rome, Italy.
FK8CD	via VE6TP (see FW0AB)
FL0QQ	R. Gemehl, 9 Petit Beauregard, F-78 La Celle St Cloud, France.
FR8AM/G	T. Chellier, BP 178, St Denis, Reunion Is.
FW0AB	VE6TP, 12907 136th Av, Edmonton, Alberta, Canada.
WA6FSC/HR	via VE6AKV (see WA6FSC/TI).
HD1RF	via WA8TDY, 3528 Craig Drive, Flint, Mich, 48506, USA.
HT0HSM	J. C. Kroll, 3528 Craig Drive, Flint, Mich, 48506, USA.
KG6SH	via JA2KLT, Y. Maruyama, Shinozuka, Kozakai, Houigun, Aichi, Japan.
KG6SL	via WA6AHF, 17494 Via Alamitos, San Lorenzo, Calif, 94580, USA.
KC6BK	PO Box "C", Ponape. E Caroline Is, 96941.
KM6BI	Box 43, FPO San Francisco, Calif, 96614, USA.
KW6HB	PO Box 96, Wake Is, 96930, Pacific Ocean.
KX6IY	via WB5EEN, Dean Griffin, Star Rte 1-Box 397, Rockport, Tex, 78382, USA.
OH0AM	via OH3XZ, Eino Leinonk 7-A-9, SF-13130 Hameenlinna 13, Finland.
TJ1BB	PO Box 4, Yokadouma, Cameroun.
WA6FSC/TI	via VE6AKV, 7612 23rd St SE, Calgary, Alberta, Canada.
TU2DI	BP 208, Adzope, Ivory Coast.
TU2DJ	BP 1295 Abidjan, Ivory Coast.
VK0RC	18 Centre Dandenong Rd, Cheltenham, Melbourne, Vic, 3192 Australia.
VP2LY	via VE3EWY, 2 Delbert Drive, Scarborough, Ont, Canada.
ex-VS9OC	J. Smart, 21 Berwick Crescent, Sidcup, Kent.
XT2AF	via VE2DLQ, 300-2nd Rang, Neuville, Portneuf, Quebec, Canada.
YB5AAQ	via W5ADZ, 2030 Quenby Road, Houston 5, Texas, 77005, USA.
YJ8BD	via I1IJ, Viale 21 Aprile 34, 00162, Rome, Italy.
YJ8BL	via W6NJU, 7164 Rock Ridge Terrace, Canoga Park, Cal, 91304, USA.
YK1OK	Box 35, Damascus, Syria.
ZF1SW	via W2GHK, Box 7388, Newark, NJ, 07107, USA.
5B4CDN	via VE2BUP, 256 Handfield Circle, Dorval, Quebec, Canada.
6D4EB	XE3EB, PO Box 309, Merida, Yucatan, Mexico.
6D4J	XE1J, M. Herrera 254, Box 200, Colima, Mexico.
6D4FFC	XE1FFC, G. Torelli, POB 13252, Mexico City 13, Mexico.
9G1WW	via W5EGH, 4868 Sierra Madre Drive, New Orleans, La, 70127, USA.
9L1JF	PO Box 1111, Freetown, Sierra Leone.

RSGB QSL Bureau, G2MI, Bromley, Kent, BR1 2NH.

Sunspot numbers

The Swiss Federal Observatory has provided the following definitive sunspot numbers for 1971:

January: 91·3	July: 81·0
February: 79·0	August: 61·4
March: 60·7	September: 50·2
April: 71·8	October: 51·7
May: 57·5	November: 63·2
June: 49·8	December: 82·2

The yearly mean number of 1971 was 66·6.

Band reports

Conditions on the hf bands have been very good at times during the past month and some very excellent openings have occurred on 28MHz. Signals from the western USA have been very good on several days. The 14MHz band has opened to the Pacific area on many mornings with signals sometimes coming via the south and, more recently, via the northern route.

Many thanks to the following for submitting logs from which this section of *MOTA* has been compiled: G2BJY, G2HKU, G3AAE, G3APZ, GC3EML, G3LPS, G3NLY, G3UKH, G3UOL, G3VBL, BRS2098, BRS25901, BRS30231, BRS31301, A7056, A7120, A7545, A7684 and A7850.

Callsigns listed in italics were cw, the rest ssb.

1·8MHz 2200 HB0s XJB, *XIV*.

3·5MHz 0000 *OY2H, UA9LAD*. **0100** *EP2ATO, VP9BL*. **0200** CR4BC, *OX3ZO, VP2MU*. **0300** HKs, 8P6AY. **0500** *W7SFA, 8P6DR*. **0600** *VP2AAA, ZL2LA*, 6D4J.

0700 *ZLs 3GQ, 4IE.* **1900** *UL50B.* **2000** *UI50B,* ZC4RS. **2100** ZD9BM. **2200** *3A0GA.*

7MHz. 0100 *VE4MP, VP2MU, VP5RF.* **0300** *JY4/B.* **0400** *VP2VAS.* **0600** PJ9JR, VKs, VP2LAD, 5K4RCA. **0700** LU1FDJ, *VE7UZ,* VKs, *WA7JSC* (Nev), ZP5AL. **0800** *VK3MR, VP2s AAA, MU.* **2100** *JA5DSS, YK1OK.* **2200** CR5XX, *KP4TIN, OY9LV.* **2300** *PJ2HT.*

14MHz. 0000 FL8MM. **0200** *VP9AS,* 6D4EB. **0300** KC4-USA. **0600** *UPOL19* (QSL via UW3HY), VR6TC, XT2AF, VR4EE/YJ8, 3D2EG, 9H1M (Gozo). **0700** FK8CD, FW0AB, JD1ACF, KH6IJ, KJ6BZ, KL7s, KM6DX, KS6s CC, DH, DV, VR1AA, YJ8BL, 5W1AR, 5W1AU, *9H3RUM,* **0800** KJ6CW, KS6EM, VR1AC, *VR5FX,* ZLs, W6/W7s, 9G1GG. **0900** VK9LV, VK0RC, VS6DO. **1100** VK9CC. **1200** K6UNT/KL7. **1300** KW6HB. **1400** KL7MF, UA1GZ/M (Vostok Base, Antarctica). **1500** OX5AT. **1600** FW0AB. **1700** A51TY, FB8ZA, FR7ZQ/E, KG6SW, KH6HNR, W9CFM/KL7, VK9XI, VS5PW, XU1AA, YK1AA. **1900** FB8ZZ. **2000** FL0QQ, TR8VE (BP 13112 Libreville). **2100** FL8MM, 4S7AB. **2300** VP2MAB.

21MHz. 0700 JAs, *3B8RS.* **0800** JAs, *JT0AE* (QSL via OK1AQW), 4J0BJ. **0900** VK9ZB/9. **1000** *KL7CZ,* YJ8GH, 9K2BQ. **1100** FL0QQ, HM4GF, KC6BK, ZB2CK. **1200** K6UNT/KL7. **1300** CR8AG, **1400** CR3VV. **1500** TR8MC, 5T5DY. **1600** LG5LG, W6/W7s. **1700** FR7AE, *VP8HJ,* W7TNA/MM (*Chamaru* at KP4 on 31/3/72), 3B8s DA, *RS,* 3D6AC, *5T5CJ.* **1800** *VQ9R* (Box 193, Mahe). **1900** FL8HM, FP8CS, *HI3J,* VQ9NEW, 6D4FFC. **2000** *OA6BB,* **2100** *KH6HGP.*

28MHz. 0800 *ZL2TG,* 5X5NK. **0900** UW0AF, XW8BP, YB5AAQ, WA2BVU/3D6 (QSL via 4X4WP). **1000** KG6SL, VK9XX, ZD8TS, 9M2DQ. **1100** CR5XX, HS1AFP, TJ1AR, VUs, *5T5CJ, 8P6DR.* **1200** CT3AB, FB8XX, ZD9BM, 9N1MM. **1300** FL0QQ, *TU2CV,* 8R1G. **1400** *FG7TG, OX3ZU,* TY7ABM (QSL via DL7JK), VP8MM, YB0AAG (QSL via DJ2JB), 5X5NK, 9L1JF, 9Y4T. **1500** G3MUL/CE3, HS5AFD, YB3AAY, 3B8AW, CZ, 9M2IR. **1600** ET3ZU, *HC3JL,* HD1RF, HS5AFJ, PZ6AM, 5B4s ES, IS, G3FNL/P/W0 (Colo). **1700** WA6FSC/HR1, KL7CL, TG9YN, W6WW7s, W7OGT (Wyo). **1800** *CX7BBB.* **1900** CR4BS. **2000** HC2GG/1, W6s.

Once again, many thanks to all correspondents, and especially to the following for items obtained from their publications: **NARS Newsletter** (*5N2ABG*), **Long Skip** (*Nick Sawchuk*), **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 Newsletter** (*VK6JR*), **QUAX** (*G3DME*), and the **DXers Magazine** (*W4BPD*).

Please send all items for the **June** issue **to reach G3FKM** not later than **8 May,** and for **July** issue by **5 June.**

YOUR OPINION

The Editor
Radio Communication

Sir—Further to the letter in the March issue from BRS32457, regarding his Top Band experience, I feel that his remarks do show the attitude of the Services to we poor amateurs.

Top Band is not a shared band at all, as we amateurs are merely permitted to try to get into an odd spare space and risk being blotted out by any Service station keeping its equipment warm.

And furthermore, the harmonics of the tv amusement sets send out interference through Top Band, so there are hardly any spaces left for 10W to be of any use.

When the days come when Richard J. Ware is sitting trying to cope with other service gentlemen and also tv harmonics he will doubtless realize that there are times when Top Band is just a noise band from one end to the other, and no joy at all. In any case, with everything being miniaturized, I would swop more 7MHz for the Top Band, and keep our aerials smaller.

Yours faithfully,
Arthur Brook, G3XYM

The Editor
Radio Communication

Sir—I agree most heartily with Radio Officer Richard J. Ware, (March issue).

Here is a classic example of how not to call. . . . Listening at 0100 on 18 November 1971 on about 1,830kHz, the following call was heard:

CQ EIGHT times, DX x 2, CQ x 3, DX x 2, CQ x 3, DX x 2, CQ x 13 (Yes, thirteen times), de G3 – – – three times . . . then on again CQ x 3, DX x 2, CQ x 13 (What, again), DX x 3, CQ x 3, DX x 3, CQ x 3, DX x 2, CQ x 2 and stops for a short while . . . then CQ x 7, DX x 3, CQ x 3, DX x 2 de G3 – – – three times. . . .

A total of 61 CQs and 21 DXs with signing TWICE.

This station was not a newcomer and while we cannot all be first-class operators, surely we can do much better than this.

Yours and 73
Jim MacIntosh, GM3IAA

The Editor
Radio Communication

Sir—Replying to Radio Officer R. J. Ware's letter, I must say that I am absolutely appalled by his suggestion that Top Band be abolished. I started all my listening on Top Band and have spent many enjoyable evenings, enchanted by the magic of hearing the voices I have heard every Thursday night at Shefford Radio Club. My receiver was an R209 and my best dx on that used to be G2AUA, 12 miles away at Cardington. I am sure G2DPQ, and many other old favourites, would be lost without Top Band. As it is, Top Band has been gradually reduced to an effective 50kHz, by various commercial stations. I must respectfully say that the one extreme example of an ill-mannered amateur (not "ham", please) is very isolated.

Think of the number of amateur stations who have to QSY because of "fish-phones".

In reply to his question, he has started one hell of a row!

Yours faithfully,
I. L. Bishop, A8025

The Editor
Radio Communication

Sir—The letter from Radio Officer R. J. Ware points an accusing finger and I do feel it is occasionally justified.

My own experience was with a phone station on 80m while I was working Humber Radio. This incident occurred during a link call when receiving berthing instructions, and the ship's master exclaimed in no uncertain terms that it was not good enough. Recalling that I was an amateur he asked what I could do about it. Diplomatically I took down the QSL cards from the bulkhead and awarded a black mark against the offending callsign in the *Call Book.*

If amateurs were charged Xp per minute when working on ship or coast station frequencies they would then realize what they were causing in the way of QRM.

Yours faithfully,
J. Pritchard-Gordon, G3PBL

The Editor
Radio Communication

Sir—With reference to R. G. D. Stone's letter (April 1972), I strongly object to his inferences. Many SWLs are 100 per cent operators and quite capable of diagnosing what they hear. The fact that he holds a G3 call does not give him the right to criticize the "unheard section of the RSGB" who are more than likely to be the licensed amateurs of tomorrow.

I am 72 years young, passed my first test in reading and writing morse in 1917 and have had to read and write it correctly, not for pleasure, but because thousands of lives depended on my interpretation of what I heard.

Instead of criticizing the capability of the swl he should go out of his way to meet and help them. Help them, and he will be helping the Society to become strong and healthy. He must also remember that the reason they only hear him on ssb is because they are on the top end of the bands.

To bear out my statements, he should turn to pages 248–9 and read the results of cw sections and UK receiving, BRS at the top. What is he afraid of, "fair criticism"?

Yours faithfully,
J. Callan, BRS27290

The Editor
Radio Communication

Sir—I was delighted to see the comments from the North Bucks ARS in the April issue. When are we going to stop changing for the sake of change?

Many years ago, it was NFD which prompted me to obtain the necessary "bit of paper" so that I could operate in, what I have considered ever since, to be the best contest of the year. The enjoyment of NFD has always been the very nature of the contest and the fact that everyone, even the large, wealthy clubs, were on the same footing. I know many people who seldom are to be found on the bands who always make a point of keeping the NFD weekend clear in order to come along and have a go.

The change of the rules will now mean that the very nature of the contest will change. No doubt many clubs will operate from caravans—the three-band beams will become apparent and, much to the disgust of many, the key will soon be replaced by the microphone. At this point, I feel sure, many people will not bother to make any great effort for the contest.

No doubt the changes will be justified on the grounds that it is what the majority want but I wonder if it is the majority of people who are interested in NFD or, as I believe to be the case, of the people who want to change NFD so that it interests them.

When talking on the bands, I find that many of the real supporters of NFD had no knowledge of the questionnaire concerning NFD. A much more realistic sample of opinion would have been obtained if copies had been sent to those who normally operate in the contest and I join with G3LCS in hoping that a return to some of the original rules can be possible in order not to completely ruin this great contest.

Yours faithfully,
M. Pharaoh, G3LCH,
Chairman, Sutton & Cheam
Radio Society Contest Committee.

OBITUARIES

Mr L. J. N. Kirkby, G3BRJ

Bill Kirkby died on 5 March. From 1949 to 1951 he held the callsign VS1AW, and in the course of Admiralty service had been connected with Bath and Chatham radio clubs as well as operating in Singapore. At the time of his death he was President of the Plymouth Radio Club.

Mr P. Bradley, G8KZ

Peter Bradley died on 30 March. He was an RSGB Council member in 1946 but had not been active in recent years.

Mr G. H. Salter, GW3MNF

George Salter, formerly of Litherland, Liverpool, died at Lesswood, Mold, Flintshire, where he had lived for 18 months. Although he was not active from Wales, he used to work all bands from Liverpool, favouring mostly 160 and 80m mobile.

We have also been advised of the deaths of:
Mr J. C. Brown, on 20 January, his 50th birthday.
Mr C. D. Harvey, G3SIJ, of Northampton on 11 March, aged 69.

RAYNET

by S. W. LAW, G3PAZ*

In the suburban tree-lined road where the writer resides the local authorities have recently carried out an extensive lopping operation which certainly improves both the daylight for the residents and the street lighting for the traffic. Moreover, far from harming the trees, this apparently ruthless exercise seems to result in even stronger and healthy growth ultimately. Can we take a lesson from this? Only individual controllers will be able to judge from their own experience how such a philosophy can be applied to the group for which they are responsible. Far be it from us to attempt to make any definite suggestions on these lines but the thought may bear fruit in some areas where controllers are worried about lack of progress.

Every controller has the right to accept or reject an application for membership of the group under his control. In the case of a rejection he will naturally state his reasons to the Raynet Committee as a matter of courtesy to all parties. But what of the long-standing group member who by reason of advancing age or unexpected disability is no longer able to guarantee his instant availability in a tough emergency?

Many controllers have overcome this problem by a system of first and second call-out procedure, grading the members by a questionnaire as to their individual circumstances at annual intervals. Thus a group is assured that the best possible use is made of the personnel comprised in the membership. Meetings and discussions between controllers of adjacent areas will further serve to solve mutual problems and aid the general increase in efficient operation which should always be our aim.

General activity

May we again remind members that suggestions and offers of help at the Raynet section of the RSGB Mobile Rally are still solicited and may be addressed to our committee chairman, G3BPT (QTHR).

The Norfolk and NE Suffolk group are holding a general summer social at Barford on 25 June and extend a hearty invitation to all Raynet members, friends and families to attend to enjoy a pleasant day. Full particulars from their newsletter editor, G8BLD, 21 Romany Road, Norwich NOR 57R (*not* QTHR). Calling frequencies are in the Raynet list on page 124 of the *RSGB Call Book*, 1972 edition. No doubt you will hear of the success of their exercise "Trophy" at Dereham on 27–28 February and compare notes.

Lectures and tapes

While various members still manage to find the time to give some much-needed lectures to interested clubs and other bodies, the lack of recorded material is still felt for these events. May we venture the suggestion that controllers might care to tape a short résumé of the make-up and activities of their groups which could be incorporated into a general lecture tape? Nothing elaborate such as a full exercise is called for, although such would naturally be greatly appreciated.

Raynet Committee

At its meeting at RSGB HQ on 11 March the committee confirmed the appointment of G3TIR as Controller, N Sussex, to replace Ron Vaughan, G3FRV, who is on his way to Australia. We wish him well in his new venture. Also confirmed was the appointment of the acting controller for S Wales, GW3LAD, due to the resignation of the previous controller. It is hoped that a lecture by G3PED in Colchester will produce results, and enquiries have been received from Cambridge. Some enrolments were reported from Buckley, Flintshire, and a group may result. The next meeting of the committee will be on 10 June.

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

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

CONTEST NEWS

To overcome some of the problems recently encountered in vhf/uhf contest operation, the VHF Contests Committee has drawn up the following code of practice.

Code of practice for vhf contest operation

1. Obtain permission from the landowner or agent before using the site, and check that this permission includes right of access. Portable stations should observe the Country Code.
2. Take all possible steps to ensure that a site is not going to be used by some other group or club. If it is, come to an amicable agreement *before* the event. Groups are advised to select possible alternative sites.
3. *All transmitters* generate unwanted signals; it is the level of these signals that matters. In operation from a good site, levels of spurious radiation which may be acceptable from the home station may well be found excessive by nearby stations (up to 25 miles or even further).
4. Similarly, *all receivers* are prone to have spurious responses or to generate spurious signals in the presence of one or more strong signals, even if the incoming signals are of good quality. Such spurious responses may mislead an operator into believing that the incoming signal is at fault, when in fact the fault lies in his own receiver.
5. If at all possible, critically test both receiver and transmitter for these undesirable characteristics, preferably by air test with a near neighbour before the contest. In the case of transmitters, aim to keep all in-amateur-band spurious radiations, including noise modulation, to a noise level of at least −90dB relative to the wanted signal. Similarly, every effort should be made to ensure that the receiver has an adequate dynamic range.
6. Above all, be gentlemanly at all times. Be helpful and **inform all stations** apparently radiating unwanted signals at troublesome levels—having first checked your own receiver! If asked to close down by a Government or Post Office official, do so at once without objectionable behaviour. If the site owner requests your station to close down, accede to his request without hostility.

RSGB 21/28MHz Telephony Contest 1972

Radio amateurs and short-wave listeners throughout the world are again invited to take part in the 21/28MHz contests for single-operator stations. In order to encourage activity from North America, the 28MHz multiplier has been dropped and certificates will be awarded to each continental leader. Each overseas entrant will receive a copy of the results by surface mail. Suitable contest log and cover sheets may be obtained from: The General Manager, Radio Society of Great Britain, 35 Doughty Street, London WC1N 2AE.

TRANSMITTING SECTION

1. The **General Rules for RSGB HF Contests**, published in the January 1972 issue of *Radio Communication*, will apply.
2. **When.** 0700gmt Saturday 7 October 1972 to 1900gmt Sunday 8 October 1972.
3. **Eligible entrants.**

Home section: RSGB members resident in the British Isles.
Overseas section: Licensed amateurs in all parts of the world except the British Isles.

4. **Contacts** may be made using any telephone system for which the entrant is licensed, on the 21 and 28MHz bands.
5. **Scoring.** British Isles stations may not work each other for points. Overseas stations may only claim points for contacts with British Isles stations (G, GC, GD, GI, GM, GW).

British Isles stations. Each completed contact will score five points. In addition, a bonus of 50 points may be claimed for the first contact with each country. For the purpose of scoring the RSGB countries list will apply, with the exception that VE, VK, W/K, ZL and ZS call areas will each count as a separate country.

Overseas stations. Each completed contact with a British Isles station will score five points. In addition, a bonus of 50 points may be claimed for the first contact with each British Isles country-numerical prefix, ie G2, G3, G4, G5, G6, G8, GC2, GC3, GC4, GC5, GC6, GC8, GD2, GD3, GD4, GD5, GD6, GD8, GI2, GI3, GI4, GI5, GI6, GI8, GM2, GM3, GM4, GM5, GM6, GM8, GW2, GW3, GW4 GW5, GW6, GW8.
A check list showing the bonus points claimed should be included.

6. **Entries.** should be sent to: The RSGB HF Contests Committee, c/o R. J. Polley, G3PYC, 81 Beech Road, Horsham, Sussex RH12 4NW, England. Entries should be posted to arrive not later than Monday 11 December 1972.
7. **Awards.** The Whitworth Trophy will be awarded to the leading home section entrant. Certificates will be awarded to the leading station in each continent in the overseas section.

RECEIVING SECTION

These rules should be read in conjunction with the **General Rules for RSGB HF Receiving Contests** published in the January 1972 issue of *Radio Communication*.

1. **Eligible entrants.** The contest is open to short-wave listeners throughout the world. All entrants agree to be bound by these rules.
2. **When.** As transmitting section.
3. **Entries** should be addressed and sent as for the transmitting section.
4. **Scoring.** British Isles entrants may only log overseas stations working UK stations in the contest. Overseas entrants may only log British Isles stations in contact with overseas stations in the contest. A station, whether fixed, portable, mobile or alternative address, may be logged only once for the purpose of scoring.

British Isles entrants. Each complete log entry will score five points. In addition a bonus of 50 points may be claimed for the first station logged in each country. For the purposes of scoring, the RSGB countries list will be used, with the exception that VE, VK, W/K, ZL and ZS call areas will count as separate countries.

Overseas entrants. Each complete log entry relating to a British Isles station heard will score five points. In addition, a bonus of 50 points may be claimed for the first station heard in each British Isles prefix, ie G2, GM3, GW3, etc.
A check list showing the bonus points claimed should be included.

5. **Awards.** The Metcalfe Trophy will be awarded to the leading British Isles entrant and certificates to each continental leader in the overseas section.

July 144MHz Contest rules

When: from 1700gmt on 1 July to 1700gmt on 2 July 1972. All entries and checklogs to: VHF Contests Committee, c/o "Easedale", Woodway, Merrow, Guildford, Surrey. The following General Rules will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11–24.

First 1.8MHz Contest 1972 results

The 1st 1·8MHz Contest was again affected by external difficulties. The power crisis led to a substantial reduction in entries, although the level of activity was not noticeably lower. Possibly, many stations were without power for the first part of the contest.

The Somerset Trophy goes this year to George Gray, G3ZPC. It is pleasing to see a station from north of the border, Ken McDermott, GM3SSB, up with the leaders in second place. His score in this contest, together with his score in the 2nd 1·8MHz Contest 1971 wins him the Maitland Trophy.

Conditions were generally quite good with 191 UK and 24 European calls appearing in logs. This year's contest was subject to closer scrutiny than normal and as full a check as possible of all logs was made. Entrants may, therefore, judge the relative accuracy or otherwise of their logs and adjust their operating accordingly! It should be mentioned that this does not represent a new policy on the part of the HF Contests Committee—the degree of checking depends solely on the time available to committee members—ideally we would like to do a full check in every contest.

A suggested change in the scoring system comes from G3HZL who would like to see it based on a multiplier system made up of counties and countries worked, which, he says, would give entrants a greater incentive to winkle out the weak GMs and dx.

Certificates of merit go to GM3SSB and G3VRW.

D. J. A.

Posn	Callsign	QSOs	Points	Cnty
1	G3ZPC	134	707	DH
2	GM3SSB	121	671	LK
3	G3VRW	120	654	LE
4	G6BQ	115	642	KT
5	G3RPB	117	639	LD
6	G4AFS/A	109	604	HF
7	G3HZL/A	105	579	MX
8	G3WDF/A	103	565	EX
9	GM3FXM	103	564	FE
10	G3VUM	101	560	LE
11	G4AR	103	555	SY
12	G3XEP (G3XUD)	95	537	YS
13	G3RVM	102	532	WE
14	G3JEQ	101	530	SY
15	G3MXJ	93	521	BS
16	G3SKC	91	494	MX
17	G3YMH/A	89	464	CE
18	G3SJE	83	459	MX
19	GM3YOR	78	455	FE
20	G3TR	73	411	SY
21	G3IGZ	71	406	LD
22	G3YPT	68	390	DT
23	G3SIA	71	382	SY
24	GM3UKG/P	87	365	BF
25	G3XFG	69	340	KT
26	G3JLE	58	320	OX
27	G3FJE/A (G3VMI)	58	319	BD
28	G3UKC	52	272	KT
	G3UKS/A	48	272	EX
30	G3KXT	47	267	KT
31	G3WZW	48	258	YS
32	G2BTO	43	245	LE
33	G3VLX	49	233	KT
34	G3ATF	38	212	MX
35	G3FVW	35	192	YS
36	G3ZOD	32	188	CH
37	G3RZP	33	184	EX
	G4ALG	34	184	BE
39	G3LHN	33	175	MX
40	G8WY/A (G3XUM)	28	135	LE
41	G3ZNH	22	128	WE
	GD5DZ	25	128	IM

Entry not accepted—G3XSA, multi-op.
Checklogs from G4AEQ, OK1MAC and OL5ANJ acknowledged with thanks.

Maitland Trophy

Posn	Callsign	2nd 1971	1st 1972	Total
1	GM3SSB	645	671	1,316
2	GM3FXM	606	564	1,170
3	GM3UKG/P	561	365	926
4	GM3YOR	366	455	821
5	GM3NCS/A	472	—	472
6	GM3ZRT	218	—	218

DF Qualifying Round—Chelmsford

Date: 11 June 1972.
Map: OS Sheet 162 (Southend-on-Sea).
Assembly: 1300bst for start at 1320bst.
Location: Cross-roads 200yd south of Cricketers PH, Danbury Common approximately five miles due east of Chelmsford NGR 778046. Frequencies and callsigns will be announced at the start.

Intending competitors are asked to notify Mr M. Hawkins, 24 St Cyrus Road, Colchester, Essex, of the numbers in their parties requiring tea as soon as possible and not later than 4 June.

DF Qualifying Round—High Wycombe

Date: 7 May 1972.
Map: OS Sheet 159 (The Chilterns).
Assembly: 1300bst for start at 1320bst.
Location: On the towpath on the north bank of the Thames one mile east of Marlow NGR 873867.

This event is being organized by the Chiltern ARS, and intending competitors are asked to notify Mr C. A. Vernon, Durlston, White Pit Lane, Flackwell Heath, High Wycombe, Bucks, of the numbers in their parties requiring tea. Please advise him as soon as possible.

DF Qualifying Round—Salisbury

Date: 16 July 1972.
Map: OS Sheet 167 (Salisbury).
Assembly: 1300bst for start at 1320bst.
Location: St Michael's Hall, Bemerton (on the NW side of Salisbury) NGR 125314. Frequencies and callsigns will be announced at the start.

Intending competitors are asked to notify Mr R. A. Titt, Royston, Middle Winterslow, Salisbury, Wilts. of the numbers in their parties requiring tea as soon as possible and in any case not later than 1 July.

DF Qualifying Round—South Manchester

Date: 25 June 1972.
Map: OS Sheet 101 (Revised 1968) (Manchester).
Assembly: 1300bst for start at 1320bst.
Location: Disused road (formerly a part of the A538), near "The Romper" PH. (The start is only a few hundred yards from the M56.) NGR 808848. Frequencies and callsigns will be announced at the start.

Intending competitors are asked to notify Mr D. C. Holland, 7 Alcester Road, Sale, Cheshire M33 3GW, of the numbers in their parties requiring tea as soon as possible and in any case not later than 18 June.

1972 432MHz Cumulative Contest Results

With over 150 different callsigns appearing in the logs submitted by the 10 leading contestants, it is estimated that well over 200 stations were active at some time during the contest. This is the highest level of activity ever recorded during the 432MHz Cumulatives and it shows that the many reports of "poor activity" and "few stations on 70cm" can be misleading.

Conditions throughout were only average at the best, and exceptionally few high scoring contacts were made even by the portable stations. Significant gaps appeared in some logs owing to the power cuts, but with only three out of seven sessions required, most contestants managed to send in the minimum number of logs.

Robin Lucas, G8APZ/P, operating solo, is to be congratulated on achieving victory with an outstanding score and an exemplary log; the UCNW ARS, GW8ERP/P, successfully gained second place with a multi-operator entry; and third place went to Malcolm Sparrow, G8ACB, who, as a solo operator, richly deserves his success on returning the highest score from a fixed station. Certificates will be awarded to the three leading stations.

C. S.

Posn	Callsign	Points	QSOs	Best QSO	(km)	Cnty	Pwr (W)	Aerial
1	G8APZ/P	346	90	G3KMS	265	BE	25	18-el para
2	GW8ERP/P	316	78	G8BCA	230	DB	40	18 + 18 para
3	G8ACB	238	86	GD2HDZ	232	SD	55	46 + 46 multi
4	G3KMS	237	63	G8AHF	334	LE	110	47-el multi
5	G8ATK	229	97	G8BCA	150	SY	10	18-el para
6	G3EHM	199	77	G3DAH	280	SD	100	46 + 46 multi
7	G3UBX	179	67	GD2HDZ	239	—	25	4 × 46 multi
8	G2RD	177	93	G3NNG	192	SY	30	multi
9	G5DF	164	60	G8BCA	160	BE	100	multi
10	G5UM	160	60	G8DNK	130	LR	16	14-el
11	G8AVX	158	52	GD2HDZ	262	WK	60	46-el multi
12	G8BIL	157	61	G8AHF	188	WK	38	46-el multi
13	G8BGC/P	148	58	G3PMX	120	BE	16	4 × 8/8
14	G8BCG	136	52	—	—	LE	80	2 × 46-el
	G3PMX	136	55	G3EHM	210	EX	7	18-el para
	G8ADC	136	66	G3DAH	128	BD	30	46 31 multi
17	G8ABI	130	56	G3KMS	125	WR	15	—
18	GD2HDZ	125	17	G8AVX	260	IM	40	18-el para
19	G8EGG	122	64	G8BXC/P	102	SY	12	14-el
20	G8CTT	106	103	G3NNG	120	KT	30	18-el para
21	G8ERW	103	57	G8AWS/P	255	HF	26	18-el para
	G8CIT	103	141	G6GN	157	MX	75/25	18 + 8/8
23	G3OHH	100	90	G8BBB	210	—	10 o/p	18-el
24	G8DNK	99	40	G8DCA	210	YS	150	8/8
25	G8FCK	90	72	G8AAY	150	HE	90	18-el para
26	G8AZU	83	70	G3NNG	88	MX	2½	46-el
27	G8CMT	72	36	G8AYY/P	116	NM	8	46-el multi
28	G3WSN	56	25	G3NNG	147	EX	50/p	2 × 18-el
29	G8AAY	53	15	G3PMX	206	—	28	18 Bi-sq
	G8ECR	53	33	G8AYY/P	148	SX	10	46-el multi
31	G8AQZ	52	30	—	—	ST	25	8/8
32	G2WS	45	33	G3ZVC/P	90	ST	70	11-el
33	G8CGN	40	25	G8ACB	100	GR	3	46-el multi
34	G8VN	39	31	G3NEO	54	DY	20	10-el
35	G3YDY	38	23	G8BBB	72	EX	3	18-el para
36	G8ANU	34	33	G3KMS	98	SD	12	multi
37	G8BKR	31	25	G3ZVC/P	68	GR	25	46-el multi
38	G4AGQ	18	18	—	—	YS	30	8/8
39	G3NZG	14	8	G8ATK	145	DT	25	46-el multi

Contests calendar

6–7 May—432MHz (Rules in March issue)
7 May—DF Qualifying Round—High Wycombe
13–14 May—USSR CW
20–21 May—YL ISSBers CW
21 May—144MHz (Rules in March issue)
27–29 May—YL ISSBers Phone
3–4 June—NFD (Rules in February issue)
10–11 June—70MHz (Rules in April issue)
11 June—DF Qualifying Round—Chelmsford
24–25 June—Summer 1·8MHz
25 June—DF Qualifying Round—South Manchester
25 June—Microwave Contest (Rules in April issue)
1–2 July—Venezuelan
1–2 July—144MHz (Rules in this issue)
8–9 July—SSB Field Day (Rules in March issue)
16 July—DF Qualifying Round—Salisbury
22–23 July—Colombian
23 July—432MHz
30 July—DF Qualifying Round—Stratford
5–6 August—WAE CW
13 August—70MHz
20 August—144MHz SSB
2–3 September—VHF NFD (Rules in March issue)
2–3 September—IARU VHF (Rules in April issue)
3 September—DF Qualifying Round—Rugby
9–10 September—WAE Phone
10 September—80m Field Day
17 September—DF Final Round—Oxford
7–8 October—21/28MHz (Rules in this issue)
7–8 October—IARU UHF (Rules in April issue)
21–22 October—7MHz CW
28–29 October—CQ WW DX Phone
4–5 November—7MHz Phone
5 November—144/432MHz CW
11–12 November—Second 1·8MHz
25–26 November—CQ WW DX CW
November–December—70MHz Cumulative

MOBILE RALLY NEWS

15th Longleat Mobile Rally

Sunday 25 June 1972

Organized by Bristol RSGB Group

Longleat is near Warminster, Wilts. or can be reached via Frome and there is something for everyone in its grounds. The wildlife park, the stately house, the gardens, children's zoo and plenty of space to picnic, park your car or just ragchew.

Twenty trade stands will be housed in spacious marquees. The rally starts at 10am. Overnight camping facilities available from 6pm 24 June. Talk-in stations: G3TAD/P on 1,885-kHz, G3OLB/P on 3,750kHz and G3XOD/P on 145 and 144.250-MHz.

Rally organizer: Tony Williams, G8CKJ.

Verulam Mobile Rally, 17 June
Organized by the Verulam ARC, this event will be held in the grounds of Salisbury Hall, London Colney, on the A6 about 5km SE of St Albans. Talk-in stations, GB3VER, on 160m and 2m; trade stands; prototype Mosquito aircraft on show; miniature railway; picnic facilities. Further information from G3PAO, QTHR.

Spalding Tulip Time Rally, 7 May
At the picnic site at Surfleet, four miles from Spalding on the A16 Spalding-Boston road immediately south of the bridge and on the east side of the road. Overnight camping and caravan facilities available Friday and Saturday. Trade stands, bring and buy stall, displays, 160m rf contest, distance travelled prize, raffle, etc. Talk-in from 10am: G3VPR/P 1,980kHz; G3XBS/P 145·8MHz; G3MMS/P 70·26MHz. No admission charge.

Anglian Mobile Rally, 18 June
To be held at the Suffolk Show Ground, Ipswich; Bucklesham Road entrance—not the main entrance on the A45 to Felixstowe. Traffic from S, W and N is advised to take by-pass round Ipswich to Felixstowe Road, turn sharp left at island near St Augustine's Church (and not the main road to Felixstowe), proceed for nearly 1½ miles and show ground is on right. Talk-in on 2, 4, 160 and 80m. Admission 20p. Family entertainment, free, will include trampoline, donkey rides, dancing, Punch and Judy, sports etc. Trade stands. Overnight camping.

Mobile Rallies Calendar

7 May	Cardiff RSGB Group mobile picnic, Porthkerry Park, Barry.
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
17 June	Verulam ARC at Salisbury Hall, London Colney, Herts.
18 June	Anglian, at Suffolk Show Ground, Ipswich
25 June	Bristol City & County RSGB Group, at Longleat, Warminster, Wilts.
25 June	GW2OP Bucket & Spade Party at Saundersfoot.
2 July	South Shields & DARC at Redwell County Secondary School, South Shields.
9 July	Cornish RAC at Truro Rugby Football Ground.
16 July	Worcester & DARC, at Hill County Secondary School, Upton-on-Severn, Worcs.
16 July	Scarborough ARS at Burniston Road Barracks, Scarborough.
6 August	RSGB 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 Stations

Dundalk Maytime Festival, 12-21 May
The Dundalk ARS will operate a special station, EI0DMF, in conjunction with this event. Operation will be on all bands 80m to 10m, ssb and cw modes as conditions permit.

Hereford Cider Festival, 4 June
Hereford ARS will set up a special station for the last day of the festival, 4 June, with possible activity on 3 June. Operation will be on 2m a.m. and rtty; 10, 15, 20m ssb; and possibly 80m.

Festival of Kidderminster, 23-24 June
GB3FK will be the call of a special station which will be operational as part of the festival from 2.30pm to 10pm on 23 June and 10am to 10pm on 24 June. Two stations will be operational on ssb hf, another on 2m; and 2m and possibly 80m will be used for talk-in stations, the 2m channel being 144·396MHz.

Looking ahead

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.

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 and licensed bar available. 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.

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, for details of meetings.

Blackburn (East Lancashire ARC)—First Thursday of month, 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Secretary W. E. Baxendale, G8FDG, "Juverna", 29 Westland Avenue, Darwen, Lancs.

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

Bury (B & Rossendale RS)—9 May ("Converting portable transistor rxs for top band and for use in direction finding equipment", by G3FLR), 8pm, George Hotel, Market Street, Bury. 13 June (Talk by R. Lascelles, Manager of Jodrell Bank). The newsletter, edited by G8DHT, is now in full swing. G8DHT would like to receive contributions so that useful information may be spread among members. Former members may obtain copies from the secretary, G3RSM for 3p plus postage.

Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock. 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 1900-2000 and on the air working, 160 and 2m, extending later to 80m. 2000–2130bst main activities. Net night on 160m on Mondays starting at 1900bst, Tuesdays on 2m at the same time. Full details from G3JWK.

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

Douglas (IOM) (D & DARS)—The society has had to relinquish the tenancy of their premises. The group is continuing its activities and the secretary will be happy to advise and welcome any visitors or intending visitors to the island. Secretary GD3YUM.

Eccles (E & DARC)—Tuesdays, 8pm, Bridgewater School, Worsley, Manchester. Club 2m net channel 145·7MHz. Secretary G4AEQ.

Lancaster University (UOLARS)—As well as being busy organizing the convention to be held on 23–24 September the society will be active during the summer term on field days and vhf outings. Details from G3YLV.

Leyland Hundred Amateur Radio Group—Second Monday of month, 7.30pm, Rose and Crown Ulnes, Walton, Leyland. Net night is Saturday, 1900bst on 145·8MHz. Details from F. Harrison, 78 Lancaster Lane, Leyland, Lancs.

Liverpool (L & DARS)—Thursdays, 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary G3WCS.

Liverpool (NLRC)—Tuesdays, 8.30pm, informal meeting at the "Nags Head", Thornton, Crosby, Liverpool 23. Visitors always welcome. Secretary G3XMG.

Manchester (M & DARS)—Wednesdays. 17 May ("Computers", by Don Shaw, G3JIB), 7.30pm, 203 Droylesden Road, Newton Heath, Manchester 10. Morse classes for G8s and SWLs. Secretary G3IOA.

Manchester (South Manchester RC)—5 May ("VHF and uhf receiving techniques", by P. Torry, G3SMT), 12 May (Talk by "home-brew" contest winner), 19 May (AGM—please be early), 26 May (IC review by R. J. Slatten, G3EXF). Club meets on Fridays, 8pm, Sale Moor Community Centre, Norris Road, Sale, Cheshire. VHF activity night is Mondays with operation from the club shack "Greeba", Shady Lane, Manchester 23 at 8pm. Visitors are welcome on Mondays and Fridays. Secretary G3WFT.

Manchester University ARS—G3VUM is operating on all hf bands with a KW2000A into a 6 element beam, G5RV on 160m dipole at 100ft. The society also runs a series of visits and lectures—also tuition for RAE and morse test. Details from G8BVF, G3ZNS or GM3YOK, University Union, Oxford Road, Manchester.

Preston (PARS)—11, 25 May, 7.30pm, Windsor Castle (private room), St Paul's Square, Preston. Morse practice, 7.30pm, main feature at 8pm. Secretary G. Earnshaw, G3ZXC.

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

Thornton Cleveleys (TCARS)—First and third Wednesdays of month, St John Ambulance Brigade HQ, Fleetwood Road North, Thornton. Details from G3ZYE.

Westmorland (WRS)—First Monday of month, New Allen Technical College. Secretary E. P. Goonan junr, "Longridge", Storth, near 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. Secretary G3SWD.

Wirral (Wirral DX Association)—Last Thursday of month at members' homes. 25 May at G2SB for talk on FT747 by G3VZM. Secretary M. Davidson, G3YSM, 43 Stuart Avenue, Moreton, Wirral. Visitors are welcome, please inform the secretary beforehand.

Local RSGB members in **Crewe** meet at the home of R. Owen, 10 Circle Avenue, Willaston, Nantwich, from whom further details may be obtained; 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)—12 May (To be announced), 26 May ("Frequency measurement at vhf", by J. Ward, G4JJ), 7.30pm, King George's Hotel, Peel Street, Barnsley. AR Peter Ackley, Barnsley "Camelot", Greenside, Havercroft, Wakefield. *G3LRP.*

Bradford (BRS)—2 May (Visit to BBC Moorside Edge transmitting station), 16 May ("ICs and transistors in the ssb transceiver", by A. Walker, G3DAR), 30 May (Final briefing for NFD), 3-4 June (NFD), 6 June (NFD—let's talk it over). 7.30pm, HQ, 10 Southbrook Terrace, Great Horton Road, Bradford 7. Hon secretary G. Cooper, G3HJP.

Fulford (York) (FARS)—Tuesdays, 7.30pm, Scout HQ, 31 George Street, York. Hon secretary G. W. Kelley, G5KC.

Halifax (NHARS)—10 May (Ragchew), 24 May (Visit to Elland Power Station), 31 May (Ragchew), 7 June (Visit to Bairds of Shipley), 7.45pm, Peat Pitts Inn, Ogden. Hon secretary A. Robinson, G3MDW.

Harrogate & Knaresborough (H & KRS)—Meets on the second and third Mondays of month. Further details from the hon secretary R. Troughton, G8CRH.

Hull (H & DARS)—5 May (Preparation for field day), 12 May ("Mobile gear", by G3WWD), 19 May ("Aerials", by G3PQY), 26 May (Quiz). On Sunday 28 May this society will hold its first mobile rally at the East Riding College of Agriculture, Bishop Burton, nr Beverley. Official opening at 2pm. Features include a talk on "Mobile suppression", by J. H. Jones, G3GBH, a treasure hunt, best mobile competition, barbeque tea, trade stands, bring and buy stall, sports for the juniors, hay rides and many other usual rally attractions. Talk-in stations: G3AMW on 1980kHz and G8EAH on 145MHz. All rally details from L. Colley, G3AGX, "Micassa", 13 Ferry Road, Wawne, nr Hull. Hon secretary Mrs M. Longson, 4 Chester Road, Hull.

North Riding (NRARG)—Meets on alternate fortnights at "Alma Inn", Alma Parade, Scarborough, and "White House", Whitby. Details from the hon secretary J. E. Agar, G8AZA, QTHR.

Otley (ORS)—Tuesdays. 9 May ("Loudspeakers and enclosures", by Dr A. R. Bailey, G3IBN, designer of the Bailey amplifier), 30 May

(Tape/slide lecture), 8pm, 14 Court House Street, Otley. The following officers were elected at the recent AGM: Chairman, B. Cattley, G8DUE; vice-chairman, K. Dale; secretary, D. G. Mott, G8BZY; treasurer, M. Birkett.
Scarborough (SARS)—Fridays, 7.30pm, Technical College, Scalby Road, Scarborough. Details from G8KU or G3VAN, QTHR.
Sheffield (SARC)—Third Monday of month at Sheaf House Hotel, Bramhall Lane. All communications to G8NN or G3JMV, QTHR.
South Shields (SS & DARC)—Fridays 8pm, Trinity House Social Centre, Laygate, South Shields.
Spen Valley (SVARS)—Thursdays. 4 May (Demonstration of members' equipment), 11 May (Visit to Huddersfield Polytechnic), 18 May ("Electronics in the postal service", by L. W. Burkitt), 25 May (Open meeting), 7.30pm, HQ, The Grammar School, High Street, Heckmondwike.
Sunderland (SARS)—Meetings on the first and third Tuesday of month, 7pm, Sunderland Polytechnic. *G3XID.*
Wakefield (W & DRS)—Alternate Tuesdays, 7.30pm, Wakefield Youth Centre, Ings Road, Wakefield. Club call G3WRS. *G3XVU,* QTHR.
York (YARS)—Thursdays. 7.30pm, British Legion, 61 Micklegate, York. Hon secretary J. A. Rainbow, 14 Temple Road, Bishopthorpe, York.

All Region 1 club secretaries and PROs please note deadlines for club news: June issue 5 May; July issue 5 June; August issue 3 July; September issue 4 August. These are deadlines at RSGB HQ. Please give me at least seven days on top of the above dates. Many thanks, G8AZA, RR Region 2, QTHR. Telephone Scarborough 2486.

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—10 May ("Basic radio", part 4), 17 May (Df practice night), 24 May (Tape/slide lecture "Club activity", by D. Bosworth, G8BAV), 31 May (Discussion "Modern beam aerials—hf/vhf/uhf). Club meets at 119 Green Lane, Derby at 7.30pm.
Derby (Nunsfield House ARG)—Every Friday. 5 May (Technical film show), 12 May (Team quiz "Identify this sound"), 19 May (Night on the air), 26 May ("An evening in space", lecture with slides by Clive Holland and Christopher Lewington), 7.30pm, Room 7, Nunsfield House, Alvaston.
Melton Mowbray (MMARS)—15 May ("Aerials", measurement, tuning etc by G4MK, G3FDF and G3NVK), 7.30pm, St John Ambulance Hall, Ashfordby Hill.
Nottingham (ARCON)—11 May (NFD preparations), 25 May (Provisionally a talk by Bill Lowe of Matlock), 7.30pm, Sherwood Community Centre, Mansfield Road. The club will be operating a station at Long Eaton Carnival on 20–21 May.

REGION 5 — RR P. J. Simpson, G3GGK

Bedford (B & DARC)—4 May (NFD planning and direction finding), 11 May (Demonstration of FTDX560 by G4ACP), 14 May (Df hunt—see G3FWA for details), 18 May (Illustrated talk on Fiji by G3HZG), 21 May (Vhf contest—G8CXM), 25 May ("Small projects for the novice", by G3XDU), 28 May (Spring holiday net, 3·65MHz at 1000 local), 8pm, The Dolphin, Broadway, Bedford. Hon secretary John Bennett, G3FWA, 47 Ibett Close, Kempston, Bedford.
Cambridge (C & DARC)—Every Friday. 5 May (Idiot inventors' contest—a radio leg pull), 12 May (Informal), 7.30pm, Club HQ, Corporation Yard, Victoria Road, Cambridge. Hon secretary J. Hern, G3NAC, c/o Club HQ.
Dunstable Downs (DDRC)—5 May ("Talk on 3cm", by G3RPE), 12 May (between week ragchew, RAE and morse), 19 May ("ICs in solid-state communications equipment", by G4AHE), 26 May (Between week), 2 June ("Tv sound", talk by G3RBI), 8pm, Chews House, 77 High Street, South Dunstable. Hon secretary C. G. Powell, G8BPK, 1 Wenwell Close, Buckland Wharf, Aston Clinton, Aylesbury, Bucks.
Ely (EARS)—Club meets on 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)—No details received. Contact the Hon secretary John Allen, G3DOT, 77 Rosslyn Crescent, Luton. Beds.
March (M & DARS)—Tuesdays, 7.30pm, The Old Police HQ, High Street, March. Hon secretary K. C. Smith, G8BEN, 36 New Road, Whittlesey, Peterborough, Northants.
Shefford (S & DRS)—4 May ("First aid", by Jim Robinson), 11 May (Morse quiz—club), 18 May (Visit to Sandy Heath BBC Station—club), 25 May (Df hunt—G2AUA), 8pm, HQ, Church Hall, Ampthill Road, Shefford, Beds. Hon secretary A. Sullivan, G2DGF, 12 Glebe Road, Letchworth, Herts.
Stevenage (S & DARS)—Club meets on the first and third Thursdays of month, Senior Staff Canteen of Hawker Siddeley Dynamics Ltd, Gunnels Wood Road, Stevenage. Hon secretary Mr V. Collett, G3OVT, 8 Silam Road, Stevenage, Herts.

REGION 6 — RR L. W. Lewis, G8ML

Bicester (BARS)—Every Friday. 5 May (Formal meeting), 12 May (A discussion of tvi—the causes, prevention and cures), 19 May (The telephone system as seen through the eyes of a PO engineer), 26 May (Transistorized txs). Morse practice at all meetings, 7.30pm for 8pm, 11 Stoneburge Crescent, Bicester. Hon secretary T. H. Shaw, G8EWS, 5 Langford Gardens, Bicester.
Cheltenham RSGB Group—First Thursday of month, 8pm, "Royal Crescent", Clarence Street, Cheltenham. *G2FWA.*

REGION 7 — RR R. S. Hewes, G3JDB

Acton, Brentford & Chiswick (ABCRC)—16 May (Aerial matching and the swl), 7.30pm, Chiswick Trades & Social Club, 66 High Road Chiswick. Hon secretary W. G. Dyer, G3GEH, QTHR.
Addiscombe (AARC)—9, 23 May (No details), 7.30pm, Prince Georges Hotel, High Street, Thornton Heath. Further information from the hon secretary, c/o 32 Nursery Road Thornton Heath, Surrey.
Ashford, Middlesex (Echelford ARS)—8 May (G6JP on vhf), 25 May (Being arranged), 7.30pm, St Martin's Court, Kingston Crescent, Ashford, Middlesex.
Barking (BR & ES)—11, 25 May (No details), 7.30pm, Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking, Essex. Hon secretary H. Davidson, G3FZP, QTHR.
Bexleyheath (North Kent RS)—11 May (AGM), 25 May (Field day arrangements, part 2, combined meeting with Cray Valley Radio Society), 7.30pm, Congregational Church Hall, Chapel Road, Bexleyheath. Hon secretary M. Lee, G4BAL, QTHR.
Burnham Beeches (BBARC)—18 May (No details), 8pm, Hedgerley Scout Hut, Hedgerley, nr Slough, Bucks. Hon secretary I. Machardie, G3YMV, QTHR.
Cheshunt (CDRC)—No information received. Club meets at Methodist Church Hall, opp Theobalds station, Cheshunt. Hon secretary K. S. Arnold, G3XNP, QTHR.
Chingford (Silverthorn RC)—Every Friday, 7.30pm, Friday Hill House, Simmonds Lane, Chingford E4. Hon secretary A. P. Mitchell, G3YJZ, QTHR.
Cray Valley (CVRS)—4 May ("CVRS and its members", by Derek Baker, G3MXD), 18 May (Natter nite), 8pm, Congregational Church Hall, Court Road, Eltham SE9. Hon secretary J. M. Tripp, G3YWO, QTHR.
Croydon (Surrey Radio Contact Club)—16 May (No details received), 7.30pm, "Swan & Sugarloaf", South Croydon. Hon secretary S. A. Morley, G3FWR, QTHR.
Crystal Palace (CP & DRC)—20 May (to be announced), 8pm, Emmanuel Church Hall, Barry Road, SE22. At the AGM in February Bob Burns, G3OOU, was re-elected Chairman; treasurer, G2LW; secretary, G3FZL; committee members, G3IIR, G3SBV and G8CSC; area representative, G3XFT; affiliated society representative, G3FZL. *G3FZL, QTHR.*
Dartford Heath (DF Club)—19 May (No details received), 7.45pm, Clubroom, Broomhill Road, Dartford, Kent. Hon secretary Maureen Worbey, G3XVC, QTHR.
Ealing (E & DRS)—Every Tuesday, 7.30pm, Northfields Community Centre, Northcroft Road, W13. Further details from hon secretary J. E. Alban, G3JEA, QTHR.
East London RSGB Group—Meets at Wanstead House, The Green, Wanstead, E11.

Edgware (E & DRS)—8 May (Talk by G3GC and G3SJE on "Contest operating"), 22 May (NFD briefing), 8 pm, St George's Hall, 51 Flower Lane, Mill Hill, NW7. Hon secretary Alan Masson, G3PSP, QTHR.

Gravesend (GRS)—Wednesdays, 8pm, Northfleet Recreation Centre, Springhill Road, Northfleet, Kent. Further details from A. J. Moules, 166 Darnley Road, Gravesend, Kent.

Greenford (GARS)—12, 26 May (No details received), 8pm, Greenford Community Centre, Oldfield Lane, Greenford. Hon. secretary John Hedges, G3MMQ, QTHR.

Guildford (G & DRS)—12 May (Being arranged), 26 May (NFD discussion), 8pm, Guildford Engineering Society, Stoke Park, Guildford, Surrey. Hon secretary Peter Hopwood, G8CQM, 27 Woodruff Avenue, Burpham.

Hampton Court (Thames Valley ARTS)—No information received. Club meets at 8pm, "The Three Pigeons", Portsmouth Road, Long Ditton. Further details from PRO Rob Muir, G3LHN, QTHR.

Harlow (DRS)—21 May (Afternoon picnic, Takeley end of Hatfield Forest, Essex. All welcome, please bring your own food). Every Tuesday, 8pm, Mark Hall Barn, First Avenue, Harlow, Essex. Club station is now operational on 80-10m ssb/cw. Club net on Sunday mornings on 28·8MHz, also most nights on same frequency. Further details from hon secretary, V. Heard, 106 Vicarage Wood, Harlow, Essex.

Harrow (RSH)—19 May (Construction contest with junior and senior sections competing for silver cups and cash prizes), 8pm, Harrow County School for Boys, Sheepcote Road, Harrow. Hon secretary Les Light, G3KDL, QTHR.

Havering (H & DARC)—3 May (VHF NFD preparations/RAE questions), 8pm, British Legion House, Western Road, Romford. Hon secretary S. J. Hobday, G3SKV, QTHR.

Hemel Hempstead (HH & DARS)—19 May (No details received), 7.30pm, "Addmult" Sports Club, Hemel Hempstead. Hon secretary A. J. Wakefield, 88 Heather Way, Hemel Hempstead, Herts.

Holloway (Grafton RS)—Mondays (RAE), 7pm; Fridays (Morse and club), 7.30pm; Archway School Annex, Whittington School, Highgate Hill, N19. Hon secretary Tom Coleman, G8EEI, QTHR.

Kingston (K & DARS)—10 May (No details received), 8pm, "Penguin Lounge", 37 Brighton Road, Surbiton. Hon secretary R. S. Babbs, 28 Grove Lane, Kingston.

Loughton (L & DRS)—12, 26 May, 8pm, Loughton Hall, Rectory Lane (nr Debden Station). Further details from the hon secretary David Bowers, 12 Theydon Park Road, Theydon Bois, Epping, Essex.

New Cross (Clifton ARS)—Meetings every Friday, 8pm, 225 New Cross Road, London SE14. Hon secretary, C. H. Gentry, 58 Camilla Road, Bermondsey SE18.

Northolt (BEAARS)—First Wednesday of month, BEA Trident Club, Western Avenue, Northolt, Middlesex. (This club is open to non-BEA employees by invitation, contact David Evans, G3OUF, telephone Amersham 3257, for details.)

Paddington (P & DRS)—Every Wednesday. Club meets at 8pm, Beauchamp Lodge, 2 Warwick Crescent, W2. Further details from hon secretary Mike Pawley, G8AWV, QTHR.

Purley (P & DRS)—9, 23 May, 8pm, The Lansdowne Hall, Lansdowne Road, Purley. Further details from the hon secretary, A. Frost, G3FTQ, QTHR.

Reigate (RATS)—17 May (No details, 8pm, "Marquis of Granby", Redhill. Hon secretary D. Thom, G3NKS, QTHR.

Scouts (Baden Powell House ARC)—13 May (To be announced), 7.30pm, Baden Powell House, Queensgate, South Kensington, SW7. Contact A. Watts at 312 Tudor Drive, Kingston, for details.

Southgate (SRC)—11 March (No details), 7.30pm, Civil Defence Hut, Bowes Road, N11 (opposite Arnos Grove Tube Station). PRO Steve White, G3ZVW, QTHR. All visitors welcome.

St Albans (Verulam ARC)—17 May (No details), 7.30 for 8pm, Town Hall, St Albans. Hon secretary Hugh Young, G3YHY, QTHR.

Sutton & Cheam (SCRS)—16 May (NFD planning), 8pm, "The Harrow" Inn, High Street, Cheam. Hon secretary Jack Korndorffer, G2DMR, QTHR.

Welwyn (mid-Herts ARS)—9 May (No details), 8pm, Welwyn Civic Centre, Welwyn, Herts. Hon secretary Peter Willcocks, G8AIE, QTHR.

Wimbledon (W & DRS)—Club meets at St John Hall, 124 Kingston Road, South Wimbledon, SW19.

Wembley (GECARS)—Thursdays, 7pm, Sports Club, Preston Road, North Wembley. (This club is open to non-GEC employees by invitation. Telephone Dain Evans, G3RPE, at 01-904 1252 during business hours for details).

Woolwich—This society is being re-formed, contact B. D. Corper, G3ZOJ, QTHR, for details.

REGION 8 — RR D. N. T. Williams, G3MDO

Brighton (Brighton Technical College ARC)—Club meets on alternate Mondays. Further details of meetings from the hon secretary R. T. Henley, G2CMH, 35 Willington Way, Brighton.

Canterbury (EKRS)—5 May (Uhf meeting at Wye College), 18 May ("Test equipment with respect to the amateur", by G3JIX), 15 June (Junk sale). Monthly meetings at Westgate Hall, Canterbury. Alternate meetings in conjunction with the UKC at the Electronics Building. Further details of future events from G3MDO, QTHR.

Crawley (CARC)—24 May (Talk with slides on VP8 by G3KAX), 8pm, Trinity Congregational Church Hall, Ifield, Crawley.

Eastbourne (Southdown ARS)—1 May (Amateur television demonstration), 5 June (AGM). Club meets at the Victoria Hotel, Latimer Road, Eastbourne.

Horsham (HARC)—First Tuesday of month. 2 May (Wavemeters and licensing conditions for the radio amateur), 7.30pm, Guide HQ, Denne Road, Horsham.

Maidstone (MYMCAARS)—26 May ("Tvi causes and cures", by G3ORP), 23 June ("The G3IAS keyer"). Meetings held every Friday at "Y" Sports Centre, the first and third Fridays being devoted primarily to the beginners.

Mid-Sussex (MSARS)—Meetings held at Marle Place, Leylands Road, Burgess Hill.

Thanet (TRS)—Meetings held every Friday, Hilderstone House, Broadstairs.

Tunbridge Wells (West Kent ARS)—12, 26 May, 2 June, 7.30pm, Art Centre, Monson Road, Tunbridge Wells. Further details from the hon secretary, H. Richards, 17 Reynolds Lane, Tunbridge Wells, or G3YOU, QTHR.

Worthing (W & D ARC)—Meetings held every Tuesday, Rose Wilmot Youth Centre, Littlehampton Road, Worthing.

REGION 9 — RR H. W. Leonard, G4UZ

Bristol (City & County RSGB Group)—22 May ("ICs for the amateur", by E. Halliday, G3JMY), 7.30pm, Becket Hall, St Thomas Street, Bristol 1. *G3ULJ*.

Bristol (BARC)—Tuesdays and Thursdays, 7.30pm, Dept of Physics, Royal Fort, Tyndalls Park Road, Bristol 8. *G8ADP*.

Burnham on Sea (BoSRC)—Contact J. Robertson, G3ZOR, for details. Telephone 2333.

Cornish (CRAC)—First Thursday of month. 4 May ("Long distance telephone communication", by MPT), 7.30pm, SWEB Social Centre, Pool, Camborne. *G3UCQ*.

Newquay Group (CRAC)—Fortnightly, 7.30pm, Treviglas School, Newquay. Further details from G3NKE, telephone Camborne 2419. *G3THT*.

Exeter (EARS)—Every Tuesday. 9 May ("Capacitor manufacture", by STC of Paignton), 7.30pm, Community Centre, St David's Hill, Exeter. Further details from A. W. Bawden, 232 Exwick Road, Exeter EX4 2BA.

North Devon (NDRC)—Second and fourth Wednesday of month. 10 May (Talk), 24 May (Ragchew), 7.30pm, "Grinnis", High Wall, Sticklepath, Barnstaple. RAE session at 7pm each meeting. *G4CG*.

Plymouth (PRC)—First and third Tuesday of month. 2 May (AGM), 16 May (Sale of the century junk sale), 6 June (Open meeting), 7.30pm, Virginia House, Bretonside, Plymouth. Further details from S. E. Martin, 32 East Park Avenue, Plymouth PL4 6PF.

Saltash (S & DARC)—First and third Friday of month. 5 May (Fox hunt, starting from Club HQ), 7.30pm, 19 May (Discussion of operating techniques), 7.30pm, Burraton Toc H Hall, Warraton Road, Saltash. Hon secretary G4AJU, 302 St Peter's Road, 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. 27 May (NFD preparation and 50/50 junk sale), 7.30pm, rear of 94 Belgrave Road, Torquay. Visitors welcome. *G6NQD*.

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

Blackwood (ARC)—Fridays, 7.30pm during school terms, Oakdale Community Centre, Oakdale, Mon. *GW3TUG.*
Barry College of Further Education (ARS)—Thursdays, 7pm during College terms. The ambitious programme of events celebrating the seventieth anniversary of the Marconi-Kemp Bristol Channel experiments include activity from both Flatholm and Lavernock Point sites during the period 14-21 May, the issue of a commemorative stamp by the PO, a luncheon on 19 May when the guest of honour will be Mr Huw Wheldon, OBE, MC, Managing Director BBC TV, and a social at the Lavernock Point site on Saturday 20 May at 7.30pm, when all local amateurs will be welcome. The operator requirements for the two stations will be heavy, and any amateurs willing to assist are asked to contact GW3VPB. *GW3VKL.*
Cardiff (RSGB Group)—8 May, 7.30pm, the BBC Club, Llandaff, nr Cardiff. The annual mobile picnic will be held at Porthkerry Park, Barry, on Sunday 7 May. This event is, as usual, completely informal, and has enjoyed great success in the past. There will be 2m and top band talk-in stations, and a df contest. The group will visit the Royal Radar Establishment, Malvern, later in the month, but numbers are limited and those interested should contact GW3GHC. *GW3GHC.*
Glamorgan Raynet Group—Details of meetings and exercises available 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. Secretary Mr F. E. Tribe.
Pembroke & District RSGB Group—Last Friday of month, 7.30pm, Defensible Barracks, Pembroke Dock, Pembs. That hardy annual the GW2OP Bucket and Spade Party will be held on Sunday 25 June at the usual location, the Regency Hall, Saundersfoot, nr Tenby. This is one of the few events not affected by weather, since it is adjacent to the harbour and beach, yet offers ideal accommodation in the event of rain. *GW3LXI.*
Sully & District Shortwave Club—Tuesdays, 7pm, The Annexe, Sully Bowls & Social Club, 59 South Road, Sully, Glam. The club is busy preparing for a season of exhibition stations at local fetes, and is planning to repeat the Welsh 80m Contest. *GW3ZSV.*
Rhondda (ARS)—Meets at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. Details from GW3PHH.
Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Swansea, Glam. Secretary Mr D. E. Connor, 7 Glanmon Road, Sketty, Swansea Glam.
University College, Cardiff (ARS)—Examination considerationa somewhat limit activities during this period, but the complets reorganization of the society accommodation and erection of e full-size beam aerial auger well for future work. Hon secretary, c/o Students Union, Dumfries Place, Cardiff.
University College of Wales, Aberystwyth Radio & Electronics Society—The society can be well satisfied with the activities of the current session. Although work this year has tended to concentrate rather more on experimental electronics generally, the amateur radio aspect is expected to increase next session when more licensed members become available. Secretary, Miss Ruth Bury, c/o Students Union, University College of Wales, Aberystwyth, Cards.

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)—Fortnightly on Fridays, starting 21 April, 7.30pm, Cameron Highlander's Memorial Youth Club, Planefield Road, Inverness. Mr L. Bell, 114 Glenurquhart Road, Inverness.
Inverness (Queen's Own Cameron Highlanders Memorial Youth Club Radio Section)—Tuesdays, 7.30pm, Planefield Road, Inverness. Section caters for all young people from 13 years interested in learning, and obtaining practice, in the elements of radio technique. Mr Bill Begg, 68 Tomnahurich Street, Inverness.
Lhanbryde (Moray Firth ARS)—Wednesdays, 7.45pm, St Andrew's School, nr Lhanbryde, Elgin, Morayshire. GM3UKG, telephone Clochan 225.
Thurso (Caithness ARS)—Second Tuesday of month, 7.30pm, Scapa House, Thurso. *GM3JUD.*

REGION 13 — RR V. W. Stewart, GM3OWU

Berwick (BARS)—Last 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 14 — RR M. Comrie, GM3YRK

Ayrshire (AARG)—7, 21 May, 7.30pm, YMCA, Howard Street, Kilmarnock.
Ayrshire (Ardeer Recreation Club)—4, 11, 18, 25 May, 7.30pm, Ardeer Recreation Club, Amateur Radio Section, Stevenston.
Falkirk & District RSGB Group—12 May, 7.30pm, Temperance Cafe, Lint Riggs, Falkirk.
Glasgow University (GURC)—11, 25 May, 7.30pm, George Service House, University Gardens, Glasgow W2.
Greenock & District (G & DARC)—5, 12, 19, 26 May, 7.30pm, James Watt Library, Union Street, Greenock.
Mid-Lanark RSGB Group—19 May, 7.30pm, YMCA Brandon Street, Motherwell.
West of Scotland (ARS)—5, 12, 19, 26 May, 7.30pm, 81 Virginia Street, Glasgow.

REGION 15 — RR J. Thompson, GI3ILV

Belfast (B & DRG)—Club meets on the third Wednesday in each month, 8pm, 90 Belmont Road, Belfast 4.

REGION 16 — RR D. F. Beattie, G3OZF

Chelmsford (CARS)—First Tuesday in each month, 7.30pm, Marconi College, Arbour Lane, Springfield, Chelmsford. Details of meetings from G3VPK.
Colchester (NEETCARS)—Wednesdays, 7.30pm, North-East Essex Technical College, Sheepen Road, Colchester. Details of meetings from T. Jacobs, 26 Pondfield Road, Colchester.
Ipswich (IRC)—Last Wednesday of month, 7.30pm, Gippeswyk Hall, Gippeswyk Avenue, Ipswich. Details of meetings from G3YWM.
Norwich (NARC)—Every Wednesday. 3 May (Hf transceiver demonstration), 10 May (Informal and morse practice), 13 May (Visit to Mullard Radio Astronomy Observatory at Cambridge), 17 May (23cm discussion and demonstration), 24 May (Informal and morse practice), 31 May (NFD discussion), 7.45pm, Crome Community Centre, Telegraph Lane East, Norwich. Details of meetings from J. M. Draper, G8BLD, The Rectory, Framingham Pigot, Norwich NOR 45W.
Southend (S & DARS)—Every other Thursday. 4, 18 May, Flarepath Canteen, Southend Airport. Details of meetings from G3AXN.

REGION 17 — RR L. N. G. Hawkyard, G3ZKR

Harwell (AERE ARC)—Meetings on the third Tuesday of month, also informal gatherings and junk sales every Friday lunch time, 7.30pm, Social Club AERE, Harwell, Berks. *G3NNG.*
Maidenhead (MDARC)—1 May ("Microphone" lecture), 16 May (Informal), 7.30pm, Victory Hall, Coxgreen, Maidenhead. *G3VMR.*
Reading (RADC)—9, 23 May, Ashmead School, Electronics Lab, Northumberland Avenue, Whitley Wood, Reading. All welcome. *G3ULT.*
Southampton RSGB Group—13 May ("Making printed circuit boards", demonstration by Mr Cargill), Lanchester Building, Southampton University. Club meets every Wednesday evening at the Clubroom, Kent Road. *G3ZKR*, telephone 73378.
Swindon (SDARC)—10 May (Constructional competition—G3JO trophy), 24 May (Foxhunt, organized by G8AVG), 7.30pm, Penhill Junior School, Swindon.

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

Drake 2B rx, Q mult, in exc cond, unused 2½ yrs, sensible offers pse. G3OH, 6 Pearce Avenue, Parkstone, Dorset. Tel Parkstone 4694.

KW2000A + ac psu, spares inc valves, vgc, £145. Appleton, 3 Boyne Rise, Kings Worthy, nr Winchester, Hants.

Minimitter minibeam G4ZU remote control gear, 30ft telescopic mast, erection instructns comp, £20. Heavy duty rotor, mtchng trnsfmr Selsens, £14. Many beam parts, sae for dets. G5NX, Lakeside Hotel, Newby Bridge, Ulverston, Lancs. Tel Newby Bridge 207.

TT21s, new boxed, £1.25. Various other valves, diodes, transistors etc, relays, pots, resistors, caps, fuses, fuse holders, everything must go. Tx, rx etc, cable, meters, printed board, copper wire, coaxial, trnsfmrs. G3SJR, 29 Elm Walk, Stevenage, Herts.

Ficord prof /P tape recorder, 1⅞/7½ips, ¼ track, v small, £10. Ficord automatic batt charger, £4. Vistarama 625 line camera + ccu/spg with camera cable, £30. Muirhead D30A line tester. Wheatstone bridge type, £23. G8AYN, 32 Ironmill Lane, Crayford, Kent. DA1 4RR. Tel Crayford 24625.

Eagle sig gen TE188, £12. Eagle vtvm, £12. Heath scope, 10–12U factory built with mains £25. GEC 100k freq stand, £2. HRO coils BS7–14·4, 14–30, £1·50 ea + post. G8US, QTHR.

Honeywell potmeter chart recorder 4in/hr, £13 ono. CR100 S meter nl, £15. Admiralty psu, metered, £1.50. Cintel counter, needs slight attention, £3. /P geiger counter, comp, £1.50. Dosimeter + charger, uranium thorium salts. G3VFG, QTHR. Tel Leeds 57692.

TCS tx, covers 160m, 80m, 40m, £15. Model radio control tx/rx with servo, £12. Sanyo cassette tape recorder, £18. Sell or exch for Trio 9R59DE/S rx. Cash adjustment. Sae pse. Jenkins, 30 Gainsborough Road, North Finchley, London N12 8AG. Tel 01-445 8722.

Codar CR-70A rx, vgc, £17. Tunnicliffe, 1 Clarence Drive, Llandudno, Caerns. Tel 75237.

Creed 7B teleprinters, fully recond, c/w, new terminal units + psus, also some rolls of paper. Packed in strong transit cases, £16 ea set. Coll or carr extra. G8BWH, QTHR.

Practical Wireless Jan 1956 to Dec 1967, all but 8 copies. Offers + pp Champion, 16 The Orchard, Kings Langley, Herts WD4 8JR. Tel 09277 62882.

Heath SB10U, Labgear LG300 cw tx, psus for same. Will del 30 miles radius. Offers. G3HLF, QTHR. Tel Gravesend 4571.

Cossor double beam scope model 1049 Mk 3A with manual, vgc but needs attention, £20 ono. Bainbridge, 150 Chase Road, Southgate, London N14 4LG.

T28, £12. 160m ttx, £8. HM102, new, £15. HA500, mint, £33. Revere 8mm movie camera, mint, £10. DG7-5 new, £4. Wanted: crt DG7-36. G3SYD, QTHR.

Trio JR310, £65 ono. 6 cnvrtrs, 28-30, 4-6, £7 ea. 3 fm boxes + 10·7MHz i.f.s, offers ? 3 vols *Radio TV Servicing*, 1965–8. £7. G3EOF, QTHR. Tel 01-650 5129.

Codar AT5 T28 ac psu, dc psu, /M control unit, G whip, £45. Vanguard Mk 2, 160–10m, £20. Trio 9R59DE, £25. G8AEV 2m cnvrtr kit, £3. G3WDZ, QTHR. Tel Carlisle 29039.

Heater trnsfmr, suit 2X813 + 6·3V 5A ct, £2. CA3014 fm disc, ICs, unused, 75p. BLY11 rf power transistors, 50p. Pair ceramic bases for 866A, new, £1. G3PGN, Steeple View, Peartree Lane, Doddinghurst, Brentwood, Essex. Tel Blackmore 822891.

HW100 + HP23 + spkr and BM3 mic + spares, exc, £115 ono GM3MQO, QTHR. Tel Prestwick 79245.

19 Mk 3/1 set, ex cond, incs variometer, mains psu, hdphns + mic, £12. Pye 2007 transistor Ranger on 4m, dash mntng, £6.50. G3WDN, QTHR.

Mohican, mains psu, £25. Unica fet, solid state, £20. Oscilloscope Testgear (Action), £10. 160 /M aerial mount, centre loading, £5. GI3AOB, QTHR.

SB102 psu, HP23A spkr, SB600 cw fltr, HM102, 9 mnths old, £210 ono. G4AIR, The Chapel House, Warfield Street, Bracknell, Berks Tel Bracknell 5386.

R107 army rx gd wkng cond, hndbk, S-meter, sep rf, i.f. controls, £12 ono. RF24 cnvrtr unit, 20–30MHz, 7MHz i.f., £5 ono. Buyer coll. Bigger, Upper Grange Farm, Markfield, Leics. Tel Markfield 2525.

Eddystone 940. KW202 + m/spkr. Codar AT5 Mk 1. USN wire recorder c/w cassettes + spare wire. Everything as new. Wanted: EC10 2m cnvrtr, sae pse. Hounslow, Carlton School, Carlton, n Bedford.

Trio 9R59DS rx fitted with ht stab, £40. Hamgear preselector, £6 Sentinal 2m cnvrtr 4–6kHz i.f., £8. Buyer coll King, 12 Towers Avenue, Maghull, Liverpool L31 OAJ.

4m Pye Vanguard, wkng, £18 ono. GEC miniscope, wkng, £5. Both arrange del pse. Transistor uhf tuners, slow motion drive, £2.50, pp 25p ea. Some valve uhf tuners, suit 70cm, £1.30, pp 25p. Brogan, 4 Newmarket Road, Fordham, nr Ely, Cambs. Tel 0638-72 545 (after 6pm).

Siemens high speed relays. 160m tx suitable for beginner. Moving coil mic. Grundig xtal mic. Woden UM2 modulation trnsfmr. Rack cab, take 19in panels. Table top cab. Hand gnrtr from 1500V megger. G3DFS, QTHR. Tel 021-354 7769.

70cm cnvrtr i.f. 24–26MHz, 9V +ve earth, £10. G3HSC records, beginners course, £1. CRT type 5BP1 with base, 50p. Plastic aircraft kits, boxed, 25p. Used double play tapes, 1200ft, 50p. G8AGR, QTHR. Tel 0632 677537.

Eddystone EC10 Mk 1, exc cond, £35. BRS31966, Tel Oxshott (nr Leatherhead) 3449.

Trio 310 ssb rx, mech fltr fitted, mint cond, hp can be arranged, £75 ono. Hesketh, 4 Hill Farm Road, Chesham, Bucks. Tel Chesham 5557.

Building digital clocks, freq meters, voltmeters etc, used numicators. HNAC XN3, 75p. Mullard 2M1080, 95p. Red tinted for easy readout, pp 10p. Send sae for quantity quote. G3SGS, 24 Valley Road, Tasburgh, Norwich, NOR66W, Norfolk.

Cossor 1035 scope, comp with manual + spare tube, £15. Williams, 29 Heathfield Avenue, Fareham, Hampshire.

10W base stns c/w hndbks. Hudson a.m.-f.m, immac, £30. Danish fm only c/w polished wood remote control box, £25. Stella /P transistor recorder, 2-track, exc cond, £14. Buyers coll. G3JMJ, QTHR. Tel 073-271 3467.

Approx copy Eddystone 870, ac only, 2 yrs old, 898 drive, 4-band commercial coil-pack, Electroniques ifts, bfo, with mtchng plug-in hf bands preselector, £19. Rayer, "Reddings", Longdon Heath, Upton-on-Severn, Worcs WR8 ORJ.

DX4OU tx, mint cond, offers nr £20, or exch for G-whip Tribander /M aerial comp. GM3ZNC, QTHR. Tel Airdrie 65507.

Triplett Mod 1632 sig gnrtr, 100kHz–200MHz, gd order, £10. Wharfdale 9cu ft corner spkr fitted 3 units 15in, 10in + 3in with crossover, as new, £15. G3SME, "Windrush", Hail Weston, St Neots, Hunts. Tel 0480 72513.

Heathkit DX4OU, slightly modded, spare pa valve + VF1U, £20 ono. Mohican rx, gd cond, £20 ono. Buyer coll or carr extra. G4APM, 16 Jersey Street, Newark, Notts.

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National NC77X rx, mint, 200–250V, c/w manual, suit swl just beginning, £14 no offers. Will del 30 miles or buyer coll. BRS20001, 16 Ashurst Close, Horsham, Sussex. Tel Horsham 62316.

75S-1, exc cond, £160 ono. KW pepmeter, £8. KW E-z match, £7. Coull, Domel, Elham, Kent.

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KW Valiant + 600V psu, £20. AR88LF, £35. Pref buyer coll. G3LUI, 81 Waxwell Road, Hullbridge, Hockley, Essex. Tel Southend-on-Sea 230489.

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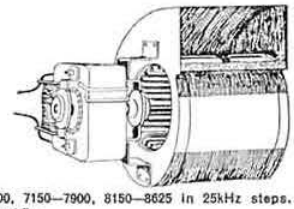

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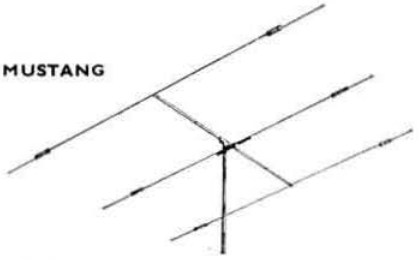

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