August 1976

radio communication

journal of the Radio Society of Great Britain

AROUND THE RALLIES

The UK FM Group (Southern) stand at the Longleat Rally on 27 June. In traditional "Longleat weather" over 1,000 cars and between 4,000 and 5,000 people attended the rally, which was supported by 28 traders. At next year's rally the Band of the Royal Signals will "Beat the retreat" on the forecourt of Longleat House to mark HM The Queen's Jubilee

A group of RAF ARS members at the Drayton Mobile Rally on 25 April. Left to right: G4AJD, GW3YQO, DA2ZA, G4DVP, G2FIX, SWL, G3EWZ, GW3IEQ, G3ZZR, G3TBS, G3ZGG and G4CFF. *Photo: G4ADD*

G3VTY operating the 80m talk-in station at the White Rose Rally on 28 March. There were 36 trade exhibitors and 3,000 visitors. *Photo: G3FCW*

One end of the main marquee at the Elvaston Castle Rally on 13 June. Thirty-five trade stands were accommodated in two large marquees, and an estimated 5,000 people attended the rally

RSGB NEWS BULLETIN SERVICE

The RSGB news bulletin, callsign GB2RS, is broadcast every Sunday morning on hf and vhf, giving almost complete coverage of the British Isles. Its main purpose is to provide an outlet for amateur radio news items and announcements which, by virtue of their topicality or urgency, cannot wait for the next issue of *Radio Communication*.

The bulletin is prepared early on Thursday morning, and news items, marked "GB2RS news" should reach RSGB HQ by first post that day (telephoned items can also be accepted until 10am). No guarantee can be given of inclusion in part or whole of any item submitted and, once broadcast, items are not usually repeated.

SCHEDULE

Time	MHz	Location and coverage (hf) or beam heading (vhf) of station
0930	3·6	G2MI, Bromley, Kent (SE England)
1000	3·6	G8ML, Cheltenham (SW England)
	144·5	GM3UAG, Ellon, Aberdeenshire (NNW)
	144·5	G8GGK, Croydon, Surrey (NE)
1015	3·6	GI3GAL, Belfast (N Ireland)
	144·5	GI3TLT, Bangor, Co Down (N)
1030	3·6	G2CVV, Derby (N Midlands)
	144·5	G4DCH, Burnham-on-Sea (NW)
	144·5	GM3UAG, Ellon, Aberdeenshire (SW)
	144·5	G3PWJ, Brierley Hill (NW)
1045	144·5	G8CDP, Middlesbrough (NW)
	144·5	G8GGK, Croydon, Surrey (SW)
	144·5	G8BHQ, Stockport (NNW)
1100	3·6	G5VO, Bridlington (NE England)
	144·5	G3PWJ, Brierley Hill (SW)
1115	3·6	G3LEQ, Knutsford (NW England)
1130	3·6	GM3EHI, Bellshill, Lanarkshire (S Scotland)
1200	3·6	GM3HGA, Aberdeen (NE Scotland)

An rtty news bulletin, callsign GB2ATG, is also transmitted every Sunday at 1200 on 3·590MHz and at 1230 and 1245 on 144·6MHz. This bulletin carries items of interest to rtty enthusiasts.

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Radio Communication **is published by The Radio Society of Great Britain as its official journal on the first Tuesday of each month and is sent free and post paid to all members of the Society**

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

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Contributions and all correspondence concerning the **content** of *Radio Communication* should be addressed to: The Editor, *Radio Communication*, 35 Doughty Street, London WC1N 2AE. Tel 01-837 8688. (**Circulation** queries should be addressed to: The Subscriptions Department, RSGB).

Closing date for contributions unless otherwise notified: 4th of month preceding month of publication.

Advertising, other than Members' Ads, should be sent to the above address marked for the attention of Mr C. C. Lindsay. Tel 01-686 5839 (ADVERTISING ONLY).

The 2m First Family

Where quality is a prime requirement

Regardless of where you are: in your QTH, on the road, on vacation, on a hike: you will always find a QSO on the 2m band with TRIO VHF equipment. And no matter on which transmit and receive frequencies other 2m stations are operating, with TRIO equipment you can always join in, because you'll be qrv on all international fixed-frequency channels—either in simplex or via repeaters.

TRIO 2m equipment is designed for versatility and can be combined to provide station systems for mobile or fixed-station use, operating on line voltage, 12 VDC car batteries or conventional dry cells—just as you like. Take a close look at the two transceivers: the TR-2200GX is from a proven line—the TR-2200 and the TR-2200G two of the most popular and best-selling 2m rigs on the world market. Like its predecessors, the

2m FM Portable Transceiver TR-2200GX

is a striking example of advanced technology, optimum performance, solid construction and unmatched reliability. In addition it offers plenty of features, 2m radio operators have been asking for:

2 watts RF output power—choice of fixed channel operation or continuous tuning through the entire 2m band by merely adding the External VFO-30G. Plus: 12 RX and TX channels (S20, S22 and R7 factory-equipped with crystals) to be fitted with crystals of your own choice; receiver and transmitter section with improved semi-conductor complement and higher power (TX input now 4 watts, RX input sensitivity now 0·4μV for 20dB S N : N); IF shape factor 2 : 1; improved squelch action; detachable telescopic antenna; built-in 1,750Hz generator, plus many others.

The TR-2200GX can operate on the following power sources: standard 1·5 volt penlight cells, rechargeable NiCad batteries (optional), 12V DC car battery or Power Supply Unit PS-5. Standard accessories: PTT microphone with hanger, carrying bag with shoulder strap, charger for NC batteries, battery holders, etc. A special mobile mount MB-1A is now available for easy and safe installation of the TR-2200GX in your car.

2m FM Mobile Transceiver TR-7200G

The TR7200G is the best selling 2m FM mobile transceiver in Europe. Some of the reasons why this is so may not be obvious from the basic specification. It's not just the high sensitivity (0·3μv 15dB quieting) or the superb finish, it's the full range of accessories and the finest service backup in the country. It's the little details like the LED under the channel number indicator that is RF powered and only lights when you have a receive crystal fitted. The "transmit" lamp gives the same function for the transmit crystals. This means that you no longer have to wonder which channels are operational when you are mobile. Did you know that by removing the rear panel accessory plug you can drop the receiver gain by 10dB to prevent the fellow next to you in the car park at the rally from blowing your head off!

Did you know that the swr protection system is not the "sudden death" variety but gradually reduces the Tx power with increasing SWR so that you are not put completely off the air when your mobile whip antenna gets wet. The same system protects the PA and driver from over voltage damage when the rig is used in a vehicle having a high charge voltage from the alternator.

Only Trio equipment has the unique tuning fork controlled repeater access tone generator to ensure access first time, every time.

All these features and more, can only be provided in equipment made to professional standards by a professional company. The Trio Corporation is the largest electronics manufacturer in Japan offering a range of amateur equipment and you, the customer, benefit every time.

The TR7200G comes to you complete with mobile mounting bracket, stand off feet for fixed station use, microphone, microphone bracket, cable, spare fuse, manual, fitted five channels at **£162** inc VAT.

As an additional bargain we can offer an extra 3 channels for **£10** inc. VAT or an extra 6 channels for **£20** inc. VAT. This offer applies only to crystals ordered at the same time as the TR7200G.

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TRIO

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NR-56 FM RECEIVER

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★ Double filters at 10·7MHz and 455KHz.
★ Dual conversion 10·7MHz/455KHz.
★ Narrow filter fitted for European Market.
★ FET RF stage for high sensitivity.
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★ Built-in loudspeaker.
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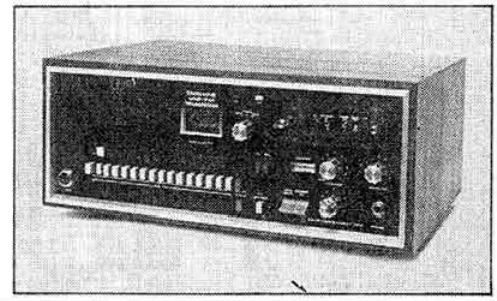
★ Mobile mount and personal earpiece supplied.
★ Full coverage VFO built in.
★ 11 crystal positions (optional crystals ex-stock).
★ 22 transistors, 1 integrated circuit, 16 diodes.
★ NR-56 £54.00 including VAT. Postage 48p. Crystals £2.40 inc. VAT.

FS1007P

The home station FM transceiver with everything. ★ Mains or 12V operation ★ 16 channel scanning ★ channel skipping facility ★ priority channel with front panel crystal sockets ★ manual or auto scan ★ switched high/low power ★ switched wide/narrow deviation ★ S meter ★ RF output meter ★ centre zero tuning meter ★ RX fine tuning control ★ built-in SWR bridge ★ built-in digital clock with alarm and auto switch on ★ built-in loudspeaker ★ 10W TX ★ 0·3μV sensitivity ★ superb styling and finish

All this and supplied fitted receive crystals for 145, 145·25, S20, S21, S22, 145·6, 145·8 R3, R4, R5, R6, R7 together with transmit crystals for 145. S20, R6 make the FS1007P the most incredible bargain on the FM market. Backed by the combined reputations of Belcom and Lowe Electronics.



SHINWA FILTERS

Lowe Electronics present a range of HF and VHF filters suitable (indeed most desirable) for the discerning radio amateur. From the very wide range of filters manufactured by SHINWA, we have selected those which we feel are the most useful in this country.

All the filters are exceptionally well made in high quality housings 30 × 50 × 180mm (1110G is 160 × 310 × 55m) and are terminated in SO239 sockets. They are suitable for a wide range of applications, the 1140 28–30MHz BPF being particularly attractive to transverter users.

The 1110G is the big daddy filter having adjustable bandwidth up to 2MHz wide at any frequency in the range 135–165MHz.

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Model	Frequency	Insertion loss	Max. att.	Max. power	Price inc Vat
1110	144–146MHz band pass	1dB	>50dB	20WRMS	£13.72
1110G	135-165MHz/2MHz band pass tunable	1dB	>70dB	100W RMS	£47.25
1140	28–30MHz band pass	1dB	>60dB	100W P.E.P.	£13.72
1006	146MHz cut off low pass	1dB	>50dB	50W RMS	£11.48
1005	30MHz cut off low pass	0·7dB	>50dB	300W P.e.P.	£10.80

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REMEMBER—WHERE TRIO "LEEDS", THE OTHERS WILL FOLLOW!

HEAD OFFICE **119 Cavendish Road, Matlock, Derbyshire. Tel. 2817 or 2430 9a.m. to 9p.m.**

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Heath (Gloucester) Limited, Dept. RC86, Bristol Road, Gloucester, GL2 6EE. Tel: (0452) 29451.

Buzzer and alarm bell are optional extras. **HEATHKIT**

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. . . then here are a few facts which you should consider:

Firstly, the head load (horizontal load due to wind) which will be placed on the top of the tower should be determined and the manufacturer of your antenna or lighting equipment can tell you what the head load will be at a particular wind speed, e.g. 100lbs (45Kg) at 75 mph. This means that when the wind is blowing at 75mph you would need a HORIZONTAL pull of 45Kg to restrain the antenna. The actual weight of the antenna is usually a factor of much less importance and is ignored. If you wish to have an installation which is rated at 100mph—then the wind load on the antenna will be much greater than 100lbs, 176lbs in fact. Obviously, a stronger tower would be required to take this additional load.

But then there is the second consideration. At what wind speed would you like the structure to be safe? No doubt the answer you have in mind is "about 150mph". That way, it will never fall down! However, economics must come into the picture and the costs go up very considerably in achieving strength.

There is a British Standard Code of Practice (BS 449), which relates to the "Wind Loading on Structures" and they recommend Basic Windspeeds of about 85mph for the London Area to as high as 110mph for Edinburgh and 120mph for the North of N. Ireland. This "Basic Windspeed" is the maximum gust speed likely to be exceeded on the average only once in 50 years at 10m. above ground in open level country. An average figure for England is therefore 100mph. Commercial installations are designed to this standard and we recommend a minimum design speed of 75mph for an amateur installation. Most towers currently available are designed for 60mph ONLY! This is why they blow down with no aerial on or when only partly raised! Because of our considerable experience in this field we have now designed and manufactured our superior quality product AND—IT COSTS LESS! *QUALITY UP* and *PRICE DOWN*—that can't be bad!

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HERE'S HOW THE "WESTOWER" COMPARES:

	"WESTOWER"			Brand X			Brand Y		
HEIGHT	MODEL	PRICE	HEAD LOAD	MODEL	PRICE	HEAD LOAD	MODEL	PRICE	HEAD LOAD
40′	2S	£189	275lbs	A	£203	185lbs	A	£250*	50lbs
60′	3S	£230	175lbs	B	£246	125lbs	B	£280*	50lbs
80′	4S	£345	100lbs	C	£366	60lbs			

(Prices exclude VAT. All except those marked include carriage)* *(Prices and headloads taken from manufacturers' current literature*

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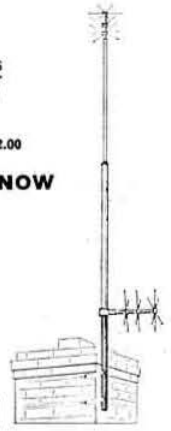

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10–15–20M
1200 WATTS
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WEIGHT 15 LBS
RADIUS 6 FT 2 INS
WIND 80 MPH

PRICE £34.37
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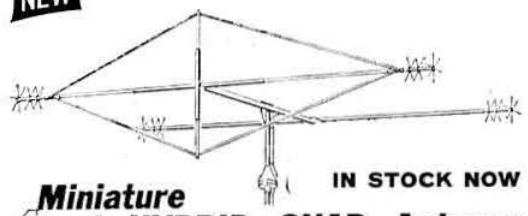

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The de luxe 2 metre FM transceiver with a 5kHz stepped synthesiser and bright digital readout, from 6 seven segment LEDs. Selectable 10 or 1 Watt output, for simplex or duplex (up and down shifts), across 144-146 (rx to 149MHz) from a tiny 6½" × 2" × 7½".
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Selective calling socket (mic/LS/PTT etc.) on rear panel.

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A unique combination of frequency control by either external VFO, 23 switchable or 4 instantly selectable auto scanning channels.
Both the Tx deviation and the Rx bandwidth are switchable accommodating 50 or 25kHz spacing.
The main dial is channel numbered (e.g. 16 = 433·4, 20 = 433·5 etc.) and is illustrated only when a channel is crystalled up. "Two R.F. stages in the receiver provide great sensitivity (0·5μV for 30dB NQ). The use of a band bass first IF (CF 45 MHz) gives high image immunity and low channel crystal drift. Further conversions to 10·7 and 455 prevent IF image whilst providing good pass and skirt selectivity". The transmitter of switchable 10/1W output draws only 2·5 or 1·3A (0·6 or 0·3A Rx) and has a netting of new crystal facility.
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With 8 channels, SU (8, 16, 18, 20) & RU (2, 4, 6, 10)

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2W RF & ½W Audio makes this with its immunity to image problems and IF break through one of the best buys today. Its performance rivals many fixed/mobile 10W sets.
The KP202 is supplied complete with HC18U crystals for S20 and S22 telescopic whip, leather handle/whip case and F type plug.
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CX120	50W	35dB Cable entry	**£7.50**
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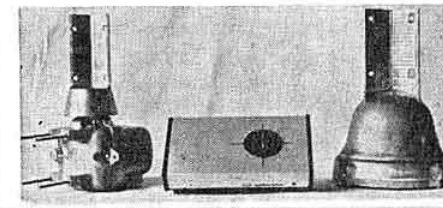

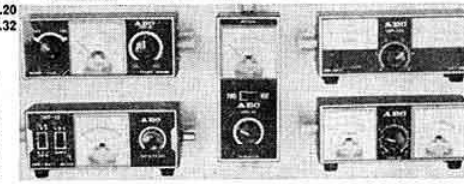

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Unless stated: SWR(±10%), 1·5 to 160MHz, 50/75Ω.

SWR10 (TLH)	single meter horizontal type	**£8.15**
SWR20 (BLH)	50Ω, F.S., PR 10 & 100W FSD(±10%) ..	**£9.90**
SWR40 (Centre)	single meter Vert. type with F.S.	**£7.80**
SWR50A (TRH)	SWR(±5%) 3·5MHz up, Pr to 1kW(±20%)	**£9.60**
SWR50 (BRH)	as SWR50A (300μA) but 100μA meters	**£11.20**

SEND LARGE (10" x 12") SAE OR 15p STAMPS FOR FURTHER INFORMATION

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PLEASE NOTE—THESE PRICES *DO NOT* INCLUDE VAT (12½% or 8%)

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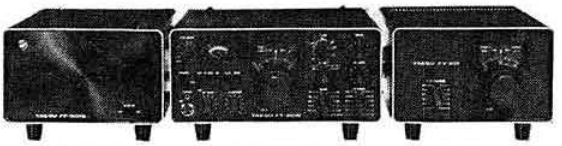

FP301S FT301(S) FV301

The transceiver employs a pre mix VFO and single conversion signal frequency IF (9MHz) uses MOSFETS in the RF and mixer stages followed directly by a roofing filter for sensitivity coupled with dynamic range.

MODES A1, A3J (USB + LSB selectable)
SELECTIVITY 2·4KHz 6dB (SF 1·7 : 1)
SIZE 11" × 5" × 11½"
SENSITIVITY 0·5uV for 10dB S/N
SELECTIVITY 600Hz 6dB (SF 2 : 1)
WEIGHT 16lbs

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12AVQ 10-20m Trap Vert.	£33.50	DB1015A 10-15m 3 ele	£99.00
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B5	¼ 145MHz	£6.35	70½ ¼ 70MHz		£4.00
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BGA s.s.	¼ 2m stainless steel	£8.50	Magnetic Base Mount		£8.50
B5U	¼ 432MHz	£5.00	Standard base unwanted deduct		£0.50

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PL259	Standard UHF plug	£0.48	SO239	Socket 2 hole	£0.37
PL259	P.T.F.E. UHF plug	£0.55		'T' adaptor	£1.20
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S 500W P.I.P. 14SWG	£19.50	P 500W P.I.P. Cu/Terylene	
HP 1K P.I.P. 14SWG	£21.75	braid c/w 75' feeder etc.	£21.75

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8Y/2M 8 element yagi	£7.00	PMH2/70 2 way harness	£4.15
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GQ2E 2 element	£95.00	GQ4E 4 element	£198.00
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RG8/U 50 ohm Heavy	yd. 33p	UR39 75 ohm Medium	yd. 23p
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This unit has been produced to satisfy the constant demand for a compact matching unit to meet the critical load requirement of the modern P.A. Receivers are also becoming more sensitive to aerial matching and our Z match can of course be used to match the aerial to your receiver. The units have been tested at 2KW CW output power into a Bird Termaline Wattmeter/Dummy load. The aerial connections can be used with balanced or unbalanced feeders and the connectors are screw terminals for wire aerials AND SO239s for co-ax fed aerials. Don't forget that multiband aerials respond as well to your harmonics as to the wanted signal. Our Z match will provide harmonic attenuation as a bonus. Price is only £28.00.

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★ Very high tolerance crystals, 5p.p.m. for calibration accuracy.
★ Strong signals and overvoltage and reverse polarity protection built in.
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SENTINEL MF Another Dual Gate MOSFET 2 metre converter which converts to medium wave in 2 switched bands. Price: £20.00 ex-stock.

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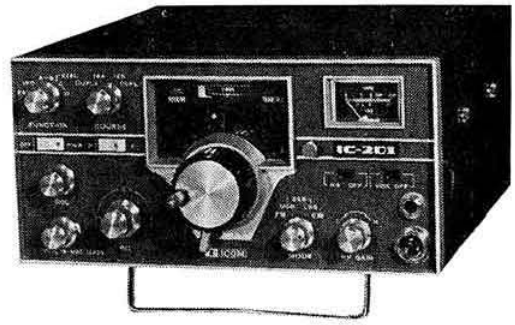

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See page 582

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With switched factory fitted R/C tone burst
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An **80 Channel FM** mobile rig with all 80 channels fitted. Uses an excellent phase lock loop system. Channels are at 25kHz spacing which fits in with the UK and continental channel systems giving *all* the UK simplex and repeater frequencies. A *crystal controlled* tone burst is introduced when working repeaters and reverse repeater facility is available on all channels by adding one extra 11·300MHz crystal. Ex-stock at time of going to press. **£250 Inc. VAT.**

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A. Because they had to sell the rolls to pay for the piper.

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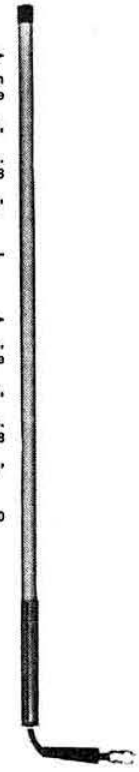

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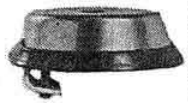

K-203
No hole boot mount, suitable for ⅜" hole snap in mount, easily adaptable for other mounts.
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We are sad to report the untimely death of Ron Turner, GM8HXQ, our good friend and Scottish Agent. Ron was widely known and respected both north and south of the border.

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G. R. Jessop, CEng, MIERE, G6JP

EDITOR
A. W. Hutchinson

CURRENT COMMENT

LAMBDA DEBENTURE HOLDERS

Important notice

The RSGB Council has decided to redeem £500 worth of stock in the Lambda Investment Company Limited. This will be done by drawing from a hat, when names will be drawn in respect of each holding of £25 worth of stock.

The whole exercise will be carried out in December 1976, and although Council do not want this to be taken as a precedent for future years, the intention is, if there are sufficient funds, to carry out the exercise again.

Before any member sells his debenture stock he should take into account the possibility that the holding may be redeemed at full value.

J. O. Brown, G3DVV
Honorary Treasurer

SCOTTISH VHF CONVENTION

Dundee University

25 September 1976

A full programme is being arranged and a further announcement will appear in next month's issue of *Radio Communication*.
The convention will end with a dinner at the Invercarse Hotel, Perth Road, Dundee.

TICKETS

Convention only . . . 75p. Convention and dinner . . . £3.50

Bed and breakfast at the university . . . £4.50

Applications for tickets should be sent with an sae to John Miller, GM4AGS, Ingleby, 70 West Road, Newport on Tay, Fife DD6 8HP, who will also be pleased to supply further information on receipt of an sae.

QTC
amateur radio news

Regional Representative, Region 7
Following the resignation of Mr R. S. Hewes, G3TDR, from the post of Region 7 regional representative, nominations are invited for the resulting vacancy.

Not later than Friday 3 September 1976 any five corporate members resident within Region 7 (Greater London south of the River Thames, and Surrey) may nominate any other qualified corporate member resident in the region for the office of regional representative by delivering their nomination in writing, together with the written consent of such person to accept office if elected, to the general manager at RSGB headquarters. Each such nominator shall be debarred from nominating any other person for this election.

In the event of no nomination being received from the corporate members in Region 7 by 7 September 1976, the Council reserve the right to make an appointment.

In the event of more than one person being nominated, a ballot will be conducted, details of which will be published in the October 1976 issue of *Radio Communication*.

Facts and figures
The Home Office advises that the following numbers of amateur licences were in force at 30 June 1976:

Class A	16,021	Class B/M	2,275
Class B	5,918	Class F/M	21
Class A/M	4,152	Television	312

The callsign record received from the Home Office dated 18 June 1976 gives the latest callsigns issued in the G4 and G8 series as G4FCZ and G8LRN respectively.

At the end of June 1976 RSGB membership totalled 19,183, made up of 16,049 UK corporate, 983 UK associate and 2,151 overseas members.

Reciprocal licensing
New conditions governing reciprocal operation in Yugoslavia have recently been approved. An information sheet is available from RSGB headquarters. Application forms for temporary licences can be obtained from the Yugoslav national society, SRJ, PO Box 48, 11000 Belgrade, Yugoslavia. It should be noted that a YU licence may be obtained notwithstanding the lack of a formal reciprocal agreement.

Botswana '76
On 6 June 1976 a conference of national amateur radio societies of southern Africa was held in Gaberone, Botswana. This was the first time during the 50 years of its existence that a conference of the International Amateur Radio Union had been held in Africa. The Director of Telecommunications of Botswana, Mr E. M. Tunelo, welcomed the delegates. Mr R. Haverson, A2CRH, was elected chairman of the conference and Mr B. Clark, 9J2CL, was chairman of the working session.

Delegates were present from the national societies of Botswana, Lesotho, Rhodesia, South Africa and Zambia. Mr H. Walcott Benjamin, a member of the Region 1 Executive Committee, represented both the IARU and Liberia.

STAFF VACANCY

Assistant General Manager

A vacancy will arise at RSGB headquarters in the near future for an Assistant General Manager with a view to becoming General Manager.

The candidate should ideally possess the following qualifications:

(a) At least five years' executive experience.

(b) Working knowledge of accountancy.

(c) Hold an amateur transmitting licence.

Salary will be commensurate with qualifications.

Applications should be made before the 30 September 1976 to the chairman of the Finance & Staff Committee, Mr C. H. Parsons, 90 Maesycoed Road, Heath, Cardiff, Glamorgan.

The discussions centred around mutual problems, particularly in connection with the hf amateur service allocations. Positive recommendations were agreed which would assist in the better understanding of amateur radio and the part that it could play in the countries of Africa. It was agreed that a further meeting of southern African societies would be held in 1978 when it was hoped additional societies would be represented.

"Club News" copy date
The date by which items should reach RRs for inclusion in their contributions to the September issue of *Radio Communication* is 7 August, not 31 August as published last month.

Slow morse practice transmissions
The transmissions on Mondays at 1930 by GI3SXG have been suspended and will be resumed on the first Monday in September.

BATC Convention
The British Amateur Television Club is holding its next amateur television convention on Saturday 18 September 1976 in Parkinson Court, University of Leeds, from 10am until 5.30pm.

Admission will be free, and everyone with an interest in amateur television will be most welcome.

There will be displays and demonstrations of members' equipment, including slow-scan as well as 625-line systems, trade stands and a bring and buy stall.

Further details are available from A. R. Watson, Somerby View, Bigby, Barnetby, South Humberside.

Advance notices
The UK FM Group (Western) will hold its first AGM at 8pm on 13 September 1976 at the Wirral Mercury Motor Inn, Backford Cross, Chester.

The Northern Radio Societies Association's Convention next year will be held at Belle Vue, Manchester, on 27 April.

The British Amateur Radio Teleprinter Group's annual convention will take place on 21 May 1977 at Meopham Village Hall, Kent.

A vfo for use with a Trio 2200G

by C. J. RAILTON, G3YQV*

WISHING to have a 2m transceiver, tunable over the whole band, and capable of being used while mobile or pedestrian portable (in the strict sense of the word), as well as being useful as a base station. the author decided that the best system would be a Trio 2200G with a home-built external vfo.

Two methods of generating the required frequencies were considered: the first by means of a phase-locked loop and the second by simply mixing the output of a free-running oscillator with the output of a crystal oscillator. The second alternative was chosen because of its comparative simplicity and because it was felt that an acceptable level of spurious signals could be achieved using this method.

Since the transceiver required a 12MHz signal on transmit and a 45MHz signal on receive with the multiplication factor differing by a factor of four, the vfo would have to contain either a divider or a multiplier. In this design a divider was used for a number of reasons:

(1) The free-running oscillator could be run in the hf region, making the tuned circuit components smaller than if it were to be run in the mf region.

(2) The divider would be in use on transmit only, thus any extra current would be drawn on transmit rather than on receive.

(3) The tuned circuits associated with the divider would help to reduce spurious signals on transmit where it is more important to do so.

(4) A 48MHz signal would be generated within the vfo which may be useful for future experiments.

There were several possible methods of implementing the dividers. The use of ttl dividers was rejected because of the high levels required to drive them and their tendency to produce switching transients with high spectral components. The method chosen was to use the more expensive but probably less troublesome SL641 double-balanced mixers wired as binary dividers.

The other main difficulty was how to interface the vfo to the transceiver. This involved coupling the vfo output to a crystal oscillator and avoiding instability. Two different problems were involved, since the receive crystal oscillator is designed for a series resonant circuit and the transmit crystal oscillator is designed for a parallel resonant circuit. The problems were solved by using a series resistor on the receive side and a pi network, part of which was formed by the crystal oscillator itself, on the transmit side. With these methods of coupling no instability occurred.

Circuit description

Fig 1 shows the free-running oscillator. This is a fet Vackar oscillator buffered by an emitter follower. A low-pass filter helps to reduce the harmonic output which would otherwise lead to spurious emissions and responses. The power supply is stabilized by means of a 9V1 zener diode.

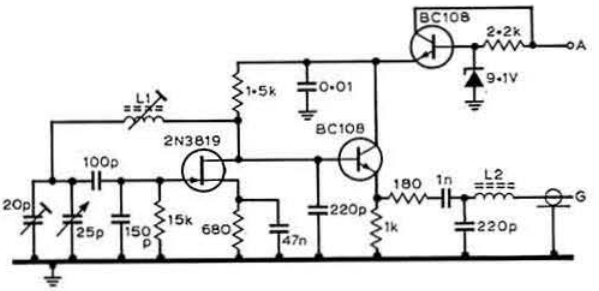

Fig 1. Free-running oscillator

The output of this oscillator is mixed with the output of either of two crystal oscillators, the circuit of which is shown in Fig 2. The outputs are diode switched so that when voltage is applied to point D on one of the oscillators the diode is forward biased and the diode of the other oscillator is reverse biased, giving 20dB isolation—more than enough for this application. The crystal frequencies are in the 35MHz region; however, it is only the difference between the crystal oscillator frequencies that is important. The exact frequencies are flexible and a crystal which is to hand may be used, the other having to be made to order. The frequency difference is 3·5667MHz, this being the first i.f. frequency of the TR2200G divided by three. Any error in this difference appears multiplied by three as a difference between transmit and receive frequencies.

In the prototype a 12MHz crystal out of an unmodified Pye Pocketfone was used successfully in the transmit crystal oscillator in third overtone mode. The output frequency of this oscillator was measured on a counter and a crystal was ordered with a tolerance of 10ppm. The possible 300Hz discrepancy between transmit and receive frequencies was not noticeable on fm. The tuning range of the free-running oscillator was chosen for the correct output and was in the 10MHz region.

The mixer consists of an SL641 double-balanced mixer, chosen for its good carrier and signal rejection and for its convenience. The output of this feeds a bandpass filter tuned to 45-48MHz. The 45MHz signal passes to an emitter follower buffer while the 48MHz signal passes to the dividers. The dividers each use an SL641 with the output fed back to the signal input.

The values for the feedback and coupling components were arrived at largely by experiment, but no great difficulty was

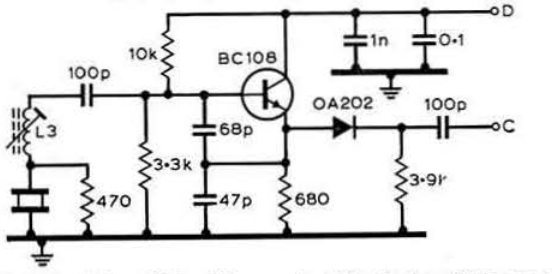

Fig 2. Crystal oscillator. There are two identical oscillators; on transmit, point D goes to F; on receive, D goes to E. Points C are both joined to point C on the mixer (Fig 4).

* "Symphony," Elm Park Road, Pinner, Middx HA5 3LE.

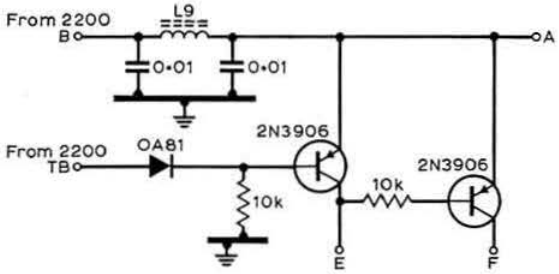

Fig 3. T/R switching

found in making the circuit function. The 12MHz output is buffered by an emitter follower and coupled to the 2200G through a pi network.

Transmit/receive switching is shown in Fig 3. On receive the first transistor is switched on, which causes the second transistor to be switched off, thus point E is energized. When point TB goes high, as it does on transmit, both transistors switch and point F is energized. The diode must be germanium for correct working of the circuit.

Construction

The general layout of the major components is shown in Fig 5. In the prototype the free-running oscillator was built on Veroboard and the remainder of the circuit on double-sided copper-clad board. There is nothing to suggest that the layout is unduly critical. The slow-motion drive used in the prototype was a standard Eagle vernier drive. This is barely adequate in terms of resetting accuracy and a better drive and dial can be used if desired. The unit was housed in a standard aluminium box about the same size as the TR2200G. The remaining space was taken up with a calibrator giving markers every 100kHz.

Modifications to the TR2200G

As there is no facility on the TR2200G for the connection of an external vfo, several mechanical modifications were carried out to make this possible.

Firstly a fairly standard change was made. The $\lambda/4$ whip was removed and the hole in the front panel filed out to take a nut-fixing BNC socket. This socket was then wired using miniature 50Ω coaxial cable to the aerial pin at the far end of the board. Into the BNC socket could be plugged either a helical aerial, an external beam or amplifier, thus the SO239 on the base of the TR2200G became redundant. To remove this socket the green locking substance was first removed by applying switch cleaner to the thread, and using a well-fitting spanner carefully manoeuvred to loosen the nut.

It was found that the recess which contained the socket was just large enough to take a five-pin DIN socket, which

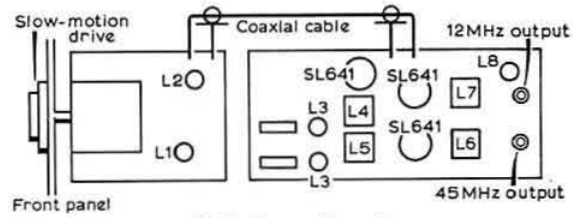

Fig 5. General layout

would provide enough connections between the vfo and the TR2200G. The recess was drilled and tapped to take 6BA bolts and the DIN socket fitted. Several earth connections which had been taken to a ring fixed to the SO239 were taken to the earth pin of the socket, and miniature coaxial cable taken from the socket to the crystal sockets for channel R1, this being chosen as it was the easiest to connect to. Connections were also made to point B for the 12V supply, and to TB for transmit/receive switching.

Setting up

First the free-running oscillator is tuned to the correct frequency using either a counter or a general coverage receiver. By adjustment of the coil and the trimmer in the usual way the oscillator can be made to cover the band exactly. The crystal oscillators are checked for activity using a suitable detector.

Having done this a detector such as a receiver or sensitive absorption wavemeter is tuned in the 45MHz region until a signal is seen. The bandpass filter is tuned for maximum output at this frequency. The system is then switched to transmit and the detector tuned around the 48MHz region until the signal is seen. Again the bandpass filter can be tuned for maximum output. It will probably be found that the filter has to be set differently in these two cases. A compromise setting is then taken.

To set up the first divider the detector is tuned to the 24MHz region, exactly half the frequency of the received 48MHz signal, and the core of L6 turned until a signal is seen. It should be found that as the core is turned the signal will suddenly appear and as it is further turned the signal will suddenly disappear. The position mid-way between these points is taken. The procedure is then repeated at 12MHz for the second divider. The core of L8 is then adjusted for maximum output to the transceiver.

The power meter on the TR2200G should now read the same when the vfo is in use as when a crystal of the same frequency is used. Using an absorption wavemeter or a general coverage receiver, a check that there are no unacceptable spurious emissions completes the setting up operation.

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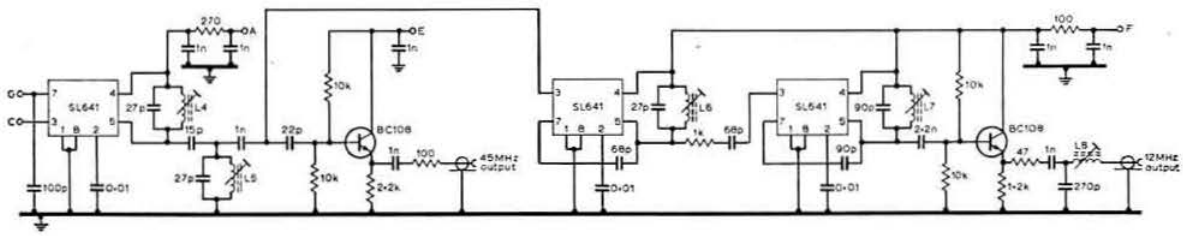


Fig 4. Mixer and dividers. Coils are wound on $\frac{3}{16}$in formers with ferrite cores: L1 25t, L2 10t, L3 12t, L4, L5 9t; L6, L7, L8 16t; L9, 12t

The suppression of television timebase interference

by L. J. CARPENTER, G4CNH/G6ALQ/T*
Member, RSGB Interference Committee

MANY radio amateurs seem to be plagued by timebase radiation from domestic television receivers, especially colour, but information leading to its suppression seems to be very scarce. It is not surprising that interference from the line timebase circuits of tv receivers presents problems, because of the high voltages to be found around this particular stage, but when attempting to understand the direct cause of this type of interference it is difficult to tell whether the problem lies in the scanning circuit or in the eht generator. A very high scanning voltage is required in order to swing an electron beam horizontally across the screen of a television receiver, and although no attempt is made to screen the deflecting coils placed around the crt it is the author's opinion that the trouble is caused by the eht generator and the crt itself. Voltages present in the generator vary between 14kV and 25kV, depending on the design of the receiver and whether it is monochrome or colour.

EHT systems

It is not intended to go deeply into the subject of eht systems but to give a brief insight into their operation; readers seeking more information are referred to the excellent article by C. R. Boggis in *Practical Television* December 1972. In all tv receivers the object is to generate the eht voltage required for the final anode of the crt by rectifying the line timebase flyback pulses. These flyback pulses are the product of back emf from the deflection coils when the sawtooth scanning voltage collapses upon the completion of each line. Therefore in a 625-line receiver the pulse frequency will be 15·625kHz. The pulses are stepped up by an "overwind" on the line output transformer, and after rectification the eht is smoothed by the crt. To achieve this smoothing, the crt is coated inside and out with graphite to form a capacitor, with the glass envelope as the dielectric.

The efficiency of the line output transformer can be increased by tuning the leakage inductance between the primary winding and the eht overwind, so that the third harmonic of the pulse frequency is added to the fundamental. This has the effect of peaking the eht pulse. Many receivers use fifth harmonic tuning for even greater efficiency, mainly in conjunction with a semiconductor voltage multiplier (Cockroft-Walton) employed in the majority of colour and a few monochrome receivers. The result of fifth harmonic tuning is to produce a flat-topped eht pulse, giving a longer rectifier conduction time. This is good for eht regulation but spells trouble for the amateur.

Tackling the problem

What does one do when "one of them" is next door? The answer is simple: there is not much one can do. If one is on good terms with one's neighbour it is possible to apply a little

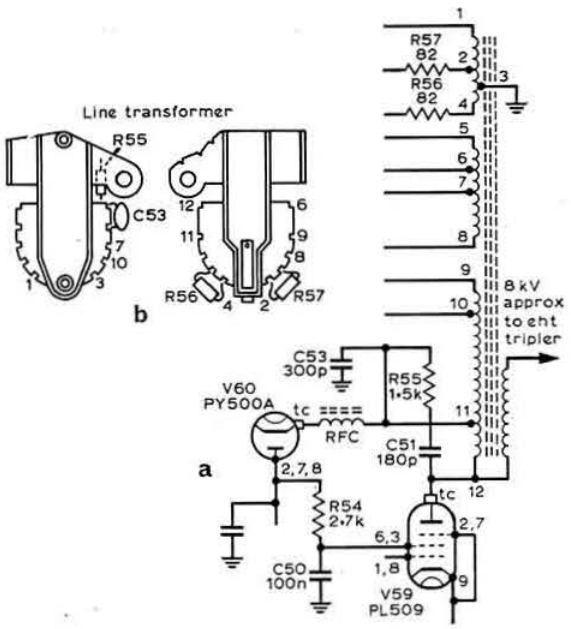


Fig 1. (a) Typical line output stage showing position of the line transformer tuning components most liable to fail (C53 and R55). (b) Where the components may be physically located. The illustrations are of the transformer end cheeks with terminating points. R55 shown dotted is mounted on other side of end cheek

suppression that may reduce or even kill the interference. However, it must be remembered that this is "pot luck" and that suppression starts in the amateur's home by checking his own equipment.

The first check is to ensure that the equipment is effectively earthed—it is no good doing it with thin copper wire taken from the primary of an old mains transformer! Treat the earth wire as if it had to carry in excess of 40A and keep it as short as is practicable. Bond the earth and all items of equipment together by using stout braid or copper strip. This point cannot be overstressed, especially when mains filters are fitted, as their correct operation demands good screening and a solid earth. A mains filter may not be effective in combating timebase interference, but it is worth trying as long as the advice on earthing is followed. It may sound strange to add that in some cases isolation of the mains earth from the equipment and relying on one's own separate earth may be beneficial. Even then one may be faced with the job of erecting a balanced aerial system to reduce the local QRM; but try it and observe the results.

If it were possible to see the interference, one would quite easily be able to take steps to stop it getting into the receiver. However, it is not visible and may travel from the tv receiver to the rig in many ways, eg via mains cables, water pipes or the rig's own aerial system. It may be assisted in this by the fact that the tv receiver is radiating interference from itself or its mains lead, aerial downlead or other metallic objects.

A noise-cancelling aerial for the rig's receiver can be built but it may be inefficient as a radiator. However, there are simple things one can do. If the neighbour is co-operative, first try the effect of disconnecting the tv aerial while the set is in operation. If the interference reduces or clears on the

* 87 Kings Avenue, Watford, Herts WD1 7SB.

hf receiver, the tv is in all probability radiating the timebase interference via the coaxial braid of the aerial feeder. This may be tackled by fitting a conventional braid-breaker, trying a braid filter or earthing the braid. To earth a feeder effectively the following method is recommended: strip off 1in of sleeving from the coaxial cable adjacent to the plug and within this 1in gap tightly close-wind some tinned copper wire to form a surrounding collar. This should then be taken to a good rf earth, but when this is not possible a short piece of wire taken to the earth pin of the mains plug may do the trick.

Both earthing and filtering together may be necessary. Most tv receivers have their chassis returned to one side of the mains supply and so it is possible, if the plug is incorrectly wired, to have the chassis "floating" at mains potential. The current practice seems to be to have the chassis "floating" at half mains potential regardless of plug wiring, but it is quite in order to apply earthing to the tv aerial system because the work is done on the "safe" side of the aerial isolator panel. Ensure that excess aerial and mains cable is not rolled up and/or positioned close to the time base stage of the tv receiver.

Radiation via the house wiring may, as previously mentioned, be reduced by fitting a mains suppressor to the tv receiver. A recent case proved that while a mains filter at the hf receiver had no effect, fitting the filter at the tv receiver reduced the timebase trouble by 50 per cent. Further improvement may be obtained by ensuring that trailing flexes to standard and set-top lamps or even hi-fi loudspeaker leads are kept a good distance from the offending tv. Domestic central heating water systems can also be carriers of the radiation, partly because the use of sealants may insulate the components into resonant lengths, and a change of room position for the tv receiver may be needed.

Do's and don'ts

Do not "home-brew" a mains filter unless the insulation can be guaranteed 100 per cent, and remember that a colour tv draws quite a high current. The filter should also be capable of handling the high "switching-on" surge current. Some amateurs have even stuck aluminium foil on to the inside back cover of a tv receiver and earthed it in an attempt to reduce direct radiation: this is not recommended because of the proximity of the live chassis, and in any case it does not prevent radiation from the face of the tv screen. However, if it is desired to try a similar method, an alternative arrangement is closely to fit an earthed fire-guard directly behind the receiver. Simply to reduce the "noise" on the hf receiver should be some encouragement and it is then that more experiments should be carried out in the shack, since a combination of local and remote devices may kill the trouble completely.

It cannot be emphasized too strongly that on no account should the internal circuitry of a tv receiver be touched. The danger is that every time the tv malfunctions one will be blamed, with the accusation that "it worked perfectly for years before you touched it". Also if an injury which could perhaps be fatal is involved, disproving your liability could become a serious matter. Where the tv set is suspected, it is far better to get a qualified service engineer to check it, but who pays for his visit is a matter for negotiation.

The line output screening covers should be checked for correct positioning with all securing devices (screws or latches) fully secured. The condition of the line output transformer tuning components and the crt Aquadag earthing should also be checked. Aquadag is the name given to the graphite coating on the outside of the crt which, as has been explained, is the earthy plate of the eht smoothing capacitor. The line output tuning components are often known to fail; they usually consist of a capacitor and resistor in series, and in a colour tv their typical values are 200pF of 8kV and 1·5kΩ 1W respectively. When these components fail, the viewers may not detect a fault condition since the effect is only to change the harmonic to which the line output transformer is tuned.

The capacitance offered by the crt is in excess of 1,000pF, and due to its importance in the eht system one would expect it to be adequately earthed. Unfortunately this is not always so, and many colour receivers employ a flimsy phosphor-bronze spring rivetted to the shield which supports the colour crt demagnetizing coils. All too often this spring becomes tarnished due to persistent arcing and usually requires frequent cleaning and re-tensioning. Signs of brushing or corona discharge around the line output transformer, solid-state tripler or shunt stabilizer rectifier system (whichever is employed), and arcing at the final anode connector, should also be looked for.

A word of warning if a colour tv employs a shunt stabilizer network. It is imperative *not to remove* the screening covers while the set is in operation, due to the presence of X-rays. A qualified tv engineer will provide a special heavy-leaded glass shield to allow close visual examination without the dangers of X-ray radiation. With receivers employing solid-state tripler units the X-ray problem is virtually non-existent.

A final tip is to add a component which is already fitted in many colour tv receivers, but which can be added to monochrome and older colour receivers. A resistance is added in series with the eht lead going to the final anode of the crt and this has a similar effect to that of adding resistance to the ignition leads of a motor vehicle. The original purpose of the resistor in a colour tv was to reduce surges where a solid-state tripler eht system is employed. The value of the resistor is typically 10kΩ with a 1W rating; the choice of type is critical. It should be good quality carbon type with a ceramic coating, and prior to fitting it is necessary to discharge completely the built-in capacitor of the crt.

This may be achieved as follows: connect a piece of wire between the chassis and the final anode connector; an Avo probe is ideal, as the probe spike can be pushed underneath the rubber cap of the connector. When this has been done, denoted by a sharp crack, the eht connector or "sunflower cap" can be safely removed by pulling. It is now necessary to fit the 10kΩ resistor inside the sunflower cap, and at first sight it looks impossible. However, it can be done by soldering the resistor hard-on to the metal part of the connector, and arranging for the resistor and the other soldered connection to lie inside the sleeve moulded to the circular shroud. It is a good idea to have the soldered connection inside the sleeve covered additionally by some small-diameter pvc sleeving. Remember to use a good-quality carbon type ceramic coated resistor of not less than 1W rating. The author notes that in recent receiver manufacture the eht cable is itself screened but its effectiveness is not known. It is assumed that the cable used has a good anti-breakdown characteristic and may be obtained from tv manufacturers.

(Continued on p593)

Semi-vertical trap aerial for 1·8, 3·5 and 7MHz

by J. T. BEAUMONT, G3NGD*

A TECHNIQUE attracting attention is the use of semi-vertical trap aerials to provide mainly vertically-polarized radiation. Although there is a fair amount of design detail available for these aerials, details of their actual construction are remarkably scarce. There also seems to be little information on the design and construction of 3·5MHz traps. Most designs have a 7·1MHz trap at the top of a vertical radiator which, together with a horizontal length of wire, resonates the aerial on 3·5MHz. The aerial described in this article has an additional trap resonant on 3·7MHz which, when connected to a horizontal length of wire, results in resonance on 1·8MHz.

Construction

The vertical radiator is constructed from 12ft lengths of 2in diameter aluminium tube, joined together with mast couplers. The dimensions are given in Fig 1. The base insulator is made from 2in diameter Marley vinyl drainpipe, as this is a push-fit over the aluminium tube: Fig 2. Since the aerial is $\frac{1}{4}\lambda$ long on all three bands, this base is at a current maximum and makes this insulation quite adequate.

The 7·1MHz trap is mounted on the top of the vertical section to take the weight, as the trap coil is close wound with 20 turns of 2·5mm² stranded copper wire 600/1,000V pvc-insulated (AEI type 6491X). This is wound on a 6in length of 1½in diameter Marley vinyl tube. The coil has a 50pF capacitor at 3kV wkg wired across it, the capacitor being inside the tube: Fig 3. It is very important to resonate the trap at 7·1MHz using a gdo.

The coil is protected with a 6in length of 2in diameter Marley vinyl tube, placed over the coil assembly. The ends are sealed with Fibreglass filler, the lower end being extended to push-fit into the top end of the aluminium vertical. The glassfibre ends are held in place with four brass screws. Connection to the coil is made with copper earthing clips, bent into a "U" shape and moulded into the Fibreglass end caps.

The 3·7MHz trap assembly is similar to the previous one, and is shown in Fig 4. The coil is wound with approximately 40 turns of 20swg copper wire spaced by one turn to prevent arcing. The smaller gauge wire is used in order to reduce the weight of the trap. The mica capacitor used is 75pF at 3kV wkg; two 100pF pulse capacitors at 2kV wired in series can be used as a alternative but an extra couple of turns will have to be added to the coil. The resonant frequency of the trap should be adjusted to 3·7MHz with the aid of a gdo. This is done by adding or subtracting the number of turns. The calibration of the gdo should be checked with a frequency meter.

The wire used for the top sections is 25mm² stranded pvc

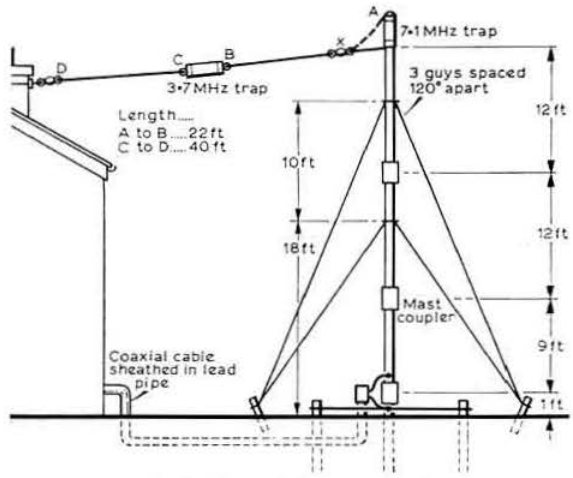


Fig 1. The aerial arrangement

insulated. Length A-B is 22ft and is not critical. Length C-D is very critical, however, and has a length of approximately 40ft depending on the height between the end section of the aerial and the rooftop of the house. The aluminium tube and the traps are painted with cellulose car paint in order to preserve them.

Erection

A site should be chosen 10ft from the bottom of the garden and a 5ft length of 2in diameter aluminium tube held vertically in the ground with concrete to a depth of 4ft. This leaves 1ft protruding above the ground which when sleeved with 2in diameter Marley vinyl pipe forms the base insulator: Fig 2.

Guy clamps should be fitted on the vertical, and 500lb-strain polypropylene rope attached with anchor rings. A strain insulator of Perspex and a length of rope is fitted between point "X" and the vertical to prevent undue strain on the trap (Fig 1). There are two earth rods, each 6ft long,

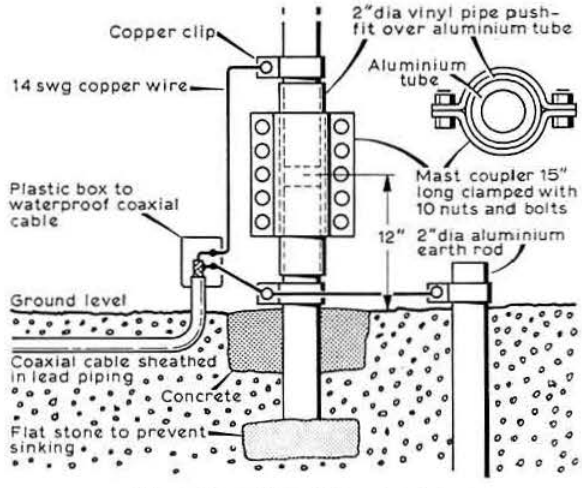


Fig 2. Assembly of base insulator

*28 Barton Road, Urmston, Manchester, Lancs.

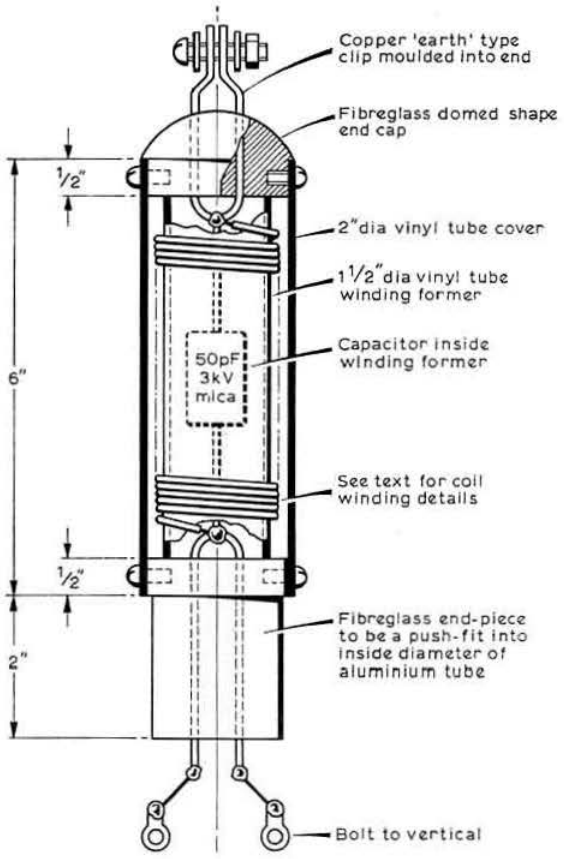


Fig 3. Details of 7·1MHz trap

which are hammered into the ground and wired with copper wire to a point underneath the base insulator.

The coaxial cable used is Uniradio 43 (50Ω) and is connected braid to earth and inner to the feed point on the vertical. The cable is fed from the shack to the aerial inside a length of old lead gas pipe buried 2ft deep, making an excellent earthing system both for the station earth and the aerial.

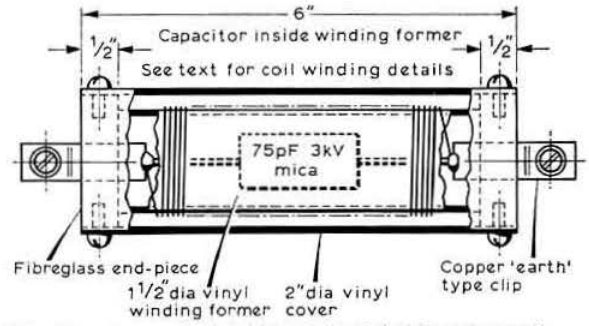


Fig 4. Details of 3·7MHz trap

Setting up

When the aerial is erected the only adjustment necessary should be for 1·8MHz. With the transmitter tuned to 1·9MHz, the length C-D should be adjusted to give an swr of 1 : 1 on an swr bridge. Checks can then be made with distant stations to establish whether or not the signal decreases in strength on either side of resonance on all three bands. The bandwidth on 7MHz is wide due to the large diameter of the vertical radiator.

On 3·5MHz the swr is 1 : 1 on the resonant frequency of the trap and cannot be altered by adjusting the length A-B. In practice it was found that when tuning a trap to resonance, the capacitance due to the outgoing wires could be ignored. A useful bandwidth of about 100kHz is possible on all three bands.

Performance

On 1·8MHz the countries worked were: HB9, LX, DL, PA, OH, W2 at S7 (ssb); and OL9, XN1, K1, OK2 (cw). Contacts on 3·5MHz included CN8, W2, JX2, WA8, YV5, JA6, VO1, VP1, W9, OX, HK4, VU2, VP2 and 6Y5, all on ssb, with 180W p.e.p. input. The 7MHz contacts on ssb included EP2, YZ2, OJ0, UK9, W4, and VK3 at S6.

On all three bands the aerial works well for dx and also for inter-G operation. It all fits into a small garden and should give good results to anyone prepared to take care to provide a really good earth system. □

A vfo for use with a Trio 2200G

(Continued from p589)

Performance

The spurious emission and response levels were both measured to be more than 50dB below the wanted signal. Drift is unnoticeable when used in the fm mode and not prohibitive in the cw mode. If it is required to use the system for narrow-band cw operation some form of temperature compensation could be built into the free-running oscillator.

The system has been in operation for some months and no difficulties in using it have come to light.

The combination of a Trio TR2200G and a vfo has been found to make a very versatile system which can be used either from a fixed station, pedestrian, or from a portable site. It is equally useful for local radiotelephone operation and for serious experimental work. □

The suppression of television timebase interference

(Continued from p591)

Conclusion

The author would welcome any further advice or tips from members, with a view to giving any submitted material a wide circulation. If just a few benefit from the suppression methods listed, outlining them will have been worthwhile. It may be worthwhile to direct readers' attention to the condition prohibiting "undue interference" which is printed on the back of the domestic tv licence. The amateur has as much right to invoke this clause as any other user of "wireless telegraphy". But the situation demands delicate negotiation: if in doubt, ask the Interference Committee for advice. □

Solid-state BC221 frequency meter

by R.S.N. RAU, VU2CX*

Synopsis

The valves used in the BC221 frequency meters long ago became obsolete and are now difficult to obtain—especially the older non-octal types—and as all models of the meter have excellent accuracy it would be a pity if the instruments have to be junked for want of valves. However, with very little effort these instruments may be modernized with FETs, with no sacrifice of accuracy, by changing/adding a few components. In the author's model no recalibration was required, and the instrument now operates from a small 9V battery.

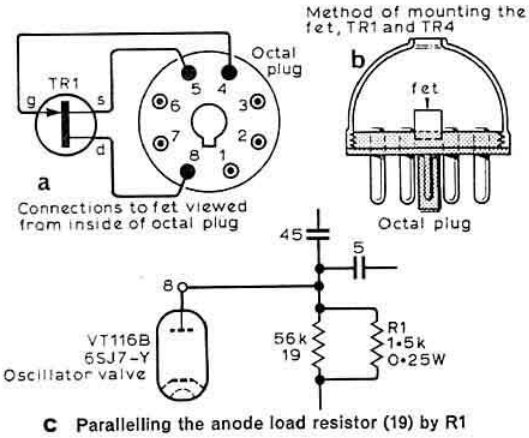
Modifications

The only description of replacing valves by FETs in the BC221 known to the author is by Charles Landhal (*73 Magazine*, May 1971, p61), and using this as a guide he has modified his BC221-0. The modifications given below specially concern this model, particularly regarding part numbers and base diagrams. However, all BC221s and LM counterparts are basically similar and hence the modifications apply to most, if not all, models.

The three valves used are replaced by four N-channel JFETs type 2N3819, but BFW10 or BFW11 may also be used. The only new components required in addition to the FETs are three octal plugs, five resistors, one capacitor and a 9V transistor radio battery.

Variable frequency oscillator

The valve used for the vfo is a VT116-B (6SJ7-Y), which is replaced by the N-channel jfet TR1 (2N3819) mounted inside an octal plug as shown in Figs 1(a) and (b). Fig 1(c) shows the modification to the anode load resistor of 56kΩ (part No 19). The value of R1 will depend on the particular sample of the fet used, and ranges from 1 to 6·8kΩ.



C Parallelling the anode load resistor (19) by R1

Fig 1. Modifications to the vfo circuit

*41/2 VI Main Road, Bangalore 560 003, India.

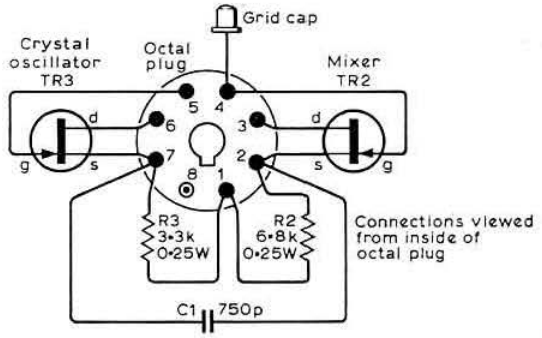


Fig 2. Modifications to the mixer and crystal oscillator circuit

Mixer and crystal oscillator

The valve used for the mixer-oscillator is a VT167 (6K8), which is replaced by two 2N3819 JFETs TR2 and TR3, one for the mixer and the other for the crystal oscillator. Fig 2 shows the necessary connections. The two FETs, together with the associated components R2, R3 and C1, are mounted inside the octal plug. R2 and R3 may need some experimentation in the vicinity of the values given (6·8kΩ and 3·3kΩ respectively).

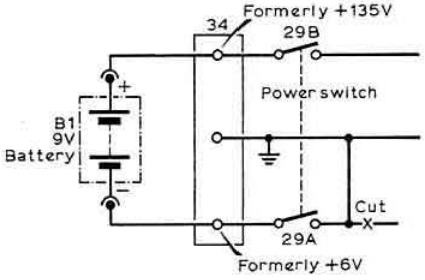


Fig 3. Battery connections

It is important to note that the original leads going to pin numbers 2, 7 (heater) and 4 (screen grid) should be cut and insulated. The top-cap clip of the mixer valve should be connected to pin number 4.

A short stiff wire of appropriate length is soldered to pin 4 and the other end of the wire is soldered to a small grid cap obtained from a defunct valve. The lead bearing the clip formerly going to the top cap of the mixer valve now goes to the new cap.

Beat frequency amplifier

The valve for this is a VT116 (6SJ7), generally connected as a triode in all models using this valve. This again is replaced by a 2N3819 fet (TR4) mounted and connected inside an octal plug exactly as in the case of TR1 (Fig 1(a) and (b)). Parallel the 15kΩ anode load resistor (Part No 24-2) by a 4·7Ω, 0·25W resistor. Remove the original 300Ω cathode resistor (Part No 41) and replace by one that gives a source current of approximately 1mA: typically this is in the range 1kΩ to 3·3kΩ.

Power supply

This is shown in Fig 3 and is self explanatory. A small 9V transistor radio battery fastened by a clip to the side of the instrument now powers the instrument. The total current drain is approximately 3mA, which assures almost shelf-life for the battery. The instrument can also be operated from mains via a smoothed low voltage dc supply stabilized by a 9V zener diode.

Performance

All the check points listed in the calibration book for low and high ranges could be clearly located and brought to settings noted in the book using the corrector. No recalibration was found to be necessary. The beats were sufficiently loud, although not as loud as the valve version. From the instant of switching on, there was practically no drift. □

Calculation of distances from QRA Locator codes using the HP-25

by A. M. STEPHENSON, G8BUQ*

IN the May 1976 issue of *Radio Communication*, C. Van Dijk, PA0QC, described a program designed for the Hewlett-Packard HP-65 programmable pocket calculator which calculates the distance between two points defined in terms of the QRA Locator system. As the HP-65, though an excellent machine, is rather expensive and therefore in relatively short supply where amateurs are concerned, the author thought to redesign PA0QC's method for the cheaper and more recent HP-25 programmable machine.

Inevitably, compromises and alterations to PA0QC's method have had to be made. The HP-25, after all, is a simpler machine with fewer available program memory steps. However, notwithstanding its relative limitations, the result of these modifications is a program which closely approximates to the HP-65 version for versatility and usefulness.

Explanations are almost superfluous, as serious users will soon understand the reasons for some of the changes, and reference to the original article will reveal the mathematical basis of the method. □

Method of use

Program Step	Keys	Program Step	Keys	To use
00	(R/S)	25	—	(1) f PRGM
01	← →	26	STO 3	f REG
02	g x ≠ 0	27	RCL 0	(w)111·1332729
03	GTO 07	28	RCL 2	STO 4
04	g 10^x	29	—	(w) ·5
05	STO 6	30	f COS	STO 5
06	g 10^x	31	RCL 3	(w) own α, ↑
07	← →	32	f COS	(w)own δ, ↑
08	6	33	×	(w) own ε, R/S
09	÷	34	RCL 1	(w)own β, ↑
10	−	35	f COS	(w)own γ, ↑
11	5	36	×	(w)own ζ, R/S
12	÷	37	RCL 3	RCL 2
13	+	38	f SIN	STO 0
14	STO 2	39	RCL 1	RCL 3
15	R/S	40	f SIN	STO 1
16	↑	41	×	0
17	6	42	+	STO 7
18	÷	43	g COS^{-1}	(2) for each other station:
19	+	44	RCL 4	(w)α, ↑
20	RCL 6	45	×	(w)δ, ↑
21	STO −6	46	RCL 5	(w)ε, R/S
22	—	47	+	(w)β, ↑
23	8	48	f INT	(w)γ, ↑
24	÷	49	STO + 7	(w)ζ, R/S
				distance for that station displayed in km

Store usage

R_0 = own long, λ_A
R_1 = own lat, L_A
R_2 = other long, λ_B
R_3 = other lat, L_B
R_4 = 111·1332729 (constant)
R_5 = 0·5 (constant)
R_6 = (used)
R_7 = total distance in km

(3) finally, for total km:
RCL 7
(4) for new run of other stations:
0
STO 7
go to (2).

NB: "w" means: "write as a numerical value on keyboard"

*19 Du Pre Walk, Wooburn Green, High Wycombe, Bucks HP10 0QJ.

QRA LOCATOR CONVERSION TABLE

QRA Locator code format:

Letter	Letter	Number	Number	Letter
α	β	γ	δ	ε or ζ

$$\text{Longitude} = \alpha + \frac{1}{5}\left(\delta - \frac{\epsilon}{6}\right)$$

$$\text{Latitude} = \beta - \frac{1}{8}\left(\gamma + \frac{\zeta}{6}\right)$$

Note: if $\delta = 0$, write $\delta = 10$ and $\gamma = \gamma - 1$

where the variables are defined as follows:

for	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	etc
α =	0	2	4	6	8	10	12	14	16	18	20	22	24	26	etc
for	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	etc
β =	40	41	42	43	44	45	46	47	48	49	50	51	52	53	etc

γ and δ are as written in the locator, and the final letter yields ε and ζ in accordance with this table:

ε { 5	3	1	
h	a	b	1
g	j	c	3
f	e	d	5
			ζ

BOOK REVIEW

Servicing with the oscilloscope, 2nd edition, 208 pages. Hardbound in laminated covers, 140 by 222mm. Published by the Butterworth Group, 88 Kingsway, London WC2 6AB. Cover price £4.50.

This edition includes additional text dealing with the oscilloscope itself, and new information on the testing of colour television and audio equipment. As implied by the title, the purpose of the book is as a guide to testing, adjustment and fault location in radio, television and audio equipment. The text and diagrams are well presented and the numerous oscillograms are clear and informative.

EQUIPMENT REVIEW

The Icom IC202 hand-held 2m ssb transceiver

by J. P. MARTINEZ, G3PLX*

THE many hand-held fm transceivers now in use all over the country on 2m have shown how, with the aid of a good location, good conditions, or perhaps a repeater, quite remarkable results can be obtained with pocket-sized equipment. In view of the well-accepted superiority of ssb over fm, it is perhaps surprising that an ssb hand-held transceiver has only just become available. Obviously there are more stringent design parameters to overcome, so it was interesting to see how well these had been met by Icom in their new IC202.

The IC202 is a vxo-controlled ssb/cw transceiver which, as supplied, covers 144·0 to 144·4MHz in two ranges of 200kHz. Two spare ranges are fitted, and crystals are available for these to cover other 200kHz segments of the band, or an external vfo in the range 133·3 to 135·3MHz can be used. The receiver and transmitter use a common 10·7MHz upper sideband filter. Most of the circuitry is on a single printed circuit board, with the vxo on a small pcb behind the tuning control. The unit is 7 by 6 by 2½in, with easy access to batteries and trimmers by clip-on panels on each side.

The receiver is a conventional single superhet design, with a dual gate mosfet rf stage, broad-band noise blanker, double time-constant "hang" agc, and facility for offsetting the receiver frequency from that of the transmitter (rit). The transmitter is single conversion, using a balanced mixer, and with automatic level control operating from the pa input signal level. The cw mode is selected by moving the carrier crystal into the filter passband, off-balancing the modulator, and keying one of the driver stages. The front panel controls are: tuning, rit, receive/cw switch, noise blanker switch, frequency range selector, volume control, and an off/on/panel light/ext vfo selector. There are sockets for the key, external speaker, external 13·8V supply, external aerial and microphone. The external vfo socket is inside the unit and can be reached through a hole normally fitted with a blank grommet. Accessories supplied include a shoulder strap with microphone case, an earpiece and an assortment of plugs.

The tests which were carried out on the IC202 were all done with it operating from its own batteries (nine HP11s), with the test equipment connected to the external aerial socket, and with the internal aerial collapsed. On receive, the noise factor was a good 5dB, and the only spurious response, the image frequency, was well down at 64dB, 21·4MHz below the tuned frequency. The dial calibration was within the width of the cursor, ie within about 500Hz at all points, except at one end of one range where it was 1kHz out. Even this could be improved, as there are three trimmers associated with each range and these would appear to be capable of setting the calibration accurately at three points in the range independently. The rit range varied a little from one end of a range to the other and was not quite symmetrical, but it was always between 2 and 3kHz on either side of the transmitter frequency identified by a mechanical notch at the centre position of the control. As would be expected in a single superhet, there were no birdies. The S-meter needed a 0·4μV signal (emf) to just lift the needle off the stop, a 4μV signal to read S9 at half scale deflection, and it was not quite possible to pin the needle on the top stop with a strong signal.

An attempt to measure the warm up drift proved futile—there was none—but not to be beaten, the reviewer carried out a more severe temperature test. The whole transceiver was cooled to 0°C and raised to 50°C, with the receiver tuned to 144·0MHz. The total change in frequency was 1·5kHz, and most of this occurred over the top 20°. This sort of temperature change is unlikely to be met in a normal contact, so there should be no problem with drift. Normal handling of the unit did not vary the frequency appreciably, the worst effect found being a shift of about 100Hz with firm pressure on one side plate near the vxo.

On the transmit side, the power output was 3·4W with an external 13·8V supply, and with the fresh set of batteries supplied the power output was 2·3W, showing that the battery voltage was dropping a bit on load. With a well-used set of batteries, the output was 1·2W, at which point the battery voltage dropped to 10·2V on speech peaks. There was no frequency shift or distortion of the signal under these conditions. On the spectrum analyser, the second harmonic was 53dB down, and all other harmonics were more than 70dB down. The local oscillator signal, 10·7MHz below the tuned frequency, was 77dB down. These figures show that it is quite safe to use this low power transmitter as the drive for a higher power broad-band linear amplifier. On a two-tone test, the third order products were 27dB below each tone.

In use at the reviewer's home, feeding a beam aerial, good reports were received on the transmitted signal. The speech quality was clean, and the cw signal was free from defects. On receive, the audio was clean and crisp, and the agc and noise blanker were particularly effective. However, the tuning was a little on the coarse side, being 66kHz per turn of the 1½in knob. On an expedition to a local 300ft hill,

Manufacturer's specification

Frequency coverage	144·0–144·40MHz
Supply voltage	13·8V ± 15 per cent
Current drain	Receive: 0·09A to 0·25A depending on volume Transmit: (3W p.e.p.) 0·54A, (3W cw) 0·75A
Transmitter	Output power 3W p.e.p. on ssb, 3W on cw Spurious outputs: more than 60dB down Sideband suppression: 40dB or better at 1kHz Carrier suppression: 40dB or better Aerial impedance: 50Ω; microphone impedance: 600Ω
Receiver	Sensitivity: 0·5μV at 10dB s + n/n or better Selectivity: ± 1·2kHz or more at −6dB, ± 2·4kHz or less at −60dB Spurious responses: more than 60dB down Audio output: 1W at 10 per cent thd

*11 Marchwood Court, Broadsands Drive, Gosport, Hants.

operating with its own whip under "flat" conditions the IC202 clearly showed the effectiveness of ssb, the best contact being a report of S5 over a 120-mile path. However, the reviewer had some reservations about waving a £180 transceiver about to get the best signal. At over 4lb the IC202 is quite heavy, and a handle or a wrist strap, as fitted to cine cameras of similar value and weight, would be better than the shoulder strap.

The extra weight, and the slightly tricky tuning, have always been a feature of ssb equipment compared with fm, and this is the price which must be paid for its considerably greater range. Icom have certainly overcome the extra technical requirements of ssb, and the IC202 has been shown to have a performance every bit as good as the best fixed station equipment. □

RAE COURSES 1976-7

Aberdeen. Aberdeen Technical College, Aberdeen. Tutor, J. M. McKinnon, GM4EKC. Commencing late September or early October. Details from GM4BKV, tel Aberdeen 691716.
Barry. Barry College of Further Education, Colcot Road, Barry. Tuesdays, 7.30pm, commencing 21 September. Enrolment 13-15 September. Fee £4.50 (under 18), £7 (over 18). Details from D. H. Adams, lecturer-in-charge, electrical engineering department at the college, tel Barry 3251/2.
Bath. City of Bath Technical College, Avon St, Bath. Tutor, P. A. Bubb, G3UVJ. Enrolment September. Details from the college.
Beckenham. Beckenham and Penge Adult Education Centre, 28 Beckenham Road, Beckenham. Tutor, J. M. Tripp, G3YWO. Wednesdays, 7.30-9.30pm, commencing 22 September. Enrolment by post 31 August to 10 September. Personal enrolment 13-14 September. Details from the principal at 244 Croydon Road, Beckenham BR3 4DA.
Blackburn. The College of Technology and Design, Feilden St, Blackburn. Tutor, Harry Leeming, G3LLL. Details from the principal.
Broadstairs. Hilderstone House, Broadstairs. Commencing September. Details from the principal or from G3OWQ.
Bury. Bury Radio Society, Mosses Youth and Community Centre, Cecil Street, Bury. Commencing 21 September. Enrolment 31 August and 7 September, 8pm. Details from G4BVE.
Canterbury. Canterbury College of Technology, New Dover Road, Canterbury. Details from the college.
Chelmsford. Mid-Essex Technical College and School of Art, Victoria Road South, Chelmsford. Commencing September. The college is also offering an advanced course for those amateurs who have already taken the course leading to the RAE and would like to broaden their expertise. There would be no examination. Details from G3EDM, tel 01-245 54491 ext 217.
Chesterfield. Chesterfield College of Technology, Infirmary Road, Chesterfield. Details from J. A. Gascoigne, course organizer, radio and television.
Eastbourne. Eastbourne College of Further Education, Eastbourne. Mondays and Wednesdays, 7-9pm, commencing 20 September. Enrolment 6-8 September. Details from G3ZFE.
Farnborough. Cove School, St John's Road, Farnborough. Tutor, John Hardy, G3KND. Commencing 30 September, 7.30pm. There will also be a morse proficiency course commencing on 27 September at 7.30pm, at Oak Farm School, Chaucer Road, Farnborough. Details from the principal.
London (Angel). Shelburne Radio Club, White Lion Street School, London N1. Tutor, G3SLF. Commencing 6 September. This class is aimed for the December 1977 examination to allow time for practical application. Details from G3SLF, tel 01-254 8528.
London (Eltham). Eltham Hill School, Eltham, London SE9. Tutor, J. M. Tripp, G3YWO. Tuesdays, 7·30-9.30pm, commencing 21 September. Enrolment by post 25 August to 1 September. Personal enrolment 13 September 10am-12 noon, 16 September 2-4pm, or on the first night. Details from the principal at Institute Headquarters, Art Centre, Haimo Road, Eltham, London SE9.
Oldham. Oldham College of Technology. Tuesdays, commencing mid-September. Enrolment 30-31 August and 1 September. Details from Peter Taylor, G8BCG, 69 Arlies Lane, Stalybridge, Cheshire.
Portsmouth. Further Education Centre, Drayton Road, North End, Portsmouth. Tuesdays and Thursdays. Details from the principal or G6NZ.
Rolleston. Rolleston and District Adult Education, The Forest of Needwood High School, Rolleston-on-Dove, Burton-on-Trent. Tutor, Denis Reynolds, G4BPW. Tuesdays, 7.30-9.30pm, commencing 21 September. Personal enrolment 16 Sept, 7-8.30pm. Fee £2 per term. Details from John Smith at the school.
Strood. Strood Evening Centre, Rede School, Carnation Road, Strood. Thursdays, commencing 28 September. Details from head of centre, tel Medway 76621.
Walsall. Walsall College of Technology, St Paul's St, Walsall. Details from college office, tel Walsall 25124.
Weybridge. Brooklands Technical College, Heath Road, Weybridge. Commences week beginning 20 September, 6.30-8.30pm. Enrolment 13-15 September. Fees £3.75 (under 18), £7.50 (over 18). Details from B. T. Teague, head of department of technology at the college.

Special event stations

GB3IWA, 6-8 August
Operational from the river embankment, Peterborough during the occasion of the Inland Waterways Association National Rally of Boats. Organized by the Peterborough Radio & Electronic Society and directed by G3EEL. Operational on 160, 80, 20 and 2m. Some 500 assorted river craft are expected and the event will be supported by many trade exhibits and other entertainment. The River Nene is navigable from the sea by craft as big as a Thames barge, and G3EEL can provide sailing directions for any craft arriving from seawards.

GB3FBC, 12-15 August
This station will be operated from Fochabes, Morayshire, on 2m, all modes, and 160–10m. Activity will be mainly on 20 and 80 on the hf bands using ssb. The main activity day will be Saturday when 30 hot-air balloonists will be competing against each other, supported by the Barnstormers, a civilian aerobatic team, the Golden Lions parachute team, vintage cars, model aeroplane display, world pipe band champions and The Gay Gordons Group comprising GM3GAY, GM3NCS, GM3KHH and GM3DZB operating GB3FBC adding to the general noise.

GB2TS, 14 August
Operational during the Tollerton Show by York Amateur Radio Society.

GB3RER, 14-22 August
This station will be operational on all bands 80-10 and 2m in connection with the centenary celebrations of the Ravenglass & Eskdale Railway, Ravenglass, Cumbria. The line, almost seven miles long, runs through the Eskdale Valley and is a well-known attraction in the area. Motive power includes both diesel and steam engines, with a new steam engine recently built and now operational. Details from GM3ULP, QTHR.

GB3TCF, 28-30 August
This station is being organized and operated by seven Midland amateur radio societies in conjunction with The National Town and Country Festival to be held at The National Agricultural Centre, Stoneleigh, Warwickshire. Operation will be on 160m, 80m, 20m, 2m and 70cm, with special commemorative QSL cards available. Talk-in will be provided on 160m and 2m. Demonstrations on the amateur radio stand will include fast and slow-scan tv, rtty, radio astronomy and aurora, and an amateur repeater. Further details from G8HRH, QTHR. Tel Leamington Spa (0926) 24465.

GB3RN, 28-30 August
This station will be in operation during Navy Days at Portsmouth Dockyard. There will be displays in conjunction with HMS *Mercury* Communications Exhibit. Details from G3JFF, QTHR.

GB3GUZ, 28-30 August
This station will be active on all hf bands and 2m during the Plymouth Navy Days, and will be run by the Royal Naval ARS. Details from Miss May Gadsden, c/o G5QA.

GB3COP, 29 August
This station will be operated in conjunction with a Public Involvement Day to be held by Tayside Police at Scone Palace, Perth, in aid of the Police Dependants Fund. Operation will be on 80, 40, 20 and 2m. The operators welcome skeds, especially with serving or ex-police officers. Contact GM8BZX for sked arrangements.

GB2NMR, 30 August
Operational on 2m during the New Milton Rotary Club Fiesta, Recreation Ground, New Milton. There will be mobile demonstrations and modern amateur equipment will be on show.

LEARNING ABOUT LOGIC by P.J. Horwood, G3FRB*

Part 3. Dividers and counters

The name "counter" is synonymous with the word "divider". A number of flip-flops may be connected to divide by some number, and if required, steps may be taken to display the total number of input pulses received, within the capacity of the divider.

Fig 19 shows four flip-flops cascaded, the unused inputs J, K, S and R, and output $\bar{Q}$ left unconnected to simplify the circuit. It forms what is called a binary up counter. Because there are four stages, the total capacity before resetting to zero is 2^4 (16). The conditions of terminals A, B, C and D will range from 0000 to 1111 (Decimal 15). There are 16 permissible states. The truth table ("a") shows that the conditions of A, B, C and D are the binary equivalent of the decimal input number. To use this circuit as a simple counter the output terminals could be made to light lamps. When lit the lamps would have the decimal values of 1, 2, 4 and 8 respectively. To further illustrate the division function the waveform diagram is also given (Fig 20). For a total of 16 input pulses (negative-going edges) there are eight at A, four at B, and so on.

In practice, each successive output would be displaced slightly to the right. This is due to what is known as propagation delay. Propagation delay is the time taken for an output to change after the input is applied. The time is very small, typically 50ns, but if they were driven by a high frequency, 50ns could become a significant part of the input pulse duration, and false counting could occur.

This leads to more complex dividers to extend the upper frequency of operation. In the above example the input is applied only to the first flip-flop, its output driving the second one, and so on. It is known as a ripple-through or asynchronous circuit. For higher frequency performance a synchronous circuit must be used, where all the clock inputs are driven simultaneously and gating employing the J and K inputs determines the count sequence. Even so, the simple four-stage ripple-through divider will operate at clock frequencies in excess of 10MHz with suitable ICs, but further cascaded flip-flops increase the propagation delay and limit the speed of operation. The delay is cumulative.

It has been shown that four stages have the ability to divide by 2^4, therefore it can be said that N stages will divide by 2^N (N meaning any number). Because the flip-flop is a two-condition device a collection of them will divide by successive powers of two.

By various methods it is possible to modify the count sequence to cause a group of flip-flops to divide by some desired decimal number. For a given number of flip-flops it is only possible to modify the circuit to divide by a decimal

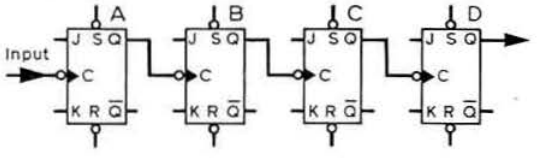


Fig 19.

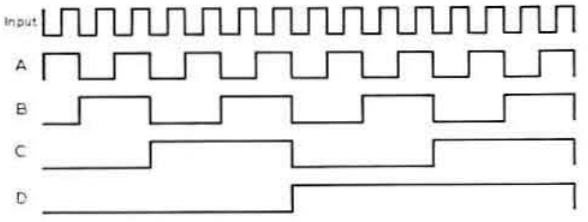


Fig 20.

number not exceeding the equivalent of the maximum binary capability. The four-stage divider may have its sequence altered to divide by any number up to 16. If it were necessary to divide by 60, for instance, the basic binary capability would have to be 64. This equals 2^6, or six stages.

Let us consider various ways of modifying a count sequence, taking a maximum count of 10 as an example. Binary counters (dividers) modified to count to 10 are described by the term binary-coded decimal (bcd). The methods require the number of count conditions to be limited to 10, either by limiting the maximum number, commencing to count at three rather than zero. or by skipping some conditions in between.

The circuit in Fig 21 is what is called a skip counter. From the truth-table it can be seen the normal binary count sequence proceeds up to seven, at the eighth count $D\bar{Q}$ goes low, taking B and C stages S with it, modifying the count to 2 + 4 + 8, a total of 14. The next count, although the ninth, is read as 15, and at the very next count all stages revert to zero. The capacitor is necessary to prevent Bs and Ds being held permanently low, otherwise the counter would lock up. A negative-going pulse via the capacitor is sufficient. The capacitor is non-critical, about 0·01μF being satisfactory. Note that the speed of the negative-going pulse from $D\bar{Q}$ is not related to the input frequency but to the speed of operation of the flip-flop.

To design a counter using this method it is necessary to subtract the new maximum count required from the maximum available, (16 − 10 = 6) and connect the feedback line to the appropriate set terminals.

Feedback to Aset = 1 skipped
,, ,, Bset = 2 skipped
,, ,, Cset = 4 skipped

Any required combination may be connected in parallel.

The speed of the skip-counter is limited because it is asynchronous, as previously explained, and further by the time taken for the set inputs to respond to the pulsed low

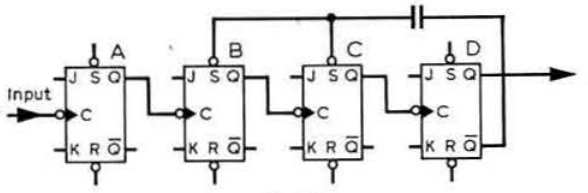


Fig 21.

* 14 Main Road, Hextable, Swanley, Kent.

TRUTH TABLES

a

Input	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

b

Input	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10 Extra state	1	0	1	0

c

Input	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	1	1	0
9	1	1	1	1

d

Input	D	C	B	A
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

"a" relates to Figs 19, 24; "b" to Fig 22; "c" to Fig 21, and "d" to Figs 23 and 25.

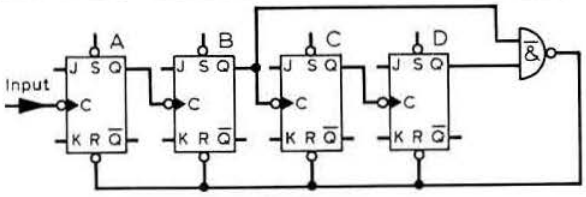


Fig 22.

signal. Even so, such a circuit is satisfactory up to several megacycles with normal ttl integrated circuits.

Fig 22 shows a gated end-stop counter. The NAND gate detects one number greater than the desired count (in this case 10) and uses the resultant low to reset all stages back to zero. As a method it has limitations; a forbidden state (10) momentarily occurs, and because the reset signal also effectively removes the 10-state the tenth pulse is extremely short.

If such a counter were used at relatively low frequencies the extra state could be ignored, but if it were followed by a logic stage the speed of operation of it could well be fast enough to respond to the spurious pulse. Surprisingly such a circuit can be used at high frequencies where the duration of the reset pulse is significant in relation to the normal input pulses. Then the ninth count is gated (gate inputs from AQ and DQ), and reset to zero occurs very shortly afterwards.

The two previous examples exploit the S and R functions, the next example uses the J and K inputs and operates in an entirely different way (Fig 23). This is an asynchronous J-K-steered bcd counter. The truth table shows that flip-flop A changes state at each input pulse. B changes state at every other input but is prevented from changing at counts above eight because its J and K are held low by $D\bar{Q}$ once eight is reached. Flip-flop C changes state at every fourth count but is also prevented from changing above eight because it receives no drive once B is inhibited. Flip-flop D, although its clock is driven in parallel with B, is inhibited until a total count of seven is reached, when its J is made high via the AND gate driven from BQ and CQ. The next pulse above nine causes all stages to return to zero.

The author hopes this method of explaining counting stage by stage can be followed without too much difficulty; there is no doubt that the practical approach is easier to assimilate using such aids as the logic tutor reviewed in *Radio Communication* March 1975.

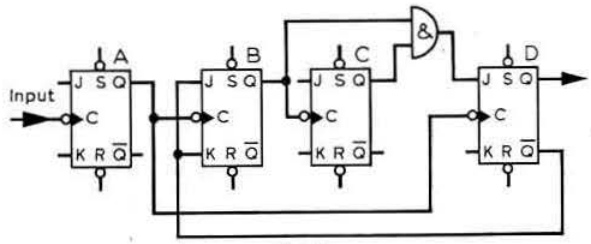


Fig 23.

The synchronous counter

All the previous examples have been based on the asynchronous counter, the frequency of operation being limited by accumulative propagation delays. Fig 24 shows a synchronous binary circuit; it can be seen that all the clock inputs are connected in parallel. Although all the flip-flops do not necessarily change at each clock pulse, when they are called upon to change they do so in synchronism, thus only one propagation delay occurs. The truth table shows that B changes after A becomes high, C changes after A and B become high, and D changes after A, B and C become high. This is achieved by the appropriate AND gates enabling the J and K terminals. One common type of ic is used, with integral AND gates, even in stages where the gate is not required. This is normal practice and also helps to ensure that the propagation delay is similar for each stage. The waveforms would be as shown in Fig 20, with only one propagation delay occurring between the input signal and *all* the outputs.

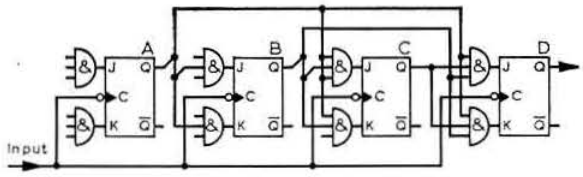


Fig 24.

Having introduced the synchronous concept in a binary counter, we can see in Fig 25 a synchronous bcd counter. AND gates dictate the sequence of counting as before, the upper limit (9) being determined by the connection of $D\bar{Q}$ to BJ. Once $D\bar{Q}$ has gone low at the count of eight, B and C stages are inhibited from changing and only A can change to make nine. At the tenth input A goes low, B and C are already low, and D goes low because its K is initially held high by AQ.

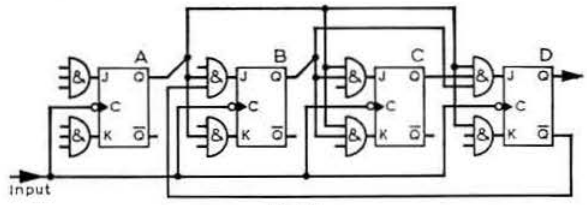


Fig 25.

We have now reached our goal of a synchronous bcd counter. The next article will deal with methods of modifying its count to make a fully variable counter. □

technical topics

Pat Hawker, G3VA

The recent carefully researched article by F. M. Smith, G8KG, (*Radio Communication*, July pp494-500) was an important contribution to the destruction of the belief held by so many amateurs that the 11-year sunspot cycle always has been and always will be, with perfect regularity and unfailingly high peaks.

I am sure, though, that G8KG will forgive me for saying that his fascinating article reminded me of the story (I swear I've really heard it and not just made it up) that when scientists at the National Physical Laboratory fail to find a firm law governing *any* series of events, in desperation they end up by correlating the numbers with the height and time of the tides at Teddington Lock—and achieve a high success rate!

Sunspots galore?

In his tentative forecast for Cycle 21 (a higher peak than Cycle 20) G8KG is clearly an optimist; we all hope fervently that he will be proved correct, and that his Goyder lock will hold steady. The pessimists, however, can point to a recent television programme that described how from 1650 right through to 1715 there was an almost complete absence of any pronounced sunspot cycles, and that (as G8KG indicates) there is some reason to believe that the sun is again behaving rather oddly and not burning as well as it should be (though I write this on a blazingly hot day). Apparently astro-physicists cannot find the expected number of neutrinos in huge tanks of cleaning fluid they keep down a gold mine (no—I'm *serious*).

This optimist-pessimist confrontation has to my mind a very important implication for amateurs. Although, as G8KG suggests, we should keep those 28MHz beams in good trim ready for a spotty sun and F2-layer paths, we should at other times make far more use of this band for a variety of other modes and purposes: sporadic-E, tropo, satellites, cross-town high-quality a.m. nets, mobile, hand-held and even repeaters. If we just sit back waiting for those fickle sunspots, not only may they never come in sufficient numbers in our lifetimes but we shall be leaving an under-used band as a tempting target for others.

Active loop aerials

It seems a long time (*TT* July 1968) since I saw at Hanslope Park a demonstration of the low profile "aperiodic loop antenna array" developed by EMI-Cossor. This system was subsequently taken over and continues to be marketed by Hermes Electronics who currently claim that more than 53 different government agencies are using this type of array to provide roughly the equivalent of a large rhombic aerial. Each loop forms an "active" aerial by means of a matching amplifier, designed to provide low-noise and a wide dynamic range. Since then there has been a growing practical interest in various forms of active aerials, although from an amateur viewpoint a possible snag is that they are suitable for reception only.

However, in recent years a lot of people have come round to the view that there is much to be said for using different aerials for reception and transmission, if this means that you can obtain good directivity which is often more important than high signal levels. For instance, on several occasions we have pointed out the value of a good frame aerial (or even a good ferrite-rod system using multiple rods) for 1·8MHz reception to obtain excellent null directivity to minimize interference. In *TT* (August 1972) we drew attention to the value of a 1·8MHz loop consisting of about seven turns of wire on a frame with 40in sides and tuned with a 500pF capacitor.

At the "Communications 76" conference a description was given of a British low profile log periodic array based on a series of loop elements, developed by C & S Antennas. This uses a *terminated* single-turn loop element which, unlike the usual continuous loop, has a unidirectional cardioid type of response pattern (typically giving a 12dB front-to-back ratio): see Fig 1. The loop is made from aluminium strip embedded in glassfibre, giving a light but rigid construction with low series inductance and shunt capacitance. The matching amplifier is in a cast box at the base of the loop and the terminating components are in a recess at the top. B. S. Collins, in the first description of this aerial element (*Comms* 74), warned against comparing active loops with monopoles on the basis of signal output, but showed that the performance of an active loop, on the basis of signal/noise performance on weak signals under normal noise-limited conditions, could be virtually the equivalent of a quarter-wave monopole.

In the latest, 1976, paper on this system, the question of forming log-periodic type arrays is further discussed, based on aperiodic loops 1m in diameter mounted 1·5m above ground in arrays covering various ranges such as 5·3 to 27MHz, 9 to 21MHz and 3·2 to 12MHz. It should be noted that

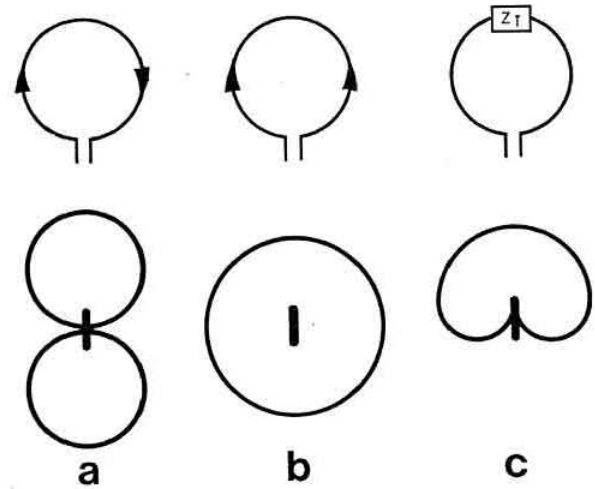


Fig 1. (*a*) Response of a conventional aperiodic loop aerial (zero-order mode). (*b*) Current-mode response. (*c*) Cardioid response to vertically polarized signals achieved by adjusting amplitude of the two modes by inserting a suitable impedance in series with the loop at a point diametrically opposite the 50Ω feedpoint. (B. S. Collins, *C & S Antennas*)

although you can compress each element into miniature form, the spacing between the elements cannot similarly be reduced.

A 1·8MHz active frame aerial

This brings me to an interesting letter from P. L. Stiles, BRS35518 (formerly G2BHR). He has been conducting experiments with an active frame aerial covering from around 1·8 to 2·25MHz. His motivation was the usual one of local authorities who dislike outside aerials but his results are of general interest. His main concern has been to optimize the output from a frame aerial so that this now provides up to about 10dB more signal than his comparison aerial which is an inverted-L 15ft high and 60ft long used with a pi-coupler matching unit and an extensive ground system. As noted above, output level is not the only (or indeed even the most important) test of a receiving aerial, and sometimes it may be an advantage deliberately to keep output low and provide low-noise gain in the receiver proper. However, there must be plenty of people using 1·8MHz receivers which need a reasonably strong signal. BRS35518 optimized his effective height from the expression $h = 2\pi NAQ/\lambda$ where h is effective height in metres; N is the number of turns on the loop; A is the area enclosed by the frame in square metres; and Q is the usual goodness factor of the tuned circuit formed by the frame aerial and its associated tuning capacitor; and λ is the wavelength in metres.

From this expression it is clear that if any or all of the three factors N, A and Q can be increased, so will be the effective height and hence the signal provided by the system. N is limited by the need to tune the frame to the wavelength required; A is limited by the need to fit the frame into a room or loft where it can be easily rotated.

Q is affected by two factors: (1) the rf resistance of the conductor; and (2) the degree of loading imposed on the tuned circuit by the coupling to the receiver.

All these factors have been dealt with by BRS35518. He uses three turns, tuned by a 100pF capacitor; the frame is 5ft square, felt to be the largest suitable for indoor use. To improve Q he uses the outer conducting sheath of the largest size of domestic tv coaxial cable. Second, in order to reduce the loading, a fet amplifier is used in a source follower arrangement. This provides a very high input resistance and very low output resistance as with a cathode-follower valve: see Fig 2.

His checks have been carried out using a Galaxy R-1530 receiver which has an S-meter calibrated in decibels. The frame aerial is indoors adjacent to the receiver and with its lowest point some 2ft above the concrete floor of a ground

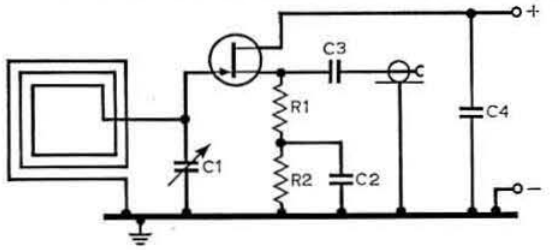


Fig 2. Optimized or active tuned frame aerial. C1 tuning capacitor (eg 100pF). C2, C4 by-pass capacitors (eg 0·01). C3 coupling capacitor (eg 0·01). R1 value equal to input impedance of receiver, usually 50Ω. R2 bias resistor to suit fet device used

floor room. As already stated, when the frame is correctly orientated for maximum signals, these are about 10dB up on the comparison aerial. BRS35518, pointing out that the source follower provides matching but no voltage amplification, is a little uncertain whether his design is an optimized frame aerial or really represents an "active aerial".

Broadband double-bazooka dipole

It has often been stressed in these columns that the bandwidth of a conventional dipole is sufficiently broad for effective transmissions throughout any amateur band (including even the full American 3·5–4MHz band). In fact a wire dipole accurately cut for 3,750kHz may be expected to have an swr of around 5 : 1 at 3,500kHz and 4,000kHz, but with normal lengths of coaxial cable there should still be substantially the same power radiated at the ends of the band as at the middle. However, there is little doubt that many amateurs still get worried when they see the swr creeping upwards with a change of frequency and, as W1ICP put it recently: "If you have confidence in your antenna it will work better than if you don't."

A more tangible advantage of an aerial specially designed to have a broader bandwidth is that it will usually be less critical to put up and less likely to be adversely affected by nearby objects.

There is one form of broadband dipole (or dipole element for a beam) that has been around many years and which I described briefly in *TT* (August 1973) based on the design by W2EEY, it also appears in some recent editions of the ARRL *Handbook*: it is known by various names including "a double bazooka".

Advantages for this approach have been claimed by F. Jennings, ZL1BET, in *Break-in* (July 1973) as a 3·5MHz aerial; and now recently in a letter from Cyprus by Gordon Thomas (5B4CA, G4AWJ) who has been using them on 14, 21 and 28MHz. In the ARRL version the two outer sections of the dipole are formed from twin open-wire or 300Ω line short-circuited at both ends; however, neither ZL1BET nor 5B4CA use this refinement, adopting simply single-wire sections.

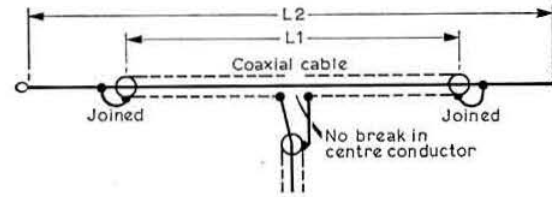


Fig 3. "Double-bazooka" form of broadband dipole element. For dimensions see text

Basically the double-bazooka (Fig 3) is an electrical half-wave of coaxial feeder (taking into account the typically 0·66 velocity factor) and thus a good deal shorter than a half-wave dipole, to which its length is extended by wire sections. The inner conductor of the feeder section is continuous but the braid is broken at the centre to provide a feedpoint.

The braid of the coaxial cable plus the extensions act as a conventional dipole; the inner conductor of the cable does not radiate but forms two quarter-wave short-circuited stubs. At exact dipole resonance these stubs represent infinitive resistive impedance at the feedpoint and have no effect; but as the system departs from resonance, the stubs represent reactive elements as seen at the feedpoint, opposite to the

reactance of the dipole element. The result is that over an appreciable bandwidth the feedpoint impedance is mainly resistive. In other words the double-bazooka has a largely resistive feedpoint impedance over a greater bandwidth than would be the case for a conventional dipole.

ZL1BET suggests it is a constructional advantage, particularly for 3·5MHz, to clamp the centre junction and the ends of the coaxial sections firmly in phenolic or perspex clamps to prevent twisting and breaking of the cable, and clamps of this type are illustrated in the ARRL *Handbook*.

The main bone of contention are the length formulas: ARRL give $460/f$ for overall length, $325/f$ for the cable section; W2EEY gives $462/f$ and $372/f$; ZL1BET gives $468/f$ and $325/f$; 5B4CA after a good deal of cut and try found it desirable for an inverted-V form of construction to use different correction factors on the various bands: $475/f$ and $336/f$ on 14MHz; $490/f$ and $347/f$ on 21MHz; $495/f$ and $351/f$ on 28MHz. With these dimensions 5B4CA had no swr problems, and useful reports when using a 20ft bamboo as the centre support. In all these cases f represents centre frequency in megahertz.

Wideband autotransformers

In some solid-state power amplifiers the input circuit consists of two wideband transformers which step down the input voltage by a factor of three, using two Permag cores. It is normal practice in this form of wideband transformer, termed a "transmission line transformer", to use several separate transformations, for example two for a 9 : 1 impedance ratio, or three for a16 : 1 ratio.

Recently Gian Moda, I2SWX, drew attention to an article that offers a slightly different approach: "Use of wideband autotransformers in rf systems" by John J. Nagle (*Electronic Design* 3, 2 February 1976). This suggests that for some applications an autotransformer with a single core may not only be simpler to construct but can also provide better results.

The distinguishing feature of any transmission line transformer is that the "winding" is composed of two conductors carrying equal and opposite currents, similar to the "go" and "return" currents in a balanced transmission line; the net magnetizing ampere-turns in the core is zero. Two identical windings are needed and the tap *must* be placed at the centre, providing in its basic form a 4 : 1 impedance ratio. By using several cores various ratios can be achieved but these are always limited to the series 4 : 1, 9 : 1 (Fig 4a), 16 : 1 (ie n^2 : 1 where n is an integer). One exception is a 6 : 1 ratio which it has been shown can be achieved by means of a third winding.

With an autotransformer approach, a range of impedance transformations can be achieved and a tapped transformer offering a series of different ratios can be developed. The secret is that each section of the transformer consists of an identical winding, and all these sections are wound with the wires twisted together. John Nagle points out that with an autotransformer the permeability of the core and the number of turns determine the low-frequency response, while the high-frequency response is obtained by very close coupling between the windings, both capacitively and magnetically; it is for this reason that twisted wires are used.

A trifilar winding (Fig 4b) can give a step-up ratio of 1 : 2·25 or 1 : 9 depending upon which tap is used: a quadrifilar winding can extend this to 1 : 2·25, 1 : 4 and 1 : 16 depending upon the tap. Both trifilar and quadrifilar transformers can also be used in a balanced-to-balanced transformation (trifilar 0·111 : 1, quadrifilar 0·25 : 1). While more than four windings would give even more flexibility, it is usually not easy to construct such transformers.

It is pointed out that in the design of a good wideband rf transformer (either conventional or autotransformer) one of the most important factors is the shape of the core, and that it is a mistake to think that the toroid core is the most suitable. Ideally one needs a core shape that maximizes shunt inductance while minimizing leakage inductance and shunt capacitance: cores can be rated on this basis by means of the "form factor". An improvement over the toroid can usually be achieved by placing two toroids edge by edge or side by side; this second arrangement is usually called a balun core.

The *Electronic Design* article gives detailed guidance on the construction of wideband autotransformers: for example a 9 : 1 impedance matching transformer (ie 3 : 1 voltage step-down) which is virtually flat between 1 and 100MHz, yet consists of just one trifilar turn. We are gradually becoming used to wideband transmission-line transformers, for example

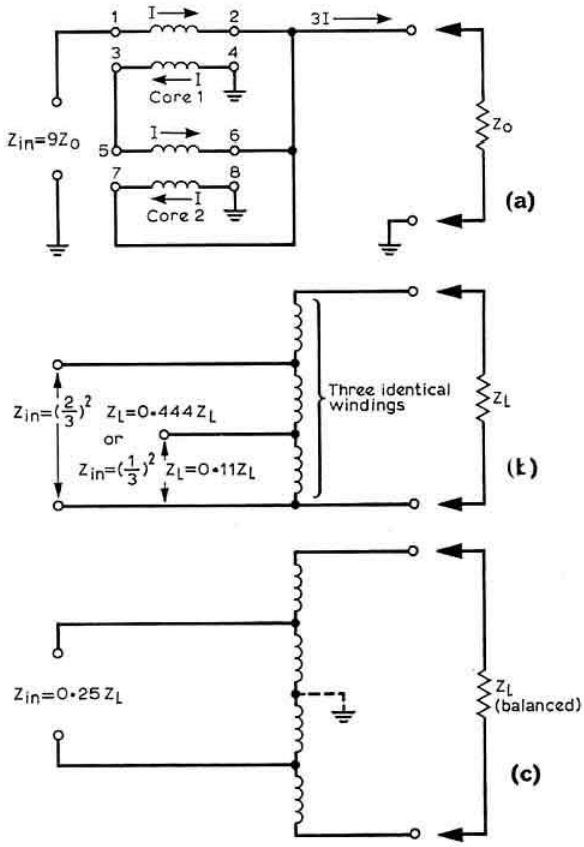


Fig 4. (a) Usual form of broad-band transmission-line transformer using two separate cores to produce 9 : 1 impedance matching. (b) Autotransformer provides more flexible arrangement on single core with trifilar winding. (c) Balanced autotransformer giving 1 : 4 impedance matching with four identical quadfilar windings

as used in double-balanced wideband mixers. It would seem that the extension of similar techniques to autotransformers could equally have useful applications in amateur equipment. It is not so very long ago that the idea of broadband rf transformers that would cope effectively from near dc to well into vhf would have seemed a figment of the imagination.

Variable three-terminal ic regulator

Three-terminal ic regulators for low-voltage power supplies have been around for some time (*TT* March 1974 and *ART*) but a useful new series of adjustable regulators (LM117, LM217, LM317) has been introduced recently by National Semiconductors UK Ltd. The output voltage range is 1·2 to 37V with an output current of 1·5A; minimum input-output voltage differential is 2·5V. Apart from the ease with which it can be used in adjustable supplies, it is claimed that this new series offers useful improvements over standard ic regulators. The LM117 is intended for operation over a very wide range of temperatures and for most amateur applications the LM217 or 317 should prove satisfactory. No zener diodes are used in order to allow the device to work with input voltages below 7V.

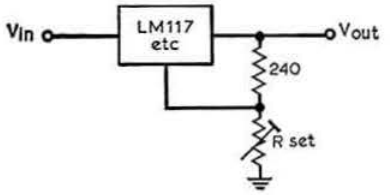


Fig 5. Basic arrangement for adjustable voltage regulator

As shown in Fig 5 only two external resistors are needed to set the output. A current of 5mA flows through the 240Ω resistor and 50μA is drawn from the "adjustment" terminal.

Morse for commuters?

Many amateurs have found that it is one thing to struggle through the morse test to obtain the coveted Class A permit; something rather different to feel really at home with cw operation. It makes all the difference if you persevere until 12w/min seems a little like flag-waving. There is a common belief that a short spell of cw operation on the bands will quickly convert a 12w/min capability into 20w/min; this is only partly true—so much amateur "traffic" follows well-defined patterns that it is by no means the ideal way of bringing up your speed.

This brings me to a note received from Dick Rollema, PA0SE, putting forward some thoughts on a novel way of finding time for regular practice sessions, originally suggested in his *Reflecties* column in *Electron*. He writes:

"Many commuters spend considerable time each day in their cars. PA0WV has suggested that this largely lost time could be put to good use by listening to taped morse as an exercise in copying cw. Some suitable practice material is recorded on a cassette recorder and replayed in the car.

"I have put this idea into practice and find it most useful. The almost daily practice soon results in good progress. My own favourite material is the 40min news bulletin transmitted daily by PCH for Dutch ships. If there is any question of copyright, as arises with the PCH material, it is better to ask permission to use transmissions in this way.

"Of course, one can copy only mentally; writing down the material is something that has to be learned separately, although many amateurs do not do this in practice.

"I have taken PA0WV's advice one step further by adding speed control to the cassette recorder. This allows me to replay the tape at up to more than double its original speed, and the variable control allows the session to be adjusted in response to growing proficiency. Fig 6 shows the circuitry that controls motor speed in my Philips N2204 cassette recorder. R2 is normally connected to "chassis" at its lower end; external speed control R3 is connected between R2 and 'chassis' and is mounted in a small box and connected by flex having a DIN loudspeaker plug at the end. This fits into the external loudspeaker socket on the recorder as I never use this for its intended purpose. This socket has the advantage that when the plug is withdrawn a short-circuiting contact restores the normal situation in the recorder.

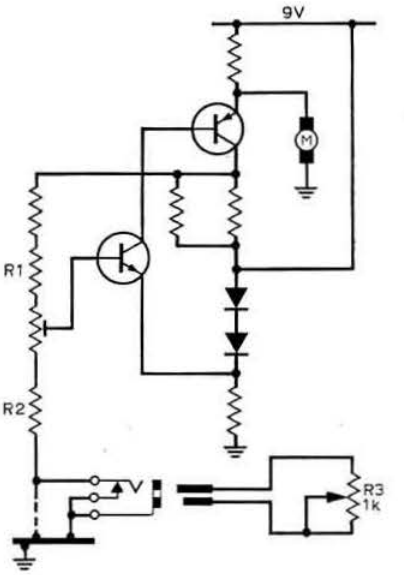


Fig 6. Speed control used with Philips tape cassette player

"Power consumption is higher than normal as the volume has to be turned up rather high to overcome the high ambient noise level in a car, especially when travelling on the motorway. The faster replay also causes more current to be taken. For these reasons dry batteries are not an attractive proposition and I run my recorder from the car battery, using another of the DIN sockets on the recorder for this unintended purpose. The 12V supply is fed to the input of the voltage stabilizer in the recorder, normally used only when the recorder is fed from the mains supply."

Because of our Wireless Telegraphy Acts I suppose it could be argued that recording any cw transmissions, other than from an amateur station, would be an infringement, quite apart from questions of copyright. But there must be ways of overcoming this; for example by getting someone to record practice tapes or by buying morse-practice tapes available on the market. □

4-2-70

Martin Dann, G3NHE*

Contest news

The big event of the month, and the major vhf/uhf contest of the year was VHF NFD. Some had viewed with concern the changing of the date of this contest from September to June, but what a great shame it would have been had VHF NFD *not* taken place on the weekend of 3-4 June! With the exception of a few scattered thunderstorms, the weather, conditions and the level of activity all vindicated the change of date and the contest was a spectacular success. From 144 to 1,296MHz the Continental dx was rolling in, and it was not until the Sunday afternoon that many of the better sited stations managed to turn their beams from the Continent and work a few of their fellow competitors in the UK.

On 70MHz all UK call areas were active, and the writer was able to copy them all comfortably on a dipole. Activity on this band seemed higher than we have heard for a long time, and it was pleasing to note a tendency for stations to spread out more, although there was still a good deal of congestion around 70·26 and 70·2MHz.

Serial numbers well over 500 were being passed on 144MHz before the end of the contest. LA, OE, SM, DM and SP were among many other countries being worked on this band, and the only sour note was the usual regrettable crop of truly appalling signals, the effects of which were made so much worse by the good conditions.

Over-enthusiasm was probably responsible for the odd over-wide signal also heard on 432MHz, where conditions were equally good. Scandinavians, right up to LA, were commonplace, together with all the usual Continental activity, and serial numbers over 200 were being passed towards the end. 1,296MHz activity also seemed well above normal, with good signals from the Continent. It was pleasing to note activity on this band from GM.

70MHz band plan

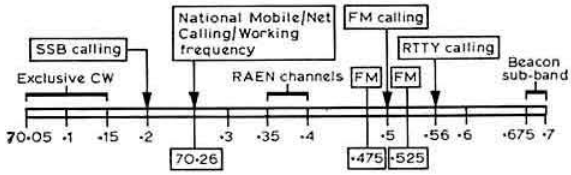
As the UK is virtually the only user of 70MHz, the band plan is unique, having evolved over the years to suit the needs of operators. Recently, the use of fm on this band has increased considerably, particularly in London and other areas of high amateur population where the mode has been found to have many advantages. This is not at the expense of other modes, but because newcomers to the band are finding fm far more usable in areas where audio breakthrough (particularly troublesome on 70MHz) is a problem.

Because of this increase in fm activity, and following requests from 70MHz operators, the VHF Committee has decided to modify the band plan by adding three fixed channels for fm use. Although fm operators can still use any part of the band not specifically allocated for other purposes, it is felt that the amount of mobile fm activity creates a real need for fixed channels.

The frequencies chosen are a calling channel on 70·5MHz (in line with calling channels on other bands), and two working channels on 70·475 and 70·525MHz. In the case of

* 49 Windermere Court, North Anston, Sheffield S31 7GJ.

70MHz band plan



70·475MHz there are already a number of mobiles using 70·48MHz, and it is hoped that these operators will find it technically possible to move their crystal frequencies the 5kHz necessary to comply with the new plan.

The original suggestion to include these fm channels in the 70MHz band plan was made in *4-2-70* some months ago, and the VHF Committee received only a few letters commenting on the proposals. The committee feels that the vast majority of 70MHz operators would either benefit from the proposals, or remain unaffected by them, so it is recommended that the new band plan becomes effective from 1 August 1976.

Seventy centimetres

Only one 432MHz report this month, from Harold Meerza, BRS34348, of Chatham. The excellent conditions on the band have enabled him to hear for the first time what he describes as a *real* Scottish station on 432MHz, as distinct from the visiting portables. Early in July he copied steady S7 signals from the Aberdeen station over a period of about 30min, during which time he worked PA0DBQ, F1BJB and ON6UG. Harold was interested to hear GM3ZBE comment on the easterly bias he found necessary on his beam heading when working the N-S path on 432MHz, because while listening to the Scottish station, the BRS34348 beam peaked 15° further round to the east than it should have done. We wonder if anyone else has noticed this phenomenon, and has any explanation?

Four metres

Howard Buckenham, G3PGN, (Brentwood) has recently changed his mobile gear from a.m. to ssb and has noticed an immediate improvement in the quantity and range of contacts. He had no difficulty, for example, in working mobile with G3CBU/M over a path of about 40 miles.

Using a $\lambda/4$ whip and 10W p.e.p. ssb output, G3PGN worked from North Yorkshire to the south coast during VHF NFD, and logged all British call areas on his mobile receiver.

A regular sked, which 70MHz users might like to note, takes place at 2100gmt each Wednesday between G3RJX of Birmingham and GM3ZBE in Aberdeen.

DX news

Overshadowing the long tropo opening caused by the stationary high-pressure system over the country during June and July was the spectacular series of sporadic-E openings over this period. In the March *4-2-70* we forecast that the first 9H1/G contact must be a strong possibility, following 9H1CD's remarkable successes in 1975. We are delighted to see, therefore, that Henry's callsign features prominently in the logs received for the recent openings. Following the first GC/9H1 contact on 6 June when 9H1CD (in HV03e) worked GC8AAZ, the Maltese station worked

GW4CXM at 1728gmt on 23 June for what must be the first GW/9H1 QSO. Surprisingly, Ray James was beaming to the north-east when he was first called by the 9H1, but on swinging the beam was able to give him a 59 report. GW4CXM is located in Newport, Gwent, (YL35c) and he wonders whether his contact with 9H1CD is a distance record.

Ray had only been on 144MHz for six weeks when he had his success, and was using an FTdx 401, a Europa and a 4-el Yagi at 16ft agl (on the balcony of his flat). In view of the fact that he also landed another 144MHz dx in the shape of EA1KC in Gijon (XD32d) at 1248, and again at 1844gmt on 11 June, Ray has made a pretty spectacular start on the band, and we wish him continued success.

The earliest G/9H1 contact we have heard of so far was between G3CHN and 9H1CD at 1810gmt on 23 June, but we should be pleased to hear from any other claimants.

More sporadic-E activity is reported by G8KLN. On 28 June Alan Floyd noted some activity during the evening, the strongest station heard being an HA in QRA locator square KG. No contacts were made from G3KLN's sea-level location, but from a local hilltop G8FCX/P worked into YU. On the following day at around 0800gmt there was a further opening, and G8FMJ, Shorham-by-Sea, worked four 9H1s and three IT9s. Later the same day, starting at around 1625gmt, G8KLN worked 9H1CD, 9H1B (HV03e) and 9H1BT (HV03f) as well as IT9TAI in GY66c. These stations were also worked by G8FMJ and G8HYN.

The 28 June sporadic-E opening was caught by G3COJ, High Wycombe, who recorded activity from 1749 until 1853 when he had to close down. Brian worked LZ1AG (MC64e), LZ1BW (LC27e), HG5KDQ (JH35c), HG5HY/8 and YU1EXY (KE13j). G3COJ also heard LZ1AB, YO2IS, HG4YF and HG4KCV/1. On 1 July Brian heard I8DFV, Naples, briefly when he called into a QSO between G3OSS and G3SAR, but no contact resulted.

Further north, G8AWU, near Doncaster, needed no more than a Liner 2 to work 9H1CV and IT9PLT, both 58 each way during a lift which occurred around 1745gmt on 25 June. Also from the Doncaster area, G8LHT, again with a bare-foot Liner, worked 9H1CD at 0845 on 29 June.

On the meteor-scatter front, GC3YIZ was delighted to complete a QSO with SP5JC between 0800gmt and 1000gmt on 7 June. This was achieved on 144MHz ssb and Jim Martin has received a QSL confirming the contact. Jim was also pleased to raise GM8FFX on 14 June, also on 144MHz ssb, but this time via tropo.

Expeditions

We have news of quite a few expeditions this month, and if they all come off it looks as though the faithful followers of these jaunts will have an enjoyably busy time for the next few weeks.

The Milton Keynes and DRS are regular vhf expeditionaries, having visited Merioneth, Exmoor, Wigtown, France, Isle of Man, Northumberland and Gwynedd since 1970. This year they return to the Isle of Man on 14 August for two weeks, using the callsign GD8IVK on both 432 and 144MHz. Equipment on 432MHz will be a Liner 2 followed by a transverter, and on 144MHz an IC22a will be used. Operation from the foothills of Snaefell will commence around 7pm each evening, but as the trip is as much a holiday as a radio expedition, no skeds will be arranged.

Following a successful trip to Alderney for VHF NFD, the Oxford University RS are planning to visit Northumberland and Peebles between 25 August and 7 September. During the first week they will be at Beacon Hill, Longhorsley, Northumberland, and the second week at Peebles will include the 144MHz contest. Callsigns will be G(M)3OUR/P and G(M)3YGF/P, and the bands used: 70MHz ssb/cw; 144MHz ssb/cw/fm/a.m.; 432MHz fm (with the possibility of cw and ssb); 10GHz wideband. All requests for skeds should go to G4CNV, QTHR.

An expedition to Northern Ireland is planned by GM3OLK and GM3YOR to take place between 27 August and 13 September. They hope to spend at least two days in each of the six counties, and although a full itinerary has not been finalized, should further information be available before the trip it will be announced on the GB2RS news bulletin. They will be using both ssb and cw on 70·17MHz and 144·275MHz, and there is a possibility of some fm activity on channels S20 to S24.

Walt Davidson, GM3NYY, will be making the long trip to the Isles of Scilly during September, with a Liner 2 and an 8-el Yagi. Operation, from near Hughtown on St Mary's, will be centred on 144·27MHz ssb, and 144·1MHz cw. Walt will be active from 3 to 6 September between 6 and 10pm, plus Saturday and Sunday afternoons. Sked requests (enclosing sae, please) should go to GM3NYY, QTHR.

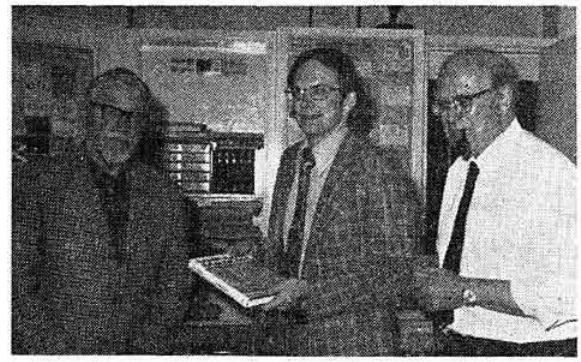
Scottish trip

It is always useful to receive follow-up news of an expedition, so we were pleased to hear from Nigel Hoult, G4CIK, about the progress of the Cambridge University Wireless Society's Scottish expedition in June. Several sites were activated, with best 144MHz results being achieved on 13/14 June from the Isle of Islay, and on 16 June from East Lomond Hill in Fife. On 70MHz the most successful site was in the Borders Region, with 20 QSOs, including Devon and N Ireland, being made.

G4AOL (left) and G3ZNU of the Cambridge University Wireless Society assembling the 144MHz parabeam used during their recent expedition to Scotland

During the trip the Cambridge University team experienced one of those problems which are always likely to occur during the expedition season on popular hilltops; they arrived at the Fife location to find the GM3JFG/GM8AGU team already there! They decided not to operate that night, and took over from the other team the next day—which fortunately turned out to be one of their busiest.

The GB3WS uhf repeater with its main constructors (l to r) Dave Cawley, G3EAO, Dave Holmes, G8FRV, and Andy Betterton, G8FNF. The repeater is operational from Sudbury Upper School at 250ft asl on 434·75MHz in and 433·15MHz out. Output is 10W erp from folded dipoles, and access is by 1,750Hz tone. Time out is after approximately 2min, and when not in use the repeater sends its callsign every 8min.
Photo: G8HPA



Dave Sumner, K1ZND, assistant secretary of the American Radio Relay League, visited RSGB HQ in early June and discussed matters of mutual interest. He is seen here with the general manager, G6JP, (right) and M. Dormer, G3DAH, (left) discussing the Society's new *VHF/UHF Manual*

QRP

While G3XBM was holidaying in South Devon he amused himself by conducting some low-power experiments on 144MHz. Having already worked into the Channel Isles and Brittany with a 1W fm hand-held portable transceiver, Roger carried out a successful test with F0CEM/M, 160km away in Tregestel, Brittany, using a home-built 10mW a.m. transceiver. This transceiver, about the size of a Swan Vesta matchbox, was powered by a single PP3 battery, and the aerial used was a $\lambda/2$ whip. The aerial at the French end was an HB9CV, and F0CEM/M was able to give G3XBM a report of 51. Roger is now convinced that anything is possible, given a clear channel, reasonable conditions and the right location.

Awards

70MHz Senior Transmitting: No 30 to G3RJX.
432MHz Senior Transmitting: after a long, hard struggle from his difficult location in Whitehaven, Cumbria, G3BW has gained certificate No 29.

Beacons

The Sutton Coldfield beacon GB3SC was moved to its new frequency of 432·89MHz at the beginning of July.

Finally, items for inclusion in the September issue should reach G3NHE by 9 August, and for the October issue the deadline is 9 September. □

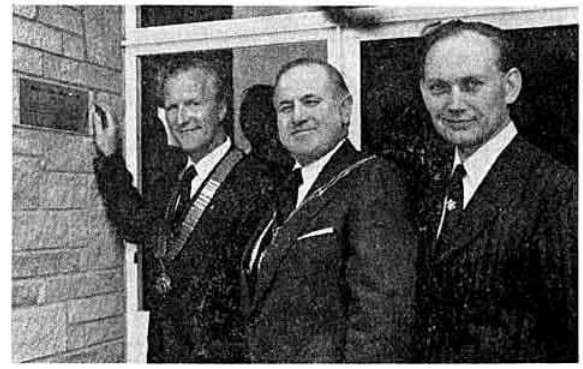
NEW PRODUCT

Telescopic towers

During the gales of early January 1976 a number of aerial supports and rotators suffered major damage. This was not confined to home constructed masts and towers, and a number of commercial structures were reported damaged. A new range of telescopic steel towers has been introduced by Western Electronics (UK) Ltd having a design standard of 75mph for the standard range which also conforms to BS449 CP3. A heavy duty range is designed for 100mph. The towers are constructed of high quality steel and are hot-dip galvanized after manufacture. Standard heights are 40, 60 and 80ft, with head loads (unguyed) at 75mph of 275, 175 and 100lb respectively.

Prices of the same three models are quoted as £189, £230 and £345. A full range of mounting accessories is available.

Further information can be obtained from Western Electronics (UK) Ltd, Fairfield Estate, Louth, Lincs, LN11 0JH. Tel Louth (0507) 4955.



Dr E. J. Allaway, G3FKM, RSGB President (left) and Councillor P. Smith, Mayor of Louth (centre) officially opening Western Electronics' new factory and offices. On right is Mr H. Perkins, managing director

microwaves

Dain Evans, G3RPE*

The first G/ON contact on 10GHz

On 27 June G4ALN (with G8HGN and G9LLB) had a super-refraction contact on 10GHz with ON6TS/P to make the first G/ON contact on this band. G4ALN was sited near Deal, and the Belgian station was at Coxyde, which is a few kilometres north of the border with France. Both stations used equipment based on Gunn oscillators generating 10-15mW and feeding small dishes, and these were operated a few metres above sea level.

Signals over the 90km path remained very strong throughout the contact, from noon to 7pm, except for a few drop-outs lasting about 30s. Careful measurements of the equipment parameters suggest that the path loss was generally 20-25dB *lower* than the free-space value, which indicates propagation via a near-perfect duct. This view was confirmed by the observation that the signals disappeared every time a cross-channel ferry interrupted the path!

The equipment used by ON6TS was that belonging to PA0KKZ who, it will be remembered, was also much involved with the first G/PA0 contact on this band. He was accompanied by a couple of other PA0s. Once contact had been made on 10GHz, a phone call attracted several other Belgian microwave enthusiasts and so quite a crowd witnessed the remarkable strength of G4ALN's signal: S9 when using the open end of the waveguide as the aerial, and remaining Q5 even when reflected from ON6TS's backside or from the cliffs behind. With the receiver pointing vertically upwards, his hand held at 45° proved an adequate reflector for a "flyswatter" aerial.

Later, ON6TS had a one-way contact with G3PQR over a 130km path, a feature of which was that the latter station was operated at 25m asl from his home QTH.

News of other stations on this band is that GM4BVD in Perth and GM3OLK of Glenrothes have already made contacts of 83 and 130km respectively and clearly both are close to working the Microwave Award distance of 150km. In the Birmingham area, G8ASW reports that he also is now on this band, with G3KPT and G3YJH also interested.

From abroad, the news is that DC0MT and DC5CZ recently had a 70km contact from Kamperwand (where even the local post office is 1,460m asl) to Munich, to start the ball rolling in that area. DC9ZU in Burscheid reports that he, DC6TV and DC6TX have had contacts over a few kilometres. PA0RTN and SK6AB are also reported to be interested in this band. Perhaps before the end of the summer there will be sufficient stations on to make it worthwhile organizing a 10GHz jamboree, with signals hopefully criss-crossing the North Sea by super-refraction.

Finally, a three-band multiband contact of note. During the June Microwave Contest, G8ADP, G3BNL and G3EEZ worked each other over paths 72-82km long using their crystal-controlled equipment for 2·3, 3·4, 5·7 and 10GHz. G3BNL and G3EEZ also had a contact on 24GHz—not to be outdone, G8ADP is building.

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

G/OZ for a new world record on 2·3GHz

On 30 June G3LQR worked OZ9OR on 2,304MHz over a 760km (472-mile) path to set up what appears to be a new world record for this band. Both stations may also claim the first Microwave Awards for this frequency, having greatly exceeded the award distance of 500km. Contact initially was made on 1,296MHz (!), but both stations moved up to 2,304MHz together to make the record contact entirely at that frequency.

The equipment used by G3LQR was 15W to a dish 5ft in diameter. OZ9OR used 1W (generated from 144MHz by two varactor quadruplers) to a 2m dish, his receiver employing BFR91s as rf amplifiers and as the mixer. Signals were 579 and 599.

Microwave drivers

Richard Porter of *Microwave Modules* writes to say that they have been supplying varactor multipliers for 128/384 and 384/1,152MHz for some time. These are their standard 144/432 and 432/1,296MHz units which they regularly advertise but which they retune to the lower frequencies. He suggests that the use of two units in cascade can give problems unless some form of isolator is fitted and therefore is not normally a recommended procedure. However, if circumstances dictate that the units must be used together, then the coupling between the two should be kept as short as possible. He also notes that the pa stage on their MMT432 transverter can be used on its own as an amplifier on 384MHz. From 100-200mW drive, an output of 10-15W is obtained.

For those wishing to employ microstrip techniques and find it difficult to obtain ptfe (Teflon) boards, they are prepared to supply top quality material in amateur-size quantities.

Interdigital filters

In his talk at the VHF Convention, G4ALN referred to the most useful design information on these filters given in the journal *Microwaves*, February 1967, p91. During the subsequent discussion someone pointed out that the coupling lines could be eliminated by directly tapping the input and output connections on to the resonant elements, and that the design data on this had also been published. Can someone supply the reference?

A 3·4GHz beacon

G8AGN has supplied details of a new beacon, GB3UOS, which only requires licensing arrangements to be completed before it is ready for operation. It consists of a 1W crystal-controlled transmitter on 3,456MHz which feeds a nominally omnidirectional slotted waveguide array of 10dB gain. From its site 4km NW of Sheffield at a height of 400m, it should radiate strong signals to the north, east and south, but it will be blocked in a westerly direction by the Pennines.

New 10GHz beacons

At least two new 10GHz beacons are being considered, both being intended to aid super-refraction tests, one possibly in the Channel Islands. The second is most ambitious: it would be sited on the east coast of Scotland and would employ a directive aerial in an attempt to cover the east coast of England, and the coasts of northern Europe and the Scandinavian countries. □

the month on the air

John Allaway, G3FKM*

Top band news

The May issue of W1BB's *160 Meter DX Bulletin* summed up conditions during the 1975/76 winter dx season as being very erratic. In the previous season Stew thought conditions into Europe were better. Both KV4FZ and W1HGT have acquired DXCC on the band, and W4BRB has 95 confirmed. Both VR1AA and VR8D were contacted from the eastern USA, and the former makes a plea for those who have already worked rare stations such as his to refrain from making second contacts. The continuance of the transatlantic tests next winter now looks rather doubtful since the advent of better equipment and more activity.

An expedition by PY1RO to Fernando de Noronha is expected to take place from 23 October to 5 November, and Rolf will have an inverted-V aerial and 500W input. His callsign will be PY0RO.

In conclusion W1BB lists a code of courtesies for dx workers on 160m. These are: (*a*) Set clocks accurately and call CQ only during the first 2½min of each 5min period; (*b*) Do not keep working the same rare stations over and over again; (*c*) When signing with a rare station indicate his frequency so that others may be helped to find his signal; (*d*) Do not rag chew on or near dx frequencies; (*e*) Make dx contacts short; (*f*) Keep "CQs" short.

News from overseas

Eric Sherlock, G3BQH/5N2ESH, has written to say that he was off the air for a few weeks while moving from Lagos to Port Harcourt earlier in the year, and that he would also be absent on leave from 31 May to 5 August. He says that there are still no new licences being issued and only four stations are licensed—5N2s AAE, AAJ, ESH and NAS.

G3RHL sailed back to New Zealand on 22 June after a year in the UK. He should be back on the air again from ZL1ACX by the time this is being read.

Richard Merriman, G3SIP, is now fully operational from Moonshine, 30 miles from Wellington, and looking for contacts with the UK most days between 0400 and 0700 around 7,015kHz. His callsign is ZL2BJX and he promises to QSL all contacts.

Martyn Phillips, G3RFX (DJ0EQ), will be in Gibraltar again as ZB2FX from 17 to 31 August. Operation will be on all bands (cw/ssb) 3·5 to 28MHz. Martyn also hopes to operate on 1·8MHz, assuming a convenient piece of Rock is available to which to attach the end of the 1·8MHz antenna. QSLs should be sent via G3RFX (see "QTH Corner").

Some readers may remember Sid Bedford when he operated from Lagos as 5N2AAX. He is now in Tehran and operating as EP2SB. Sid has a TR4C and 14 and 7MHz dipoles, the latter is also used on 21MHz. Main operating times are from 1300 to 1900, and 21MHz the preferred band if conditions permit. Operating hours are longer on Thursdays and Fridays.

Nelson, 4S7NE, is at present in Britain on a study course. He invites anyone needing his QSL to contact him at the address in "QTH Corner", or by telephone at St Albans 51661, before his return to Ceylon in mid-September.

3D6AM and 3D6AR have left Swaziland and are now living in ZS6. They hope to be on the air again by Christmas 1976 and May 1977 respectively. Their new address is listed in "QTH Corner".

Barry Toffany, VR4BT, expected his equipment to reach the Solomon Is in mid-July. Initial operation will be with 90W p.e.p. to one 12AVQ, but a linear will be used later.

DX news

Official Bulletin No 595 from ARRL announced that Okino Tori-shima has been added to the ARRL Countries List. Confirmations for contacts made on or after 30 May 1976 may be submitted for DXCC credit starting 1 September. Contacts prior to that date will continue to be credited to the Ogasawara listing. Advice from JARL indicated that the first contact with the special expedition station 7J1RL took place at 0030 on 30 May.

No more QSL cards or applications for the Diploma Independencia de Mozambique should be sent to Mozambique. The former should now be directed via the Portuguese QSL Bureau, and the latter to ex-CR7IZ at the same address.

Apologies to those readers who searched in vain for the address of LA5NM in June *MOTA*. It will be found in "QTH Corner" this month. The special station LG5LG has a new QSL address which will be found in the same spot.

WB8OFG acquired the reciprocal licence callsign ZL2AWK during late March and early April. He operated from the home of VR4DX from 29 March to 3 April as VR4DA, and from the Nauru club station C21NI from 4 to 6 April. QSLs for these two periods should be sent to his USA address.

YN8KMA is the special callsign of a group of volunteer medical workers who make an annual pilgrimage to Central America. They call themselves the "Amigos de las Americas".

A35AF left Tonga at the end of June en route for New Zealand on his way home to Japan where his callsign is JR1ATU. This leaves the islands devoid of regular activity. A station using the callsign XW8ER and giving an address in Laos was reported to be on the air during June. He was speaking Japanese but it is not known whether he was operating legally. KS6DV/KB6, ZL3FM/KB6 and KB6CU have now all left Canton Is. VU7GV, who was formerly in the Andaman Is, is now in Calcutta. He asks for QSLs to his new address and not via the bureau.

West Coast DX Bulletin reports that LU2DZ will be in Libya late this summer and hopes to obtain a 5A licence.

Strange callsigns reported recently include WG1JFK which was the call used by a special station operating from Runnymede on 3 and 4 July to celebrate the USA Bicentenary. The station was on land presented to the USA in memory of President Kennedy and this is the first time that an American callsign has been used from Britain.

K5QHS visited a number of areas off the east coast of Africa during June and July. QSLs go to the address in "QTH Corner".

WB6EWH/VQ9 has been on the air from Chagos Is

* 10 Knightlow Road, Birmingham B17 8QB.

and heard after 1530. A local radio club is being formed on Diego Garcia, and there are already 32 possible members.

YL net

Diana Hughes, G4EZI, is attempting to organize a regular net for lady operators. She is holding it at 11am on Saturday mornings, on or near 3,705kHz. She would like to hear from any who would be interested (3 Primley Park Crescent, Leeds LS17 7HY), and all are welcome to join in the net.

Dxpedition

The Malaysian Amateur Radio Transmitters Society has organized an expedition to five small islands (Tioman, Rawa, Permanggil, Aur and Tinggi) which lie off the south-east coast of West Malaysia, in the South China Sea. This will take place from 14 to 18 August, and ssb and cw will be used on all bands 3·5 to 28MHz. The callsign will be 9M0EXP, and a special commemorative QSL will be sent direct to those desiring it if they enclose $1, or equivalent in other currency or IRCs.

Expedition

GM3OLK and GM3YOR are considering a portable expedition in Northern Ireland during the period 27 August to 13 September. It is their intention to activate all six counties on all bands 1·8 to 144MHz. At least two full days will be spent in each county, and activity should be 1·8/3·5-MHz one night and 70/144MHz the next night, with the other bands being used during daytime. Actual locations are not yet known, but may be given over GB2RS later. Frequencies to be used are 1,835kHz (cw) and 1,910kHz (ssb), 3,650kHz and 3,750kHz (ssb), 70,170kHz (cw and ssb), 144,275kHz (cw and ssb) and possibly S20-S24. All contacts will be QSLd via the bureau. Sked requests would be welcome (QTHR).

Contests

TOPS 30 Contest

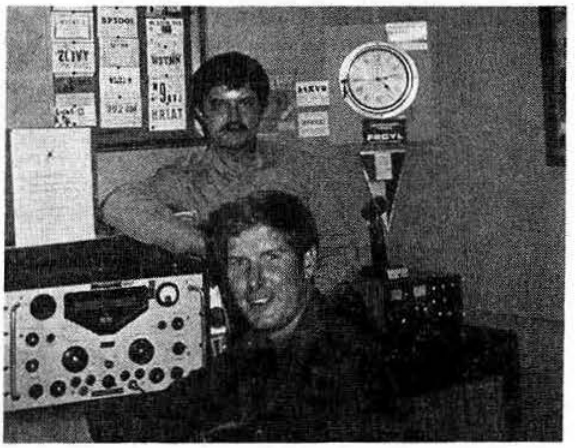
0001 15 August to 2400 21 August.

3·5 to 28MHz, cw only. Members—single-operator, non-members single- or multi-operator categories. Contacts with own continent count one point, with others three points, with TOPS HQ station 25 points. TOPS members send RST and number, others send RST and serial QSO number from 001. Non-members only score by working members. This contest celebrates the 30th anniversary of the TOPS CW Club. Logs should be sent no later than 30 September to: P. Lumb, G3IRM, 14 Linton Gardens, Bury St. Edmunds, Suffolk, IP33 2DZ.

ORARI SEANET DX Contest 1976

0001 21 August to 2359 22 August.

Phone and cw, 1·8 to 28MHz. Single-band—single- or multi-operator and multi-band multi-operator entries. Exchange RS/T plus serial QSO number from 001. Contacts with Indonesia count 10 points on 3·5 and 7MHz, and four points on 14, 21 and 28MHz; with other countries, five and two points respectively. The multiplier is three for each country worked on each band added together. Separate logs should be submitted for each band and a contestant may only operate on one mode—phone or cw; stations may be worked on each band for points. Entries should reach SEANET Contest Committee, Ismail Razak "Eshee" 9M2FK, 281-C Jalan Pekeliling, Bukit Glugor, Penang, Malaysia, before 30 October. The highest scorer in each country will receive a commemorative certificate from the sixth SEANET Convention which is taking place in Djakarta in November. The Organisation Amateur Radio Indonesia is running this contest to celebrate the 31st anniversary of the independence of Indonesia.



The station of RAF Masirah with Mick, A4XVI (front) and Bob, A4XVB

All Asian DX Contest

1000 21 August to 1600 22 August (cw).

Rules in June *MOTA*. Results of the 1975 contests have now been received. In the phone section **G3RCV** scored 6,996 points in the multi-band section, and **G3XYP** 1,128 points on 14MHz. In the cw section **G3ESF** was the only multi-band entrant with 7,810 points, and **G3TXF** (5,964), G3SXW (5,265), G6GH (297), G2AJB (288) and G6NK (190) all entered the 14MHz section.

The Romanian Contest

1800 7 August to 1800 8 August.

3·5 to 28MHz, cw and phone. Single-operator single- and multi-band, multi-operator single- and multi-band. Two points per contact, six with stations in YO. Multiplier is the sum of YO counties and DXCC countries on each band. YO stations will send two letters indicating their counties, otherwise the exchange consists of RS/T and serial number (from 001). Separate logs should be submitted for each band, and logs should indicate time, station worked, serial numbers sent/received, if multiplier, points claimed. A signed declaration should be included and the entry posted before 1 September to: Romanian Amateur Radio Federation, PO Box 1395, 7000 Bucuresti 5, Romania. Note that a station may be worked once per band—either on phone or cw.

In the 1975 event **G3TXF** scored 14,171 points on 14MHz, and **G3SXW** (65,076), G3ESF (38,285) and **GW4DOO** (6,615) entered the multi-band section. Over 50 other UK stations took part but did not submit logs.

The Scandinavian Activity Contest

1500 18 September to 1800 19 September (cw).

1500 25 September to 1800 26 September (phone).

3·5 to 28MHz. Non-Scandinavians work Scandinavians. Same station may be contacted on each band. For the purposes of this contest the following areas count as Scandinavia:

QTH Corner

A9XU	now O. Jackson, c/o 44 Barrington Av, Beith, Ayrshire.
C21KM	via WA6AHF, 17494 Via Alamitos, San Lorenzo, Cal, 94580, USA.
C31JA	HB9APJ, Freienstr6, CH 8805 Richterswil, ZH, Switzerland.
C31JW	HB9AYX, Villa Planchement, Rte de la Croix Blanche, CH 1066 Epalinges, VD, Switzerland.
CR5LB	Luiz Beirao, Box 147, Sao Thome.
CZ20	via VE2 bureau.
D6A	via K5QHS (see below).
EP2SB	Sid Bedford, Zafar, Baback 126, Tehran, Iran.
K5QHS/FH8	Dr S. E. Hutson, Box 2588, Hot Springs, Ark, 71901, USA.
LA5NM	Box 210, N-9401, Harstad, Norway.
LG5LG	LA2ZN, U. A. Strandberg, Konglevegen 3, N-2200 Kongsvinger, Norway.
P29AX	Box 204, Port Moresby, Papua New Guinea.
ZL3FM/VR1	ZL3FM, R. J. Campbell, 6 Candys Road, Christchurch 3, New Zealand.
VR3AT	via K2BT, 75 Crest view Rd, Mountain Lakes, NJ, 07046, USA.
VU7KV	G. V. Sulu, Wireless Quarters, Nizamuddin East, New Delhi, 110031, India.
YN8KMA	via WA5WCT, W. K. Carr, 1707 Southwick Dr, Houston, Texas, 77055, USA.
ZB2FX	G3RFX, M. C. Phillips, 8 Hill Road, Theydon Bois, Epping, Essex.
ZL2BJX	R. Merriman, Box 46057, Lower Hutt, New Zealand.
3D6AM	R. F. Busby, 92 Venter St., Kempton Park, 1620, Tvl, Rep. of South Africa.
3D6AR	Mrs R. F. Busby (as above).
4S7JK	DJ7JK, B. Markwardt, Goethestr 68-A, 4300 Essen, W. Germany.
4S7NE	N. Ranasinghe, c/o 17 Wellington Rd, St Albans, Herts.
9M0EXP	Dxpedition 9M0EXP, PO Box 777, Kuala Lumpur, Malaysia.

RSGB QSL Bureau, G2MI, Bromley, Kent, BR2 7NH

JW, JX, LA, OH, OH0, OH0 (Market Reef), OX, OY, OZ and SK/SL/SM. Exchanges consist of RS/T and serial no (from 001). Each contact counts one point, and the multipliers are the 10 areas listed. Final score is QSO points multiplied by the sum of multipliers from each band added together. Logs should show date, time, station worked, numbers sent and received, band, if new multiplier. A summary sheet should be included, and the entry should be signed to the effect that the rules were observed. Logs should be posted before 15 October to SSA Contest Manager, SM0DJZ, PO Box 3036, S-195 03 Maersta, Sweden.

In the 1975 event (cw) **G3SXW** (5,380), G3ESF (4,416), **GW3INW** (1,612), G8DI and G8VF (both 1,008), **GM5AXY** (410) and G4DBW (14) were listed. **G3SXW** was world fifth. In the phone section **G3NFV** (2,844), G8VF (1,740), **GW4CYD** (1,630), **GC3YIZ** (1,417), **GM4DZX** (558), G3JFY (468), G3RHL (450) and GM5AXY (410) entered. All were single-operator.

Awards

The 1st All Africa Boy Scout Jamboree Award

The jamboree will be held between 28 August and 14 September, and will have the callsign 5N2BSJ. For the award it is necessary to contact this station and two other African stations during 1976. The QSLs, plus five IRCs, should be sent to: Award Manager, 1st All Africa Boy Scout Jamboree, PO Box 448, Apapa, Lagos, Nigeria.

The Mobile Century Award

For confirmed contacts with at least 100 countries taken from the ARRL Countries List while operating mobile. Stickers are available for each 20 additional countries confirmed. The cost to non-members is £3.50 (UK); outside Britain the price is £5 or $8. Endorsements cost £1 or $2.

The Worked All Continents/Mobile

Fee is £1, or $2. Applications for each award should consist of QSL cards and check list and should be sent to C. J. Page, "Tatworth", Station Road, North Chailey, Lewes, Sussex.

The 50 OVRC Award

Available to licensed amateurs and listeners for contacts/confirmed reports between 17 July 1976 and 17 July 1977. European stations require contacts with 15 different Gent stations (or 10 on 144MHz). The award is issued for all-cw or all-phone contacts on either the hf bands, or on 144MHz or above. Contact with ON5UG counts as five contacts on the hf bands and three on vhf. The same station may be contacted on different bands. Send a certified list of claimed contacts (checked by the award manager) plus four IRCs to: OVRC Award Manager ON5UN, 18 David Teniersstraat, B-9000 Gent, Belgium. Valid members include ON1DG and DV; ON4s BN, DC, DH, DT, DY, GL, HW, JE, KC, KP, KX, LM, LQ, MA, NC, OJ, OR, PA, RP, SQ, TD, TW, UN, VQ, WM, WN and XL; ON5s AL, AN, BQ, BW, DM, EN, EO, EQ, FH, HH, LI, NN, NU, OG, QH, QM, QW, SL, SQ, UL, UN, VQ and VX; ON6s AE, AT, CI, CR, CT, DC, FG, FI, GJ, GP, HS, KW, MW, MT, PX, SC, SV, VV and YA.

The DZR (Diploma of the Zaire Republic)

Issued by the Union Zairoise de Radio Amateurs for contacts with 10 9Q5 stations since 1 July 1960. Contact with 9Q5ITU counts as two. Send certified list of QSLs plus $2.00 or the equivalent in IRCs to: Tony Jeuken, 9Q5QR, BP 10061, Airport, Kinshasa 24, Zaire. The award is free to blind or handicapped applicants and is also issued to listeners on a heard basis.

The committee of the **Amateur Radio Mobile Society** have decided that their MCA and WAC/M awards will in future be available to non-members.

Band reports

The hot summer weather has taken its toll of reporters this month, but those perspiring over hot receivers have shown that some very interesting dx has been workable on every band. Many European signals have been recorded on 28MHz; and G6GH, reporting the value of calling "CQ" when it is apparently dead, says that doing this at 0800 on four different mornings produced answers.

Many thanks to the following for sending in information for this section: G2HKU, G3HB, G4RZ, G5JL, G6GH,

G3s LOL, NKQ, BRSs 17567, 36928. As 8312, 8713, 8961, and G5049.

Stations listed in italics were using cw, the rest ssb.

1·8MHz. 0000 *LU1DZ, PY1RO, VE1AXT, W1HGT.* **0100** *K1PBW, PT2FRU, W2DEO, W3MI, W3WI.*
3·5MHz. 0000 YVs, ZB2DL. **0200** CE0AB (?). **2200** PY5ARG, ZD9GF. **2300** JY3ZH, OX3OO, WG1JFK, ZD8EW, 5B4YK, 9M2DW.
7MHz. 0000 CT3AF, HIs, HPs, LUs, *OJ0JN*, UL7s, ZPs. **0500** *VE2AQS/TG9*, CE3AKX/TI2, VKs, *W7DI* (Arizona), VP9IL, *XE1FGB*, ZLs. **0600** *VKs.* **2300** CPs, LUs, PYs, UA9s.

14MHz. 0000 HK0AA/S. **0500** D6A, K5QHF/FH8. W6/W1s. **0600** KH6s, KL7s, *VR1AA.* **0700** VR3AH, VR3AK, ZK1DA, ZK1DX. **0800** *AH3FF*, KS6CC, KX6BU, VR8A, *5W1AD.* **0900** VK6RU, VR3AK, W5/W6/W0s. **1400** BV2B. **1600** HS3AGN, *ZK2AQ/TA* (= WB7ABK), VS5DB, WA7ZXH (Nev.). **1700** ST2SA, VU7ANI. **1900** W6s. **2000** C5AF, *D2ACK*, FP8DX, HC1XG/HC8, ZD8TM. **2100** FL8KP. **2200** EL0AA/MM (on oil rig off 9Y4), PJ9SNV, VKs, VP2MB, XL2DST (= VE2). **2300** HC8RG, HK0AA, JW1SO, VKs, ZLs.
21MHz. 0800 9J2s. **0900** 9J2s. **1200** ZSs, 5Z4s. **1300** *F0AOJ/FC* (QSL to HB9ASZ), JAs. **1400** 9G1GE, 9Q5SW. **1700** TU2GK. **1800** ZD7SD, ZP5RS, 5N2NAS. **1900** FG7TD, PZs, 9G0ARS. **2000** CE, CXs, PZs, TR8SM, 9G1RQ. **2100** CT3AF, XQ3AY (= CE), 5U7AG.
28MHz. 0900 4Z4GH. **1200** W2PIC. **1400** VU2GDG. **1800** F0AOJ/FC, LUs, PYs, PZs. **2000** W2PIC, WB9MMR/2, 8P6AJ. **2100** VE1ATT. **2200** HP1GD, W2LBB, K3OIO. **2300** K1RQF. Many Europeans throughout the day.

Many thanks to all correspondents, and to the following for items extracted from their publications: *DX'press* **(PA0TO)**, *CQ Magazine* **(W1WY)**, the *Ex-G Radio Club* **(W3HQO)**, *DX News Sheet* **(Geoff Watts)**, the 29 *DX Club Newsletter* **(VK6RV)**, *Long Skip* **(VE1AL/3)**, and the *West Coast DX Bulletin* **(WA6AUD)**.

Please send all items for the **September** issue **to reach G3FKM** no later than **9 August**, and for **October** by **8 September.** □

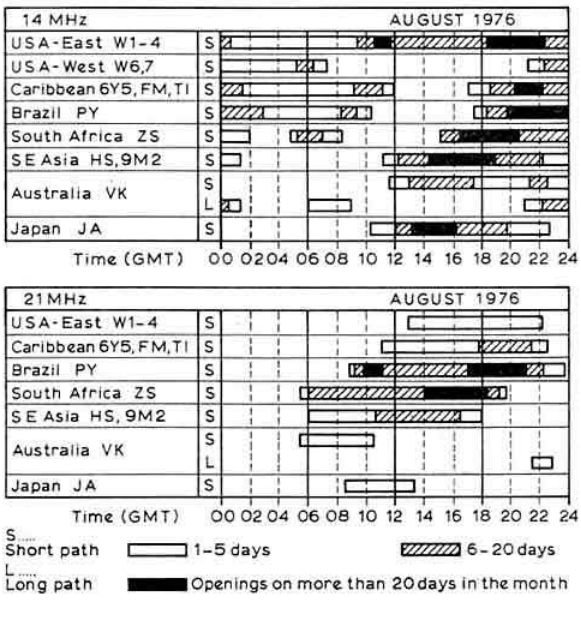
Propagation predictions

August is the last month of summertime propagation conditions so the unfavourable conditions on **28MHz** and **21 MHz** will continue. From September onwards dx conditions will improve with the seasonal change to reach their peak in October and November, but 28MHz will have no practical importance for dx. A certain increase in activity will occur this month on 21MHz for traffic with Europe by short skip, but the season for this will come to an end during September. Traffic with South America and Africa will be certain on 21MHz; traffic with North America, South-East Asia and Australia will improve slightly compared with last year.

DX conditions at night on **14MHz** will worsen a little compared with June and July, especially towards the end of the month, as nights lengthen and the night-time frequencies sink more than during the summer. There will also be less possibility of dx via the indirect path because of seasonal changes. However, as we are moving into spring in the southern hemisphere the path to South Africa will remain open longer on both 21 and 14MHz than in June and July.

On **3·5** and **7MHz** conditions will be the same as given for the previous month. 3·5MHz will be interrupted occasionally by the dead zone during the latter half of the night.

The provisional sunspot number for May 1976 from the Swiss Federal Observatory was 12·7, with solar activity on a low scale occurring during the first half of the month. The predicted smoothed sunspot numbers for September, October and November are 6, 5 and 4 respectively.



HF propagation study

Predicted hpfs (MHz × 10) for August 1976

gmt =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	108	107	135	199	225	224	221	219	227	257	148	119	108
Ascension	122	96	87	83	210	229	219	249	228	271	276	177	122
Bahrain	122	110	136	195	218	218	215	210	219	265	171	144	122
Bangkok	120	106	139	180	197	201	196	194	202	150	145	125	120
Barbados	145	120	105	111	122	172	202	206	197	196	228	239	145
Bermuda	149	117	98	97	111	161	186	194	186	186	199	219	149
Bogota	148	116	97	105	122	122	199	196	192	192	219	233	148
Buenos Aires	138	115	108	122	97	168	210	219	214	219	268	221	138
Cape Town	120	107	87	172	223	237	235	255	249	220	157	148	120
Colombo	106	111	140	194	214	214	210	202	215	141	101	98	106
Cyprus	116	105	122	172	202	205	202	196	202	244	216	148	116
Dakar	122	107	117	129	197	225	213	223	218	249	279	209	122
Denver	138	117	98	100	106	106	130	143	148	168	173	167	138
Fairbanks	153	138	138	143	149	155	157	157	157	157	157	150	153
Falklands	120	110	108	116	100	147	209	221	215	232	237	158	120
Gibraltar	88	75	75	103	134	147	145	143	139	153	173	120	88
Hongkong	98	100	138	171	183	190	187	187	171	143	138	124	98
Honolulu	153	139	131	136	149	149	117	111	130	168	168	150	153
Iceland	91	86	74	96	108	122	126	128	131	134	128	117	91
Jamaica	148	120	98	98	120	117	196	196	187	188	204	227	148
Lagos	100	94	93	161	223	234	221	255	244	277	242	135	100
Las Palmas	122	106	101	125	180	201	195	199	192	205	241	195	122
Lima	145	120	97	110	116	105	205	209	201	199	237	242	145
Los Angeles	145	125	112	112	93	87	112	143	154	173	173	173	145
Malta	98	89	96	134	164	172	171	167	167	196	206	131	98
Mauritius	103	97	135	197	229	229	229	223	232	192	168	134	103
Mexico	136	117	92	100	124	111	155	172	180	180	186	138	136
Moscow	94	86	111	140	154	168	166	162	167	178	169	116	94
Nairobi	96	94	124	195	228	230	235	235	248	253	148	102	96
New Delhi	124	108	140	186	202	206	200	196	208	186	153	131	124
New York	141	119	97	98	110	135	157	182	176	178	186	185	141
Osaka	106	111	138	161	167	173	173	163	143	129	125	133	106
Perth	122	111	140	192	213	213	177	144	141	136	124	112	122
Rio de Janeiro	135	114	108	96	97	221	211	220	215	225	276	230	135
Salisbury	120	94	97	188	229	233	244	248	251	274	188	129	120
Seychelles	86	100	135	197	225	224	225	223	235	219	122	92	86
Singapore	124	108	140	186	202	206	200	196	176	105	120	93	124
Suva (s)	145	138	136	149	154	168	141	119	94	122	162	150	145
Suva (l)	119	107	108	161	134	122	124	125	125	100	183	172	119
Sydney (s)	98	100	138	171	183	166	143	148	141	124	111	124	98
Sydney (l)	143	119	110	116	116	97	98	103	103	100	145	166	143
Teheran	122	111	140	194	214	214	210	202	215	256	183	150	122
Vancouver	152	131	131	130	124	117	124	150	150	149	149	149	152
Wellington (s)	110	111	136	162	167	173	135	122	124	119	155	143	110
Wellington (l)	126	107	108	115	97	92	93	101	101	100	159	163	126

council proceedings

A brief report of the Council meeting held on 20 May 1976

Present: Dr E. J. Allaway (*President, in the Chair*); Lord Wallace of Coslany, Messrs D. J. Andrews, J. O. Brown, D. S. Evans, R. W. Fisher, W. F. McGonigle, C. H. Parsons, D. M. Pratt, W. A. Scarr, A. W. Smith, R. F. Stevens, G. M. C. Stone, C. J. Thomas, D. M. Thomas (*Members of Council*); G. R. Jessop (*general manager*), A. W. Hutchinson (*editor*), D. A. Evans (*minutes secretary*).

Apologies for absence were received from Messrs P. Balestrini, R. J. Baker, D. Byrne and J. R. Petty.

Welsh beacon

Mr Scarr commented that he had no further information regarding the proposed 2m Welsh beacon. Mr Parsons said that he was meeting the prospective new beaconkeeper in the near future and would report back to Council.

It was agreed that the Society's beacon co-ordinator, Mr B. Bower, G3COJ, and RSGB HQ would also contact the prospective beaconkeeper with a view to reactivating the Welsh beacon.

RSGB International VHF Convention

Mr Stevens said that he wished to thank the VHF Committee, and in particular Mr D. A. Evans, for their efforts in the organization and running of the RSGB International VHF Convention. He thought that a number of minor improvements could be effected if it was held at the same venue next year. The lectures were very successful but he was disappointed with the standard of the audio equipment at Brunel University.

Dr D. S. Evans said that he hoped more publicity and greater encouragement would be given next year for the home-constructors display.

Mr Jessop said that following a more detailed review of the convention by the VHF Committee, plans for the 1977 event would be put in hand.

Financial report

Mr Brown gave Council a number of figures related to budgets and said that the loss for the financial year 1975/6 would probably be £1,000 under budget.

Mr Jessop reported on the current cash situation within the Society; from the cash flow side, the position looked extremely favourable.

Data processor

Mr Jessop said that considerable further work had been done at RSGB HQ associated with the proposed introduction of the data processor.

Mr Parsons reported that the Finance & Staff Committee had also done a lot of work in connection with the proposed project and its members were quite convinced of the necessity for the processor and there was no question of any cancellation of the project.

Mr Brown asked Council if they would authorize him to transfer the purchase of the IBM32 to Befco. This was agreed and approved.

Mr Parsons said that should the Council finally approve the project he considered that this was the first step in the project; Phase 2 would have to consider how the equipment was going to be used.

Mr Brown asked if Council members could report feeling of members concerning the project.

It was reported that headquarters and various Council members had received a number of letters about the project, for and against.

Mr Brown read a letter from G4BBA, the Region 5 Representative, who, having read the article in *Radio Communication*, had changed his mind and was now fully in favour of the project.

Mr D. Thomas commented that now members had been put in the picture, there was a much greater understanding of the subject.

After further discussion Mr Parsons proposed and Mr Stone seconded, that "The Society proceed with the purchase of the IBM32 machinery as previously recommended by the Finance & Staff Committee". The motion was carried unanimously.

Mr Brown said that he would now finalize the order and expected that the equipment would be delivered in late July.

General manager's report

Mr Jessop reported on staff changes which had taken place and on the illness of Mr Othen. He also reported that an IBM32 operator would take up her appointment on 2 June.

A public address system had been presented to headquarters by Mr E. Yeomanson, G3IIR, which the telephonist would use to summon staff to the telephone if they were absent from their offices.

Mr Andrews asked what steps were being taken to replace Mr D. A. Evans, assistant general manager, when he returned to his normal employment towards the end of 1976. Mr Jessop replied that nothing had yet been done and that there was also the question of his own successor to be considered.

The President said it was vital to advertise for these staff in *Wireless World* and the Society's journal as soon as possible.

WARC 79

Mr Stevens reported that Mr Jessop and he had had a meeting with senior officials of the Home Office in connection with the World Administrative Radio Conference in 1979. The Home Office was noting the requirements of different groups, and different interests of services with conflicting frequency requirements. It was proposed by the Home Office that eventually meetings would be held with other users so that a final brief could be presented to the UK Frequency Advisory Committee (on which the RSGB is represented).

Mr Stevens said that essentially the proposals put forward by the Society were in line with those agreed at the Region 1 meeting in Warsaw in 1975 and accepted by Regions 2 and 3. All amateur frequencies up to 250GHz were covered in the Society's proposals and new bands were being requested at 10, 18, 24 and 50MHz, and, in the case of the hf bands, professional propagation data was being utilized to justify the proposed new allocations. The hf bands would probably be unaffected but there may be some problems in the 7MHz band.

Mr Stevens said that basically the reaction of the Home Office was one of very good co-operation. He added, however, that certain administrations, even in Europe, were not 100 per cent in favour of amateur allocations, and that even though the UK delegation may be all for extending the bands allocated to the amateur service, not all countries will have the same brief. He said it was essential to discuss frequency allocations with other services where it appeared that interests would conflict.

Mr R. J. Hughes, G3GVV, who attended the Council meeting at this point by invitation, reported to Council on the IARU Region 2 Conference at Miami (*A full report was published in the June issue*).

Dr Allaway said that he was delighted by the way in which the RSGB was accepted overseas. The Society was regarded with very high esteem in all parts of the world. He read a letter from the President of JARL which had been addressed to the President of the RSGB.

It was reported that several actions by the IARU Working Group were in hand so that members and non-members alike could be informed about the important work which the Society was undertaking on their behalf in connection with WARC 79.

RSGB Radio Communication Exhibition

Mr J. Hitchins, G8GBN, attended the Council meeting at this point by invitation in his capacity as Exhibition Manager. Mr Hitchins gave a resumé of the organization which has been carried out for the exhibition, and answered some questions put by Council members. The President thanked the Exhibition Committee, and in particular Mr Hitchins, for their efforts on behalf of the Society.

Membership and representation

In April there were 163 new members, 72 resignations and 14 deceased, giving a total membership of 20,068.

It was resolved:

(1) to accept reduced subscriptions from 12 members;
(2) to waive the subscription of 15 members;
(3) to grant life membership to Mr R. A. Ledgerton, G2ABC;
(4) to grant affiliation to Gibraltar Amateur Radio Society, Kent Repeater Group, Newport Amateur Radio Society and Tyneside Amateur Radio Society;
(5) to approve the appointments of the following Area Representatives: Messrs M. Connah, G8IMF (Swindon); P. Erkiert, G4BKS, (Aylesbury); P. Grimshaw, G8KME (Yeovil); Miss C. Wade, G4CUY (Leeds); T. Barnes, GI3USS (Belfast).

Repeaters

Mr Stevens reported on various meetings which had been held between the Society and the Home Office concerning the administration and control of repeaters. Additional responsibilities had

now been given to the Society commencing in the area of uhf repeaters, where the Society was now responsible for the close-down operation. It was anticipated that this facility would be extended to vhf repeaters at a later date.

It was reported that a meeting had taken place between the Home Office, Dr Allaway, Mr Stevens, Mr Jessop and Mr R. Greenleaf, G3VAG, secretary of the GB3LO Group, concerning measures for the reduction of interference levels on GB3LO.

HF certificates

Council considered various proposals from the HF Awards Manager, Mr C. R. Emary, G5GH. It was decided to issue a 5-band BCRTA/BCRRA Award, which could be done by an endorsement on the existing certificate. In addition, it was decided to adopt separate "country" status for Gilbert-Ocean Islands as VR1, and Tuvalu as VR8.

Mr Jessop reported that the Home Office was considering issuing the prefix GU to Guernsey and its associated islands and the prefix GJ to the island of Jersey.

Committee minutes

Council accepted the minutes of the following committee meetings: Education (27.3.76), Finance & Staff (18.3.76/29.4.76), HF Contests (11.3.76/22.4.76), IARU Working Group (29.1.76), Interference (30.1.76), Mobile & Exhibition (2.3.76/6.4.76), Propagation Studies (29.3.76), Raynet (24.4.76), Repeater Working Group (6.3.76/10.4.76), Technical & Publications (10.2.76/30.3.76), Telecommunications Liaison (6.5.76), VHF (6.4.76), VHF Contests (25.3.76/29.4.76).

Concern was expressed about certain recent vhf contests and Mr Stone explained the reasons for the changes which had been made.

Mr Stevens reported that over 2,500 copies of the new edition of the *VHF/UHF Manual* had been sold and continuing sales were very satisfactory.

Mobile rallies calendar

7 August	Air Day at HMS *Daedalus*, Lee-on-the-Solent, Hampshire. Talk-in on 2 and 160. Details from G3JMG, QTHR.
15 August	Derby & D ARS Mobile Rally, Rykneld Schools, Bedford Street, Derby. Rally opens noon. Admission and car parking is free. Talk-in on 2m ssb and fm, G3ERD/A and G2DJ/A. Attractions include trade stands, junk sale, a tombola with many valuable prizes to be won, a brass band concert, repeater group exhibitions and competitions. Surplus gear can be sold in the flea market where tables can be hired (not available to traders). Details from G3FGY, QTHR.
15 August	Pembroke RSGBG "Bucket & Spade Party" Regency Hall, Saundersfoot. Rally opens 10am. Talk-in on all bands and modes, mainly 2m fm S20, S22, etc, and ssb 144·300MHz. Free car parking and refreshments at nominal charges. The hall is a few minutes' walk from the beach. Details from GW3XJQ, QTHR.
22 August	Preston ARS Mobile Rally, Walton le Dale County Secondary School, Brindle Road, Bamber Bridge, Preston. One mile from junction 29, M6. Talk-in station on 2m fm and ssb. Bring and buy stall, trade stands, raffle. Admission and parking free. Details from G8KTM, 9 Ratten Lane, Hutton, Preston PR4 5TE.
22 August	RAIBC Picnic and Mobile Rally in association with Southampton RSGB Group, The Fairground, Broadlands Estate, Romsey, Hants.
29 August	Torbay ARS Rally, change of venue to Haldon Racecourse, A38, near Exeter. Talk-in on 1·865, 3·775 (approximately), 145·5 and 433·2MHz. Signs to guide to new venue. Details from G3GDW, QTHR.
19 September	North Ulster RSGB Group Mobile Rally, Castle grounds, Antrim. Details from GI8AYZ, QTHR.
19 September	Peterborough Mobile Rally, Walton Secondary Modern School, Mountsteven Avenue, Peterborough. Talk-in on 160 and 2m. Details from G3EEL.
26 September	Harlow & D ARS Rally. Venue as last year. Details from G3WUX, G8JXU, G3YDI, QTHR.

your opinion

The Editor
Radio Communication

Sir—There is considerable pressure at present to establish a Citizens' Band in the UK. The Council of the RSGB discussed it at their meeting on 25 March and, more recently, *Practical Wireless* has published an editorial suggesting that the RSGB should help control Citizens' Band as well as amateur radio.

Citizens' Band is not a form of second-rate amateur radio for those unwilling (or unable) to pass the necessary examinations. It is a radio service to those—including sportsmen, small businessmen and many others—who want the convenience of being able to communicate slightly further than they can shout but do not need the extra privacy (and cost) of an exclusive land-mobile radio channel.

In the USA the Citizens' Band is an a.m. and ssb service on the 27MHz band. It causes interference to television, radio and, particularly, RC models, and in a few years time when the sunspots return it will suffer badly from co-channel interference.

The Citizens' Band Association has been formed to try to ensure than when CB is established in the UK it does not follow the American 27MHz a.m. pattern but is introduced as an fm service at vhf where most of the 27MHz disadvantages do not occur. Another advantage of a vhf fm service is that the market will not be flooded with Japanese 27MHz equipment and British manufacturers should be able to exploit the boom themselves.

We have written a technical proposal for vhf fm Citizens' Band which should avoid many of the problems of the American Citizens' Band and would be pleased to send a copy to anyone who is interested.

James M. Bryant, G4CLF
President, Citizens' Band Association,
16 Church Road, St Marks, Cheltenham

The Editor
Radio Communication

Sir—The pros and cons regarding repeaters which unfortunately have tended to become personal and emotional in recent months have been of interest to me and members may be interested in an overseas view.

The availability of multi-channel lightweight transceivers makes it possible to contain in one's briefcase an easily transportable station which in many of the population areas of the UK provide QSOs at practically anytime, day or night, via repeaters or simplex. My own visit to the UK during May resulted in many pleasant contacts using R and S modes, and there can be no doubt that repeaters have encouraged an upsurge in 2m activity.

In my opinion the sensible repeater approach by the HO and the RSGB can only be to the good of amateur radio, certainly during my visit I found the standard of operating to be very high and the friendliness and ham spirit was beyond reproach. Well done, repeater groups.

Alec Hodgkinson, ZS6BMU/G3LLJ/M

The Editor
Radio Communication

Sir—On behalf of the G-QRP-Club, I wish to express concern about the new rules for the RSGB Field Day. I have been approached by a large number of members, who also convey the unrest of QRO operating friends and local clubs.

It is our opinion that the restriction category would be more viable if applied to a power limitation rather than an aerial height limitation.

Many operators feel that the spirit of the old NFD will be lost in the new competition. The power limitation not only encouraged skilful operating, but prompted the use of amateur-built or modified equipment and enhanced the "self training" ideal of the amateur radio licence.

George Dobbs, hon sec

The Editor
Radio Communication

Sir—With regard to recent letters concerning donations to the Society in "Your Opinion", I think that this is a splendid idea and I hope that it is adopted by the bulk of the membership.

Please find enclosed herewith a Girocheque for £10 donated in the hope that it will induce other members to do likewise.

E.J. Vesper, G3WKG

contest news

May 1976 144MHz Portable Contest results

Activity was high and conditions were good for most of the contest with a good E-W path, although a signal which was strong one moment could be taken out with a deep rapid QSB. Several GM stations were active but they did not get a look-in at the mountain of dx available. Many contestants were thankful that the 200km ruling has been dropped. There are still a few who would like to see a reduction in power; there may be some merit in this, but looking at the top of the table it appears that the only disadvantage is from the economic sense and the expenditure of energy hauling equipment up a hillside. *G4CUT*

Posn	Callsign	Points	QSOs	QRA	Pwr	Ant	Best dx	Km
1	GW3WRA	4,815	551	YL05	150	14P	F1ANH	775
2	GW3OXD	3,852	487	YM55	100	10Y	DC9KU	645
3	GW8BHH	3,824	493	YM44	80	14P	F9NT	630
4	G3UUS	3,511	386	AM66	400	10Y	DJ7CL	688
5	G8GBY	3,238	388	ZN18	300	14P	DC0QT	612
6	GW5BI	3,188	448	YL25	200	8Y	F1ANH	723
7	GW4ALE	3,164	438	YM04	100	2–10Y	F1DRR	565
8	G3BRS	2,932	504	ZN61	70	8Y	F1DRR	504
9	GD3FLH	2,658	259	XO67	230	14Y	PA0CIS	635
10	G3JEQ	2,620	393	ZL77A	70	8S	DC6TY	545
11	G8FAB	2,532	368	ZL52	170	4–14Y	GM8EIR	630
12	G3RAC	2,491	403	ZL53	200	2–10Y	GM4CXP	465
13	G3PFM	2,439	333	YK09	125	2–14Y	GM8EIR	690
14	G3XBF	2,146	334	AL21	180	10Y	F1ANH	575
15	G3ERD	2,142	403	ZN72	70	4Q	F1CRP	500
16	GW8AVH	2,113	254	YM12	180	10Y	F1KBF	580
17	G4DAG	2,002	417	ZM25	400	10Y	GI3JLA	400
18	G8GMF	1,996	315	ZL53	170	10Y	GM8EIR	635
19	G4DSC	1,907	227	ZO64	80	6Q	FIBHL	575
20	G3IZD	1,898	315	ZK08	90	14P	GM8HYF	500
21	G3REI	1,859	350	ZL80	200	10Y	DC6TY	450
22	GW4APD	1,800	261	YM75	14	8Y	F1CF	520
23	G3FJE	1,761	329	ZM79	80	5Y	DC6TY	515
	G8GDK	1,761	338	ZL17J	80	10Y	DC9KU	476
25	G8GRB	1,757	302	YM28	10	6Y	F1US	519
26	G8KSD	1,731	207	AL76	30	8Y	DC6KL	452
27	GM8EIR	1,566	135	YR80	400	8S	G3PFM	692
28	G4CAR	1,411	265	ZM32F	150	14P	GM8EIR	496
29	G8CJO	1,362	310	AL41F	10	8Y	GM8HYF	450
30	G4DZO	1,350	208	AL11A	40	8Y	F1EMH	510
31	G8KNU	1,318	253	ZM41J	10	8S	F1CF	487
32	G3OHM	1,275	257	YM50B	?	8S	GM8EIR	515
33	G4CBZ	1,274	231	ZM68F	20	10Y	GM8EIR	540
34	G3WIR	1,197	261	ZL26F	75	14Y	GD3FLH	371
35	G4BOX	1,193	247	ZL59C	180	10Y	GD3FLH	425
36	G4CDD	1,175	186	ZN32J	?	?	F1BHL	450
37	G3YEF	1,164	195	ZK05H	10	10Y	ON1GT	475
38	G4EXO	1,102	142	ZK35H	60	5S	F1AZE	865
39	G8IWD	1,091	168	YK28G	9	14Y	PA0CIS	310
40	G4ASE	1,025	212	ZM16J	70	10Y	GM8EIR	471
41	GM8HYF	954	102	YP73C	140	10Y	G3YSB	535
42	G4DLB	940	295	ZM73C	100	7Y	F1DRR	510
43	G8HQL	934	208	ZL30C	80	8Y	DC6KL	490
44	G3AHD	854	158	YN47F	10	8S	GM8EIR	408
45	G8AJR	853	177	AL11B	15	10Y	F1CRP	440
46	G8KHI	802	182	ZL09G	5	8Y	GD3FLH	380
47	G8CDL	768	157	ZL08C	100	14P	GM8EIR	580
48	G3AWK	656	134	ZN68H	5	6Y	G4ABP	310
49	G8CXK	607	125	ZN65D	5	11Y	GM8EIR	410
50	G8KJG	500	107	ZL08C	10	10Y	GM8HYF	375
51	G8LIM	493	100	AL21F	10	10Y	GD3FLH	422
52	G3JFY	406	79	ZL73H	10	4Y	PA0CIS	354
53	G8LED	400	100	ZM45J	5	6Y	GW8HVP	270
54	G8ABI	170	30	YL72H	8	4Y	G8GBY	360
55	GM8AKB	79	21	YP15G	5	10Y	G8FAB	485
56	GM8KIE	42	18	YQ37G	5	5Y	GM8GEC	125

Check logs are acknowledged from G3BPM, G3BVF, G3FPK, G3VIJ, G4AEN, G8ITS, G8JYR, G8KKX, G8KNL, PA0FIN.

144MHz Open CW Contest results

This contest was introduced in response to requests from cw enthusiasts and attracted 26 entrants. At the same time a 24h 144MHz portable contest was being held and the comments concerning this varied from full support because activity was thereby increased to some opinion against in the case of those stations which were not able to enter both events: in fact, one multiple entry was accepted. Conditions were average and GC3ZNU/A did very well to make such a large score although he found it difficult to attract stations to look in his direction.

The winner and the runner-up will be awarded certificates. Thanks to G3FPK for sending a check log. *G3FZL*

Posn	Callsign	Points	QSOs	Best dx	Km
1	GC3ZNU/A	655	63	G4CDN	467
2	G3POI	614	81	GM4CXP	500
3	G3NNG	578	85	DJ9CZ	600+
4	G3GZJ	512	44	G3NEO	440
5	G3CHN	480	51	G2FT	430
6	G3GQC/P	474	70	G3GZJ	405
7	G3WSN	438	64	GM4CXP	480
8	G3KMI	431	65	F2RW	554
9	G3XBY	379	63	PA0CIS	370
10	G3NSM	370	67	DJ9CZ	502
11	G3NEO	358	42	PA0CIS	—
12	G3DAO	337	49	G3BW	450
13	G3LCH	269	57	GD3FLH/P	410
	G3AKF	269	57	PA0LSC	392
15	G3OSJ/A	228	40	GI3SXG	425
16	G3YYF/A	213	35	G3GZJ	400
17	G2BLA	210	42	DJ9CZ	430
18	G4ANH	187	39	G3ZXZ	305
19	G5HD	176	34	G3ZXZ	305
20	G4ALG	166	46	G3GZJ	340
21	G3JFY/P	140	26	G3GZJ	276
22	G3FJE/P	127	28	GC3ZNU/P	327
23	G3TWG	122	38	GC3ZNU/A	277
24	G2HH	114	26	GC3ZNU/A	224
25	G4DLB/P	85	20	GC3ZNU/A	310
26	G3ILO	78	14	G3GZJ	—

144MHz Open and Listeners Contest rules

1600–1600gmt 4-5 September

All entries and check logs to: VHF Contests Committee, c/o Mr P. W. Willcocks, G4BWY, 27 Manor Road, Barnet, Herts EN5 2LE.

The following general rules, published in the January 1976 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11–22.

This contest is timed to coincide with an IARU Region 1 contest, which will ensure a large amount of Continental activity, and if conditions are right many dx stations should be contacted. There is no doubt that the IARU event adds to the attractions of the RSGB fixture and it is hoped that a number of British stations will submit entries to the European contest, especially the stations with good scores. Logs should therefore be scored according to general rules 7a and 7b. The extra points/km scores should be entered in an additional half-inch column ruled adjacent to the "Points claimed" column.

The Mitchell-Milling Trophy will be awarded to the overall leader.

Listeners Contest: rules 1—6.

70MHz Fixed Contest rules

0900–1500gmt 24 October

All entries and check logs to: VHF Contests Committee, c/o Mr M. T. Deacon, G3XHU, 94 Herman Hill, SouthWoodford, London E18.

The following general rules, published in the January 1976 issue of *Radio Communication*, will apply: 1, 2, 3, 4c, 5a, 6a, 7a, 8b, 9a, 10a, 11–12.

SSB Field Day

Supplies of multi-band contest summary sheets (Form HFC 8/76) and band cover sheets (Form HFC 9/76) are now available from RSGB HQ for SSB FD. Groups intending to participate in this event are invited to send a 9 by 4in sae to the general manager with a request for one Form HFC 8/76 and five Forms HFC 9/76.

Groups are reminded that 100 contest log sheets may be purchased for 60p, which includes p & p, and orders should be sent to RSGB Publications (Sales), 35 Doughty Street, London WC1N 2AE.

1976 BARTG RTTY Contest results

Eight UK callsigns are shown among the 74 entrants listed in the single-operator stations taking part in this contest: G3VXO, 11; G3YDR, 14; G3OZF, 16; GW3IGG, 27; G8LT, 40; G3RDG, 42; G3LDI, 66, and G3RED/A, 72. G4ALE occupied fifth place out of eight multiple-operator entries.

Propagation conditions presented problems: in general, stations in Western Europe were able to work N and S America, Africa and Europe, but very few signals from Asia and the Pacific were heard. Stations in Japan and Australia heard very few stations in Europe and Africa but could work N and S America with little difficulty.

Rugby DF Qualifying Event results

The first RSGB df qualifying event of the season took place on 2 May, starting from a lay-by near Akeley on the A413 north of Buckingham. Good signals encouraged the 14 teams to set out in search of the two hidden transmitters, both of which had been very expertly concealed by the transmitter crews.

Station A (G4APD) was located on the north side of Plumpton Wood, about 10 miles north-west of the start, and Station B (G4EBF) was located on the Grand Union canal near the point where it crosses the River Great Ouse, about seven miles east of the start. A bridge over the river and two tunnels under the canal added to the difficulties. Despite the sparseness of foliage, both transmitters were extremely well hidden, and most competitors spent a long time in each area before getting in.

Bob Vickers was the first competitor to find a transmitter, Station B, at 1427, but Mike Hawkins overtook him to win the contest by finding his second transmitter at 1530.

After the contest prizes were presented to Mike Hawkins and Dave Holland: subject to confirmation they also qualify for the Final.

Thanks are due to Bryan Mahoney (Station A) and Gordon Reason (Station B) and their crews, and especially to Mr and Mrs Walker and their helpers who provided such an excellent tea.

			Time of arrival	
Posn	Competitor	Club	Station A	Station B
1	M. Hawkins	Chelmsford	1530	1434½
2	D. Holland	South Manchester	1531	1436
3	E. Mollart	Oxford	1555	1437
4	I. Butson	Chelmsford	1556	1438
5	P. Tyler	Oxford	1601½	1454½
6	B. Bristow	Oxford	1602	1434½
7	W. North	Chiltern	1602½	1434
8	W. L. Pechey	Chelmsford	1603½	1504
9	J. R. Vickers	Stratford	1604	1427
10	T. Gage	Oxford	1535	1622
11	C. Plumber	Coventry	—	1514
12	A. Butcher	Chelmsford	1521	—
13	J. McBurney	South Manchester	—	1615
14	O. L. Harding	Lincoln	—	1620

South Manchester DF Qualifying Event results

Ten teams assembled at the start, Heaton Park, on 6 June; the weather being very warm and sunny. Both signals were audible at the start, and most competitors chose Station A as their first objective.

This transmitter, G3FVA/P, manned by Chris Scholefield and Doug Jackson, was hidden in a hole in the ground, at an old quarry on Rooley Moor, about 12 miles N of the start. Access was via an old track which rapidly became unusable soon after leaving the main road. Most teams had to make a two mile uphill trek along this track in order to get to the quarry. Fortunately for Eric Mollart, he persuaded a passing Land Rover to give him a lift and, upon locating the transmitter at 1515 (first arrival) was fortunate enough to meet the same Land Rover on its way back. Eight teams eventually located this transmitter, although two 15min extensions of the contest were necessary.

Station B, G3UHF/P, was operated by Dave Holland and Colin McKenzie from a plantation some 14 miles NW of the start. The transmitter was hidden deep in the middle of the pine trees. Two radiating aerials and one dummy aerial were used. The first arrival was George Whenham at 1513½ followed by Tony Leeming at 1517, but no-one else appeared for over an hour, until at 1632½ Eric Mollart arrived, wearily pushing his way through the trees. Two other competitors were in the area, but despite useful "hints" spent valuable time searching the undergrowth.

Eric Mollart, who won the event, also wins the South Manchester Radio Club's new DF Cup which will be awarded annually at the qualifying event.

The South Manchester Radio Club would like to thank all those who attended, the ladies who organized the tea, and transmitter operators and organizers, for making this event so successful.

			Time of arrival	
Posn	Name	Club	Station A	Station B
1	E. L. Mollart	Oxford	1515	1632½
2	G. Whenham	Coventry	1644	1513½
3	A. Butcher	Chelmsford	1539	1658
4	J. McBurney	South Manchester	1519	1659
5	T. C. Gage	Oxford	1522	1659½
6	A. Leeming	Mid-Cheshire	1716	1517
7	R. P. Smith	South Manchester	1613	—
8	P. Woollett	Dartford Heath	1624	—
9	G. Foster	Stratford on Avon	—	1633½

One competitor failed to locate either transmitter.
Subject to confirmation, G. Whenham and A. Butcher qualify for the National Final.

Dartford Heath DF Qualifying Event results

On an ideal day for df, bright and sunny but not too hot, 14 teams assembled at the start at Paddock Wood. Good signals were received from both stations and all fourteen competitors were away on time. Most made for Station B which was located in Bedgebury Forest, about 10 miles away. This station was manned by Ken, G4APB, and Phil Mills, G8KBI, and although well hidden did not present any great difficulties, being run to earth as early as 1421 by Eric Mollart, 25min before the second man in, Arthur Butcher.

G4BDF, Station A, operated by Alan, G4BWV, and Phil Wolfe, G4EGU, was in an almost diametrically opposite direction about seven miles from the start in a copse near Ightham Mote. Most hunters seemed to have some difficulties with this station, bearings appearing very inconsistent. Here, Peter Woollett was first home as early as 1434, though his luck deserted him at the next hide! At 1557, when we had arranged for an extension to get two qualifiers home, came news that Paul Tyler had also found both stations and so we were able to cancel the announcement quickly.

After the event, we enjoyed the hospitality of John, G4CXS, and his wife, Hannah, who gave us an excellent meal at the *Hop Pocket*.

Thanks must be expressed to all who helped with the event: the operating crews; John, G8HCW, who manned the vhf link all the afternoon, and all who worked so hard behind the scenes.

			Time of Arrival	
Posn	Competitor	Club	Station A	Station B
1	E. Mollart	Oxford	1554	1421
2	P. Tyler	Oxford	1557	1447
3	B. Bristow	Oxford	1606	1453
4	G. Foster	Stratford on Avon	1607	1451½
5	C. McEwen	Chelmsford	1612	1457
6	G. Whenham	Coventry	1453	1629
7	P. Woollett	Dartford Heath	1434	—
8	A. Butcher	Chelmsford	—	1446
9	J. Everist	Dartford Heath	1452	—
10	T. Gage	Oxford	—	1507
11	M. Hawkins	Chelmsford	1512	—
12	D. Newman	Rugby	—	1524
13	I. Deacon	Dartford Heath	—	1553

One competitor failed to locate either station.
Subject to confirmation, E. Mollart and P. Tyler qualify for the National Final.

DF Qualifying Event Slade

Date: 22 August 1976.
Map: OS Sheet 150 (Worcester and The Malverns)
Assembly: 1300bst for start at 1320bst.
Location: Car park Pershore NGR 950458.

Intending competitors requiring tea are asked to notify Mr J. E. Drakeley, 186 Conway Road, Fordbridge, Birmingham B37 5LD (Tel 021-770 3474) not later than 12 August.

October 1975 RSGB UHF Contest results correction

A mistake was inadvertently made by the adjudicator of this contest, and apologies are offered to those concerned.

The item about the overall winner should have read: The overall leader of the contest is the Cray Valley RS with the combined scores of their two stations G3RCV/G8AYN. Certificates will also go to the band leaders and to the runners-up provided that 10 or more entries were received for a particular band. *G4CUT*

Contests calendar

7-8 August	70MHz Portable & Listeners (Trophy) (Rules in July issue)
22 August	DF Qualifying Event Slade (Rules in August issue)
4-5 September	144MHz Open & Listeners (Trophy) (Rules in August issue)
4-5 September	SSB FD (Rules in May issue)
12 September	DF Final High Wycombe
2-3 October	UHF/SHF (Rules in May issue)
9-10 October	21/28MHz (Rules in May issue)
16-17 October	7MHz Phone (Rules in July issue)
24 October	70MHz Fixed (Rules in August issue)
Oct-Nov	432MHz Cumulatives
6-7 November	144MHz CW
6-7 November	7MHz CW
13-14 November	Second 1·8MHz
5 December	144MHz Fixed

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed in alternate issues 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 50p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

The closing date for each issue is the 1st 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. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

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. Advertisements may be edited or abbreviated as necessary.

Post to: MEMBERS' ADS, "RADIO COMMUNICATION", 35 DOUGHTY STREET, LONDON WC1N 2AE.

FOR SALE

Hustler mast, body and bumper mounts, spring, res 80/40/10, £40. SSM Europa 28/144, £60. FV200 ext vfo, £35. Comdel CSP11 processor, £30. G3ZYN, QTHR. Tel Lea Valley 712874.

Trio vfo 30G ext vfo for TR7200G, 3 months old, comp with manual, leads, etc, as new, in original packing, £50 ono. G4EMR. Tel 0705 21082.

R107T rx, good cond, very stable, manual, £12. Eddystone 680/2, vgc, int S-meter, with manual, one owner, £55. Buyers to inspect and collect. Lees, 450 Castle Lane West, Bournemouth. Tel 517200 after 6pm.

Zenith B SLR camera with f2 lens, £22. Weston Master 2 exposure meter, £8. Tel 0422 60279. G4EMW (ex G8JEY), QTHR.

Trio TS700, £320, Standard C146A with t/b, S0, S20, S22, R5, R7, £90. 2m Liner linear forty, solid state, 40W o/p, £30. Geloso G209 amateur bands rx, £25. CCSI conduction cooled 4CX250B, £4. M. Kipp, G4FBK/G8HOW, QTHR. Tel 01-864 1412 evenings.

Sommerkamp FL200B a.m./cw/ssb tx, 200W p.e.p., £80 ono. 14AVQ 40–10m trapped vertical, unwanted gift, £35 ono. Codar AT5, rough working, £5. Reesmace marine tx, 1·5–16MHz, a.m./cw/mcw, no psu, £8 ono. HW32A plus ac psu, 20m ssb, £50 ono. A. Jones, G4CMF, QTHR. Tel 01-764 3881 home, 01-920 8587 work.

Unused Polyquad triband Fibreglass quad, instruction manual, a real bargain, £30. Delivery arranged at cost. Ron Cartwright, G3UCV, 5 Manston Gardens, Leeds LS15 8EY. Tel Leeds 643 788.

Liner 2, PA3, immac, recently professionally aligned. R115E psu, bought new costs £194, will accept £125 ono. Prior, G8KQB, Box Tree, Minster Lovell, Oxford. Tel Asthall Leigh 272 after 5.15pm.

QM70 70cm conv, i.f. 28–30MHz, £10. 4m 4-el Jaybeam Yagi, £3.50. QQV06-40A, £2. Trio 3·395MHz xtal filter (ssb), with both carrier xtals, £17.50. Xtals 70·000, 70·035, 70·135, 70·260, 70·635MHz, HC6U, £1.50 each. Upcote Cottage, Chilbolton, Stockbridge, Hants. Tel Chilbolton 244.

Shack clearance. Green and Davis 2m/70cm tx inc ac/dc psus, £50. Pye Ranger, £7.50. Murphy Rover, £6. Advance rf sig gen, £10. Pye Vanguard 2m. L/B Cambridge. 4m conv, £4. Many components, please enquire. G4ERX. Tel Brentwood 225736.

Clearance of new items. MVR5V regulators, £1.25. Mains transformers, 12-0-12V at 50mA, 75p. IN4001, £1.50/100. 5·1V or 5·6V zeners, 75p/10. Small switches, 4 pco pcb mounting, £1/25. 100kHz xtal oscillator modules, £4. 38·6666MHz xtals, £1.80. 6146Bs, £3.50 post paid. G4BJG, QTHR.

FT220 144–146MHz tx/rx, fm/cw/ssb, exc, £200 ono. Storno Viscount tx/rx, perf with xtal shift, 145, S20, R5 and R7, £45 ono. Price, G8FIH, 17 Bremhill, Calne, Wiltshire SN11 9LD.

Star 600 triple conversion rx, xtal controlled, exc cond, £30. Eddystone 1000, gen cov super rx, rechargeable battery or mains, nearest to £100. Rogers, G3AIU, Essendon Post Office, Essendon, Herts. Tel Hatfield 61251.

Inoue IC2F, fitted 145·35, 144·48, 145, 145·5, 145·8, R6, toneburst, mic, mobile mount, leads, fm/a.m. switch on rx, English manual, good cond and wkg fb, £75. G3KZX, QTHR. Tel Plumtree 5516.

Tokai stereo power amplifier, £10. Tel Cheltenham 59935.

Electronic keyers, led indicators, variable speed, looks commercial inside and out, £7 each. Good quality C10 micro switches, 250V each 3A, 125V each 10A, brand new, 12p each, p&p inc. Callers welcome. No phone calls please. Robin Box, Caretaker's Bungalow, Tudor Grange Special School, Solihull, W Midlands.

Liner 2 with preamp, comp with mobile mount, mic, etc, vgc. Jaybeam 8 over 8 slot fed Yagi. G8JJB, QTHR. Tel Thurton 213, evenings.

Pye U450 uhf base station, £15 ono. Carr arranged. HC6U xtals 8·0555, 8·0666, 44·8333, 44·7666, suit Cambridge, etc, £2 each post paid. GW3UOO, QTHR. Tel Deeside 814955 after 4pm.

10ch Pye Vanguard tx on 2m, with control box and cable, £8. H/B 2m tx chassis, £4. Buyer collects. G8BEW, QTHR. Tel Cleethorpes 68638.

Pye FM10B on 2m, toneburst, £25. Revco 2m $\frac{1}{4}\lambda$ whip, new, £5. H/B freq counter, five digit, £20. Heath OS2 scope in Imhof cabinet, £15. G3VSJ, QTHR. Tel Hodd 68052.

Trio JR310, £65. Heath RA1 calibrator spkr, £35. Codar preselector, £3. G3WUR, QTHR. Tel 0279 57251.

Labgear LG50 tx, 80–10m, cw/a.m., 50W, £20. Buyer collects. Microwave Modules 70cm converter, 144–146MHz i.f., brand new, £18. 12MHz vfo, ideal for 2m tx, £8. G4EZA, 40 Gurdon Road, Colchester, Essex CO2 7PB. Tel 46966.

KW Viceroy Mk2 ssb, 80-40-15-10, manual, spare 6146, £60. 4E4m Yagi, £3.50. Buyer collects. G3FD, QTHR. Tel Southend 554764.

Liner 2, one year old, vgc, manual, mobile mount, preamp, £120. Low band Pye a.m. Ranger with control box cables, £5. High band a.m. Ranger, dash mount on 2, £10. G3NBO, QTHR. Tel 0509 66316.

Pye Pocketfone tx and rx, unconverted, in good cond, £25. U10B uhf Pye Cambridge, no control gear or tx valves, £25. Hartley, 16 Aynsley Grove, Bradford. Tel 0274 498172.

Excellent contest QTH in Camberley, Surrey. Detached house in $\frac{1}{2}$ acre grounds, 90ft telescopic tower with planning consent, 3 large bedrooms, modern fitted kitchen, cloaks larder/utility, large garage shack/workshop, gas cent heating, £25,500 ono. G3UJE. Tel Camberley 65654.

TE16A transistor sig gen, £7. Joymatch 3A atu, £1.50. G-whip 80/160 mobile aerial with basemount £6. Manuals, Drake R4B, Heath GR78, as new, £1 each plus postage. *Wanted:* New cond class D Mk 1 wavemeter. Vintage radio books. Richardson, 2 Edna Road, Maidstone, Kent.

Heathkit SB101, HP23 psu, good cond, £135. Liner 2, mic, etc, £105. G3ORL, QTHR. Tel 617167, weekends only, or Weybridge 49345 Mon to Thurs evenings.

KW110 Q-mult, as new, with instructions. KW2000A/B dc psu, comp with all connecting leads. Will swop Johnson Matchbox atu for KW107, must be in good cond, 50Ω. EI2CI, 12 Wolseley Street, Sth Cir Rd, Dublin 8, Rep of Ireland.

FT101 Mk2, 160–10m, comp with G3LLL rf clipper, £240. SSM Europa, 2m, £55. G8HED, QTHR. Tel Cleveleys 3632.

Heathkit SW717G, exc cond, £30. Buyer collects. 8 Kennet Road, Wroughton, Swindon, Wilts. Tel Wroughton 812842.

Yaesu FT2FB 2m tx/rx with mobile mounting bracket, mic, instruction manual, xtals fitted S0, S20, R6, R7, 144·48, 144·60, a.m./fm rx, £110. Bantex B5 $\frac{5}{8}$ 2m whip with magnetic base mount, £10 or inc with FT2FB. G3VOF. Tel 04023 73366.

R216 rx, £30. Trio JR310 rx, £50. Eddystone 680R rx, £8. Canadian 52 rx, £5. BC342 rx, £7. Sky Buddy rx, £5. Telford TC10 Mk2 tx (144MHz), £70. Philips scope, £6. GPO osc No 28A, £7. Audio wattmeter, £3. Standard radio aircraft tx/rx, 50kHz channels, xtal controlled, £30. Advance sig gen, £8. Marconi sig gen TF144G, £10. Marconi sig gen TF867, £25. Class D No 2 wavemeter, £8. Purchaser views and collects. G8FSZ, QTHR. Tel Byfleet 48307.

Eddystone 840C gen cov rx, 480kHz–30MHz, £30. Codar PR30X preselector, mains powered, £5. *Wanted:* Dual beam scope, good cond. Kent, 84 Crescent Road, Heybridge, Maldon, Essex. Tel Maldon 54063 evenings.

70cm Hi-Q break, G8ABP type, £6. 70cm 46-el Multibeam, £8. *Wanted:* Top band atu, KW160, etc. Datong clipper. G-whip extendarod. 40m coil. G3OHC, QTHR. Tel 021-308 2512.

KW201 rx, 160–10m, extra xtals, vgc, £110 ono. Trio TS500 remote vfo, 12·24–12·84MHz, vgc, £20 ono. Clayton. Tel Medway 361606 after 7pm.

Pye base station, 40W on 144MHz, £25. H/B tripler/pa unit for 70cm, inc two 3/20A valves, £20. Several TR1986 modulators, £3 each. Various vhf sundries, sae for list. G5UM, QTHR.

432MHz QRO, silver plated coaxial line, 4CX250B and base, £30. 4CX250B with base, chimney, £10. Klystron on WG16, £3. 240V ac blower, £5. 951 type coaxial relays, 12/24V coils, £5 each. All new and unused cond. G4BMM, QTHR. Tel Luton 35617.

Yaesu SP101 spkr, mint, £10 or exchange for SP400/SP401. *Wanted:* FLDX400 tx, any cond considered. Details, price to G3PDL, The Orchard, Vicarage Lane, Cadney, Brigg, South Humberside. Tel 06527 335.

Trio QR666 gen cov rx, 0·5–30MHz a.m./cw/ssb, bandspread, mint cond, £130. A. Pickering, The Vicarage, Buckland Newton, Dorchester, Dorset. Tel Buckland Newton 223.

FT501, FP501, £295. Trio vfo 5D, fits FT501, £30. Bortex ¼ whip, Fibreglass with magnetic mount, £10. G3ZVC tx/rx kit with all parts incl XF9-B filter, £50. G4DAW, 479 Wellingborough Road, Northampton. Tel 714821 anytime.

Variometer, £1.50. TE18 grid dip meter, £12. Aerial impedance meter, £5. ATU, £12. Wavemeter, 18–87MHz, £4. Roller coaster, £2.50. Oscilloscope, £17. Joymatch, £3.50. *Wanted:* T-4XB/C MN2000. Turvey, 2 Knowles Street, Wednesbury, West Mids.

HRO-MX, psu and coils, mw through to 10m in good cond with comp set of spare valves, £37.50. Prefer buyer inspects and collects. G3LGX, QTHR. Tel 032-94 42482.

Pye Vanguard tx/rx, variable tuning 146–145, boot mounting, comp control unit, exc cond, comp with manual, exchange for 144/28MHz Sentinel or similar type, will collect 50 miles. G6MN, QTHR. Tel Worksop 3515.

Trio TS900 tx/rx and ac psu, comp with CW900 filter, hand mic and headset, as new, very little used, mint cond, £430 ono. Moores, 13 Astbury Cres, Bridge Hall East, Adswood, Stockport, Cheshire. Tel 061-429 7692.

Trio HC2 ham clock, new, £11. Microwave Modules 28–30m converter, £10. Heathkit HW102 swr/power meter, £15. Cadenza ribbon, mic, in case, £9. ATU with built in swr meter and AE switch, £10. *Wanted:* KW109 Supermatch. G3UCE, QTHR. Tel Heysham 51760.

Trio JR310, full 10m, £70. Sentinel 2m converter, 28–30MHz, £12. TE20D sig gen, £15. GM4EGE (ex GM8ILE, QTHR). Tel Peebles 20586 evenings.

Toneburst, 1750Hz CMOS type, adjustable output and frequency, £3. 2m pre-amp, mosfet type, noise figure better than 3dB, gain 18dB, £4. 2m converter, 28–30MHz i.f., better than 3dB noise figure, 25dB gain, £12. G4EBI, QTHR. Tel 01-231 0879.

Eddystone gen cov rxs, model 680X, £90. Model 880/2, in excellent cond, £250. Davis, 34 Sims Lane, Quedgeley, Glos.

Hudson AM10B mobile, xtalled 145MHz, £15. ¾ 2m whip, £5. Marconi TF144G sig gen, £15. Class D wavemeter, requires attention, £5. Cossor 1039M oscilloscope, trace faint, £5. All plus carr. G3SCU, QTHR.

FT200 + FP200, full 28MHz, exc cond, unused, boxed + variac, £215. Trio JR500S + manual, £35. AR88D, S-meter, orig handbook, revalved, £32. Valves TT21, new, boxed, £5 each. GM8BWT, QTHR. Tel Linlithgow 2321.

TR2200GX, 2W, latest model, 10 days use only, mint, fitted R6, R7, S20, S22, nicads charger, leather case in original packing, reason for sale prefer hf bands, £120. G3MZE, QTHR. Tel Stevenage 57803.

R220 rx, original cond on 70·1MHz. *Wanted:* Trio tx 599, must be in exc mech and elect wkg order with manual and cables. 6m converter for JR599 and split-stator capacitor 200 plus 200pF min, each 3kV spacing. R. J. Napper, 22 Rydal Drive, Hale Barns, Altrincham, Cheshire.

Trio 9R59DS, fully stabilized, cond immaculate, comp with manual, gen cov and bandspread on amateur bands, £55. Buyers collect or carr by arrangement. Lees, 450 Castle Lane West, Bournemouth. Tel 517200 after 6pm.

18AVT/WB plus 200ft copper radial wire, unused, £30. ALI aerial mast, seven sections, all interlock, 35ft total height, £7. Buyer collects. G4DLW, QTHR. Tel 024-463 433.

Liner 2, in good cond, with preamp, spare power lead, mobile mount and instruction book, £110. Also US Navy vhf wavemeter model OAP9. Offers. G4EDM, QTHR. Tel 061-973 7398.

Hygain 18AVT/WB, new, comp with 44ft 50Ω coaxial, handbook, £40. Delivered. G4ELK, 8 Springcroft, Parkgate, Wirral, Merseyside. Tel 051-336 2646.

Stolle 2010 rotator, as new, in carton, 15m 5-core cable, £35. 2m Jaybeams, 14-el Parabeam, as new, 5m low loss cable, £16. 10-el Yagi, perf, £10. Collect or carr extra. Kokusai MF455-10CK, new, £11 plus postage. G3GUU, QTHR.

PR40 rf preselector, modified for 12V or 9V, £12 ono. Buyer collects. Heath sig gen, £20. G8KLI, 49 Widney Avenue, Birmingham B29 6QE. Tel 021-472 4678.

MM 432/28 converter, £12. H/B 432/144 converter, £10. Valve 70cm converter, 26·7-28·7 i.f., £6. 144/28 H/B converter, less xtal, £2.50. 2m preamp, £1.50. Pye base tx, modified for fm, £15. Buyer collects tx. G8BEQ, QTHR.

2m xtal controlled a.m. tx. QQV03-10 pa. Pair EL80 modulators, stages and output metered s/r switch. Carrier switch, neat grey cabinet, separate power supply. Offers. GW6WB, QTHR.

Drake SPR4, in perfect cond, with broadcast and amateur bands xtals. AL4 loop aerial mains and dc power leads, manual, £275. Sony stereo cassette recorder TC124CS, mint cond, 2 spkrs, mic, leads, etc, carrying case. £55. Alis, 7 Hillside Avenue, Wembley, London Tel 01-902 4358 evenings.

Superb vhf QTH in Cornwall, third place in December 1975 fixed 2m contest, 660ft asl, five miles from Launceston, 22 miles north of Plymouth, modern detached three-bedroomed split-level luxury house with integral garage, 120ft rear garden, sale to include aerials and carpets, £14,950. John Quinn, G8FDK. Tel 051-523 4011 office hours.

Heathkit 50/75Ω swr meter. Jaybeam 8-el 2m beam. Pye rack mounted base station, low band. All best offer. Pye Cambridge low band, good cond, £20 ono. G3ZLH. Tel 0691 5730.

Factory assembled Heath HW12A and 12V psu with TTC power/swr meters. 80m G-whip, spkr, mic, mounting bracket, bought for caravan holidays, used less than fifty hours. Park-Air 50X tx. KW E-Zee match. Offers. G3YDZ, QTHR.

Panda Cub tx, vfo controlled, 40W cw or a.m. 160–10m. No sensible offer refused. G3YEK, QTHR. Tel Radlett 6795.

FRDX400, £130. FF50DX, lpf, £15. KW109 Supermatch, £60. 100ft 300Ω, £2.50. 240ft 18G aerial wire, £5. Slide rule, £1.50. Ditto electronic calculations, £2.50. G2TA, QTHR. Tel 01-950 1762.

Heathscope OSI, £20. Acton sig gen, 100kHz, 100MHz, £5. Reslosound RBH/T, £8. Weston cine meter, £3. TT100, unused, £15. Flexiwhip, mount, plus 80m, £10. Ferrograph defluxer, £3. 300Ω ribbon, 4p. 50Ω miniature coax, 5p yard. G3XKA. Tel Woking 73620.

KW2000B, good, £160 plus carr or offers. *Wanted:* Going separates, require HQ170 type rx plus ssb/cw tx. No h/b. Will part exchange, possible straight swop. Write first, GW3WWN, QTHR.

KW2000B, with ac psu, Shure mic and lp filter, £200 ono. Delivery can be arranged. G8HI, QTHR. Tel 07833 2605.

No 19 set plus power supply, phones, manual, etc, working 5FP7 plus scan coils, focus unit, offers. *Wanted:* Circuits for sstv character generator, cameras, fast scan converters, etc. H. Winwood 87 Alderson Road North, Sheffield S24 UF.

Trio JR310, mint cond, ssb and cw filters fitted, operating and service manuals, £65 or offers. G3KBQ, QTHR. Tel Hexham 2488.

Shack clearance requested. ½ ton inc 1131 tx, components, valves etc, anyone interested in collecting the lot? No separates. G2NR, QTHR.

VHF mobile interference: new, straight and right angled screened plug suppressors, £1 each. Other suppressors available, sae for details. Pye Vanguard on 2m, £12. Sig gen, Marconi TF390F, £12. G8EBM, 15 Wheeldon Way, Hulland Ward, Derbyshire. Tel Hulland Ward 530.

Yaesu FR101D rx with 2m 4m bands and gen cov 1·8–30MHz, unmarked, only 6 months old, under guarantee, bargain, £320, cash only. T. Roberts, 18 Ash Tree Close, Radyr, Glamorgan.

Interest in amateur radio now gone, have KW2000A, KW160, KW101, KW103, KW E-Zee match, 3-way switches, aerials, books, will not haggle over reasonable offer, suggest call by appointment or sae for details. G3WXT, QTHR.

Liner 2 + Burns preamp, fb cond, £125. MM 2m tx, a.m. 145·0 + 3ch, £18. Pair BLY83, new, 12V, 7W rf, £2 each. A-Upton, G3UZU/A, 143 Belvedere Court, Childwall Green, Woodchurch, Merseyside.

Yaesu FR101D rx, 6m, 2m, all filters and fm discriminator, as new cond, in original packing, £300, no offers. Prefer buyer collects. GM8HEY, QTHR. Tel Dunfermline 25534.

Samson ETM3 squeeze keyer, £30. Lattice tower, two sections, overall height 36ft, hinged grillage, custom built. £40. G4CJY, QTHR. Tel 0494 444417.

TW2 tx, psu, TW2 converter, £30. Taylor 65A sig gen, £12. Q-fiver, £4. Avo model 7, £12. Old radio components, send sae with your requirements, all plus freight. *Wanted:* Marconi 365A marine key. G6AB, 44 Preston Road, Holland on Sea CO15 5JX.

TS700 2m tx/rx, £290. GM8BOV, QTHR. Tel Bathgate 54025.

FT221, 3 months old, immac cond, £310. No offers please. Buyer collects. G4DXM, QTHR.

Tuning fork controlled toneburst, ex-TR2200G, in good cond, £12. 2m converter, 4-6MHz i.f., £6.50. 2m fet preamp, boxed, 18dB gain, £2.50. S-meter, ex-HRO rx, £4. G8JWC, QTHR. Tel 0926 26681.

G3XGP freq meter parts, all ICs and display units, 2 pcbs and wired clock pcb and 1MHz xtal worth £18, will take £14 ono. G3JDN, QTHR. Tel Reigate 40646 after 6pm.

A.M. 4m base station, 30W, BCC, 8 xtals plus converter 28–30MHz, £30. HRO senior, 8 coils inc all BS amateur bands, no PS, £25. Buyer collects. *Wanted:* Circuit Marconi rx H2301. G3JKF, QTHR. Tel Crawley 28080.

FR50B rx, built in calibrator, instruction manual, in very good cond, £65. RAE correspondence course, £15. Tel Hayling Island 4013.

KW Atlanta with spare pa valves, £190. Yaesu FR50B with calibrator and WWV, £65. Telequipment D55A oscilloscope, £80. GI4BDR, QTHR.

Telford TC9, £45. Telford TC7 Mk2, £35. Liner linear 40W, £30. MWM 432/28 conv, £14. MWM tripler, 144/432, £12. G8AEV 144/28 conv, £10. G3ILO, G4BKY, QTHR.

30ft rigid steel tilt over tower, comp with ropes, winch, pulleys, etc, but less ground post. Offers. Buyer collects. *Wanted:* Faulty Stolle rotator for spares. G3XFM, QTHR.

4m mobile rig. Storno Viscount xtalled on 70·26, 70·156, 70·500, 70·655, comp with whip, cables, control unit and manual reprint. H/B xtal shift unit, built in MM converter 70mH 6mH i.f., £35. Carr at cost. G3APV, QTHR. Tel Seascale 449.

Liner 2, one year old, £120. *Wanted:* FV101B and SP101B. GM4DHJ, QTHR. Tel 041-889 9010.

HW12A with HP23 spkr, £80. 18AVT/WB coax, £45. GD-IU grid dip, £12. AEC SWR50, £9. KW trap dipole coax, £8. *SWM* 1962–65, *RadCom* 1962–75, £2 per volume. *Amateur Radio Handbook*, £2. *Radio Communication Handbook*, 4th edition, £4. G3NFL, QTHR. Tel Charing 2209.

Joining RAF July, selling Pye base transmitter less QQV06-40A, needs attention, with external fm circuit, £7. Power supplies, 250V with spare, £9. 150V, £6. Both regulated with 6·3V outputs. Carr arranged. G8HAY, 39 Cross Street, Wombwell, Barnsley, South Yorkshire ST3 0LJ.

Comp station, FTDX401, matching spkr, 18AVT/WB vertical, twin meter swr, electronic and hand keys, headphones, YD844 desk mic, lpf, all cables/connectors, first-class cond, £350. D. J. Sloss, 65 Tedder Avenue, Henlow, Beds. Tel Hitchin 811943.

Walkie-talkies, Motorola type CC1504, 30MHz fm 5W output, rechargeable 12V batteries, both working but have different xtals. Buyer to change frequency. Tel 0455 32173 after 6pm or Sundays.

KW2000B and ac psu, mic, little used, exc cond, £200. PW Texan stereo amp, 20W, channel perf, £34. Eddystone S640 G/C rx, bandspread amateur bands, manual, £20. TW 70cm conv, £10. All carr extra or collect. G3XGK, QTHR. Tel Lowestoft 64160.

Mains/900V 250mA oil transformer, £3.50. HC25U 72·5MHz xtal, new, £1.50. QQV06-40, £1.50. Marconi No 6 valve voltmeter, faulty, £1.50. RTC 10W mono hi-fi transistor amplifier, mag ceramic, £4. Xtals FT243, 6050, 6075, 5875kHz, 75p each. G8FHN, QTHR. Tel Medway 63365.

Ex-RAF 1392 vhf rx, with psu. A. H. Humphries, 14 Fosseway Crescent, Tredington, nr Shipston-on-Stour, Warwickshire CV36 4NX.

Hygain 103BA, used 9 months only, £25. CDR22 rotator, £17. 8/8 2m aerial, £5. Tel 0954 60584.

Due shack reorganization selling FT401, few hours use, £240. Trio JR500SE, mod, 160m, £55. Both mint cond. Trio 9R59DE, £35. Pair hi-band fm Bantams, comp inc two new nicads, all good cond. Will haggle. *Wanted:* FT101E. G3ZON, QTHR. Tel 01-546 3447.

AM10D rf board, incomp, £15 ono. AM10B tx vxo, a.m./fm plus xtals, £9 ono. Collins ssb filter, 250kHz, £8. Goodmans Axiom 301 with ARU172, £16. EL34, 50p. 2N3866, 30p. HC6U oven, 30p. 2200MFD, 100V 10A, 40p. Many shack clearance items. G8CXK. Tel 050-981 2433.

KW (E-Zee) match, £15. KW 75Ω dummy load, £12. AEC swr/power meter, £12. KW aerial switching unit, £3. Buyers collect. Craven, G4EQI, Grass Moor, Radford Road, Alvechurch, Birmingham. Tel 021-445 1347.

IN4002, 3p. IN4004, 4p. 4·7V zeners, 6p. 50g xtal etching chemical, ammonium bifluoride, 20p. 2N5061 SCRs, 10p. Short leads. Good sae please, espec for chemical. G3VZF, 5 The Close, Radlett, Herts.

RTTY Creed 7E page printer, good cond, with cover, spare paper, ink, ribbons, £20. Spacemark SRD-1 TU 170 400 850Hz shift, single or double current, with optional AFSK unit, perf, £50. GM3XWJ, QTHR. Tel 041-959 4654.

Brass straight key, £5. H/B band linear 80-10m 500W p.e.p., £35. Transformer 400–0–400 400mA, £5. Avo 8X, new, £35. *Wanted:* DX40 or DX60 with vfo. G3YGM. Tel Brixham 51674.

SSB 80-10m tx with l/p 160m output, uses 9MHz McCoy xtal filter and pair 5B/254M in final, comp with separate compact power supply and connecting cable, £45 or reasonable offer. Buyer collects. G3HVA, QTHR.

FT101 Mk1 fan, £250. 4CX250Bs, new, boxed, £7.50 each. Tavasu mobile whip, 80/20m coils, £5. Bauer keying paddle, £4. Large 1500pF tx capacitor, new, £2. All incl carr. G4AED, QTHR.

Creed 85R reperforators, £5. Also R209 rx, recently bought for £12, selling for £10. Buyer arranges carr. John Lindley, 12 Douglas Avenue, Bury, Lancs. Tel 061-764 1504.

Drake R4B, 160, £200. Solartron oscilloscope CD1212, 20MHz, dual trace, 40MHz, plug ins, manual, £75. IC21XT fm tx/rx, toneburst, S0, S20, S21, S22, R5, R6, £90. Tiger 300W a.m. cw tx, 80–10, £25. *Wanted:* B40. G3RCE, QTHR.

88mH potcores, STC grade 3AF, superior to American toroids, higher Q, closer tolerance, in aluminium, can approx 1in high by 1in diam with 6in flying leads, ideal for rtty, sstv, filters, etc, 65p each. G3YKB, QTHR. Tel 0634 571909.

Pye Pocketfones working fb on 433·2 comp with both nicads and leather cases, rx fitted with BNC socket and external ¼ wave whip, squelch mute switch fitted, £38. G4DHF, QTHR. Tel 0472 55354 after 6pm.

Grundig Satellite 2000 plus ssb kit. Perf, virtually unused, full instructions, etc, new 24.2.76, cost £225, sell £135. Denis Taylor, 25 High Brow, Harborne, Birmingham.

BC221T with original calibration, £17. Prop pitch motor, 24V, unused, £15. Agfacolour 50 slide projector, little used, £16. G3AUB, QTHR. Tel Macclesfield 25910.

Shop with three bedroom flat on main road shopping parade four miles north of Manchester and two miles from M62, parking front and rear, permission for second garage, available March, £12,500. G4BKZ, QTHR. Tel 061-740 4065 evenings/weekends.

Heathkit service scope OS2, good cond, comp with operating manual and two probes, £30. Defty, 119 Westmorland Rise, Peterlee, Co Durham. Tel 862062.

3cm oscillator with × 12 step recovery diode, atten o/p to 20mW, with details, £6. Untested, good for Gunn or xtal source, £3. Other useful microwave comps, sae. Pen recorder, Evershed and Vignoles, £6. G8AFU, QTHR. Tel Guildford 223652.

Trio JR310 rx, no mods, mint, £65. *Wanted:* Small scope. G8IAZ, QTHR. Tel Hermitage 201520.

Heathkit Mohican hf rx, £30 ono. Ultra Cub hand portable vhf tx/rx, £30 ono. Black and white tv, uhf, £17 ono. P. Catling, 12 North Street, Burwell, Cambs. Tel Newmarket 741493.

Power units and transformers, 250–620V, meters 2–150mA, HRO dial, £1. HRO gear boxes, £1. *RadCom* 1974/75, £2. *Hi-fi News* Oct 1970-Dec 1973, £3. 813 866Jr, used, 75p. G2QY, QTHR. Tel Cheltenham 20105.

Codar CR70A, mod with Silicon ht rectifiers, voltage stabilizer, fm detector, PR30X, spkr, Q-mult, £20. 4m Vanguard tx, a.m./cw, controls on front, £5. 2m, 14-el Parabeam, £8. Class D wavemeter, £4. All buyers collect. G3ZMD, QTHR. Tel 0582 25115.

TS700 with expertly fitted commercial preamp, immac, £279. G2KF, QTHR. Tel Par 2337.

Boomless 3-band Jolliffe Quad, see *TT* March for remarks, size 12 by 12 by 8½ft, £20. Would prefer exchange with Minibeam, cash difference. Fay, 5 Harland Way, The Glebe, Washington, Tyne and Wear.

Garex 2m deluxe rx, a.m., fm, ssb, £35. Storno base tx, 6MHz Vackar vfo, £30. 6ch Vanguard h/b, all controls, manual, £10. G8KAT, QTHR. Tel Wantage 4943.

AR88D, unmod, exc cond with original manual and spare valves, bargain, £45. Prefer buyer collects but could deliver. Brown, G8FIK, 6 Melton Stantonbury, Milton Keynes, Bucks MX14 6BA.

100ft 300Ω balanced twin feeder, new, £1.50. 80Ω Morganite dummy load, 10 by 2in, £2. Kriegsmarine-NEX 4000Ω headphones, £3. Mohican GC-IU data circuits, £2. Pye PTC116/7X reporter, manual, £2. Tektronix 190A attenuator volts peak, £2. G3MBL, QTHR. Tel 01-445 4321.

FT401, £230. HRO500, £210 ono. Two TT4A miniprinters, £40 pair. VHF BC221, £35. HRO5T, £30. FT243 xtals, 8000-8106 (9), £2 set. 5675-8650, every 25kHz, £4 set (120). *Wanted:* TS520. G3OPF, 10 Milford Avenue, Stony Stratford, Milton Keynes, Bucks.

Racal SA550 8-digit 100MHz counter/timer, handbook, £75. Trio 9R59DE, spkr, handbook, £35. Emsac TX2-PS2 10W 5ch fm/a.m./cw, CN2 28–30MHz converter, £25. Marconi CT218 sig gen, 85kHz-30MHz, a.m./fm/cw, handbook, £20. Solartron stabilizer psu, 0–600V, 6·3-3A, £15. Advance sig gen 100kHz-30MHz, £10. RCA rtty-tu, matches ARR88, £10. Pye 2207, 2m 25W, boot unit, handbook, £8. Pye 2m base rx, £7. Jaybeam 6/6, new, £7. Hamgear PM1, £5. Turner base, mic, £5.19 set, £5. Cossor CC3s, 4m a.m. hand portables, nicads, £5 each. All ono. Buyers collect. G8GEZ, QTHR. Tel Brighton 558032.

FT150, immac, plus 160m built in cw monitor, transverter connections (10m), little used, 2 spare (new) pa valves, one professional engineer owner, £160. G3CYY, QTHR. Tel Tarvin 40787 evenings.

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Circuit diagram TV picture monitor type Epsylon Industries PM8 (625). P. H. Straw, 7 Deepfield Way, Coulsdon, Surrey CR3 2SY. Tel 01-660 0803.

GDO, at least 1·5MHz–150MHz, 4m beam. To buy or copy, info on 4ZU 3-el 3 band hf Minibeam and Tiger TR100 tx tuning table. G4DYN, QTHR.

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Instruction manual for Heathkit UXR-1, loan or buy. C. E. Fuller, 47 Cooper Road, Croydon CR0 4DL.

RSGB "Radio Communication Handbook", fourth edition. HRO bandspread coils for 80 and 40m. F. Redhead, 7 Brocklewood Avenue, Poulton-Le-Fylde, Lancs. Tel Poulton 883461.

Two Pye Bantams, h/b, fm, have lb/fm. Hudson FM208, h/b, 12V. GC3HKV, QTHR. Tel 0481 47278 6-7pm.

BC348 rx, diagram required to get it going. G8JKL, 4 Foxfield Road, Broughton in Furness, Cumbria LA20 6EZ. Tel 0657 6237.

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KW low pass filter. High impedance mic. GM4FDM. Wylie, 38 Rosedale Avenue, Paisley, Strathclyde PA2 0RR.

Operating manual for Radio City Products tube tester, model 314. T.P. Emblem-English, 36 Horsley Road, Chingford, London E4 7HX.

FL400 or FL500, willing to collect over reasonable distance. G4DIX, QTHR. Tel Sevenoaks 55757.

HF bands ssb tx/rx for disabled operator, Yaesu or Sommerkamp preferred, any type and cond considered. Details, price to GM3RVL, 5 Hillview Drive, Edinburgh EH12 8QW. Tel 031-334 7152.

R103 circuit or handbook. *Bulletins*, Sept, Oct 1959, loan or purchase. KW2000 dc power supply, neg earth. Rxs B40D, B41, late model. G3MBL, QTHR. Tel 01-445 4321.

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Manual for Mallard high speed valve tester, buy or copy. PSU for AT5 mains/mobile. G8HCF, 36 York Gardens, Braintree, Essex CM7 6NF.

Looking ahead

18 September—British Amateur Television Club Convention, University of Leeds.
25 September—Scottish VHF Convention, Dundee University.
26 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent.
16-17 October—JOTA 1976. JOTA Scout camp and radio teach-in at HMS *Mercury*.
28-30 October—ARRA Exhibition, Granby Halls, Leicester.
24 April 1977—NRSA Convention, Belle Vue, Manchester.

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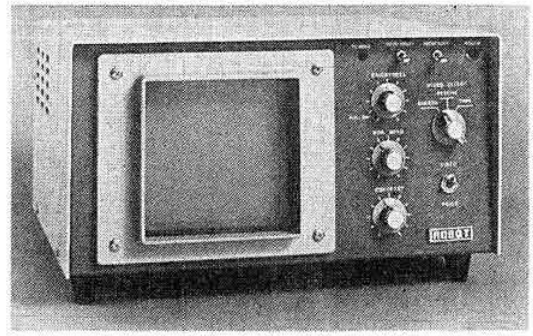

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SMALL MAINS SUPPRESSORS (small chokes, ideal for radio, HI-FI inputs, etc.) approx. ¾in. × 1¼in. 3 for **50p.**

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MIXED COMPONENT PACKS, containing resistors, capacitors, switches, pots, etc. All new, (Random sample bag revealed approx. 700 items) **£2.00** per pack, while stocks last.

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

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All 240V input voltage quoted approx. RMS.
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ALL BELOW—ADD 12½% VAT

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