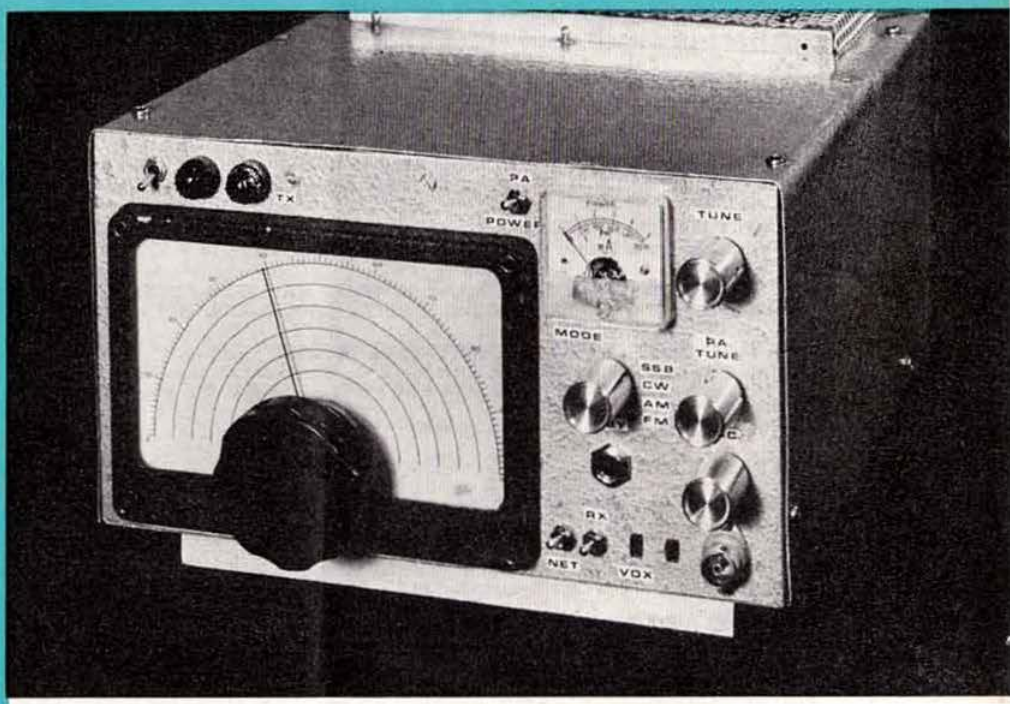
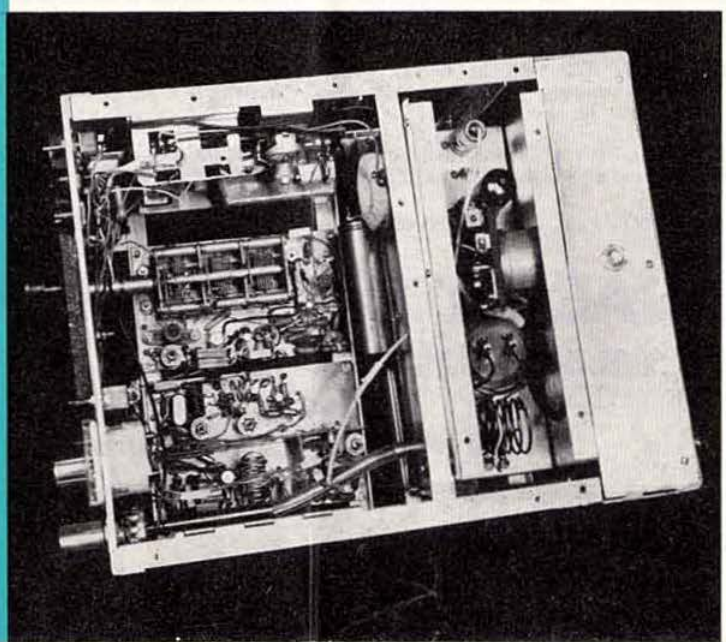
radio communication

September 1972

Journal of the Radio Society of Great Britain





A multi-mode transmitter for 4m

by C. S. Gare, G3WOS

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Volume 48 No 9 Price 30p

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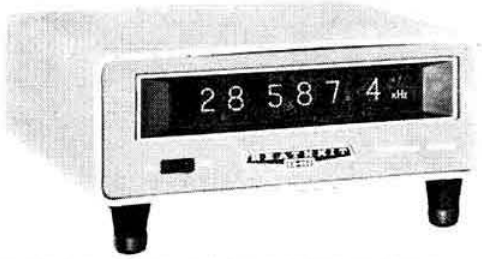
Advertising, other than Members' Ads, should be sent to the above address marked for the attention of Mr C. C. Lindsay. Tel 01-837 8688 or 01-686 5839.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

New digital readout



"Digitize" your Heath Maxi-Rig

NEW Heathkit Digital Frequency Display —

- **Resolution to within 100 Hz ± 1 count.**
- **Compatible with all Heathkit SB receivers and SB and HW multiband SSB transceivers.**
- **6 bright readout tubes display MHz, kHz and hundreds of Hz.**
- **Full 80 through 10 metre coverage.**

An exciting new piece of ham gear to bright-light your operating frequencies in digits, the SB-650 "reads" the three frequencies of a heterodyne circuit, then computes and displays the actual frequency to show you exactly where you are anywhere from 3 to 40 MHz, right down to tenths of a kHz. When used with a Heathkit SB or HW multiband transceiver, it displays both received and transmitted frequencies. Solid-state circuit uses 35 ICs (socket mounted), 6 transistors, 6 display tubes, and double sided glass epoxy board. Just 4 easy adjustments, no tuned circuits. Another "first" you can count on, from the hams at Heath.

Kit K/SB-650.

SB-650 SPECIFICATIONS—**Frequency Range:** 3-40 MHz (80-10 meters.) **Frequency Display:** 6 display tubes (kHz to 5 places, plus tenths of kliz.) **Maximum Viewing Distance:** 30 ft. **Maximum Input Signal:** 5V rms. **Accuracy:** 100 Hz ±1 count. **Cumpute Time:** 160 msec. **Sensitivity:** Adjustable. **Input Impedance:** 2000 ohms. **Internally Generated Spurious Frequencies:** Approx. 0.25 uV equivalent signal level. **Crystal (clock) Frequency:** 1 MHz. **Crystal Aging Rate:** Approx. 10 ppm year. **Ambient Crystal Stability:** Approx. 10 ppm from +10 to +65°C. **Ambient Operating Temperature:** 0° - +40°C. **Ambient Storage Temperature:** −55° to +80°C. **Power Source:** 120/240 VAC, 50/60 Hz, 10 W. **Dimensions:** 3½" H x 10" W x 10" D.

Heathkit SB-102 — the big one on 80-10 —

Big in popularity because it's big in performance and value, the SB-102 has what it takes to take you anywhere. Sensitivity better than 0.35 uV for 10 dB S+N/N ratio. Solid-state linear master oscillator with 1 kHz calibration, less than 100 Hz drift per hour after 10 minute warmup, and a dial resettable to 200 Hz with bandspread equal to 10 feet per MHz. Front panel selection of built-in 2.1 kHz SSB filter on optional 400 Hz filter, and upper or lower sideband. Built-in 100 kHz crystal calibrator. 180 watts PEP SSB input, 170 watts CW input; built-in sidetone for monitoring; triple action level control to reduce clipping and distortion; built-in VOX; five-position metering facilities. Easy circuit board and wiring harness construction.

Kit K/SB-102.

Kit K/HP-23A.

Kit K/HP-13A. DC supply

Heathkit SB-220 — the best value 2 KW —

The linear that gives you the most for your money, the SB-220 has two Eimac 3-500Z's, grounded grid, that offer up to 2000 W PEP SSB input or a full 1 kW on both CW and RTTY yet require only 100 watts of drive. Other features are: broad-band pre-tuned pi input, built-in solid-state 120/240 VAC power supply; circuit breaker; zener diode regulating operating bias; big quiet fan; ALC to prevent overdriving; metered grid current, high voltage, and relative power. Clean, compact, table-top cabinet design uses extensive shielding. At its price, there's no comparison.

Kit K/SB-220.

new digital instruments

see them all in your FREE Heathkit catalogue

See all the gear in the world's leading ham equipment line plus all the instruments you need to make your hobby complete. Over 350 kits are shown including the famous Heathkit stereo, marine, automotive, shortwave, music amps., intercoms, R/C, portables, and more. Send for your FREE copy today.

New Heathkit 8-Digit Calculator —

Adds, subtracts, multiplies, divides, chain or mixed functions, and constant. Floating or selectable 7 position decimal point. Has plus, minus, and overflow indicators. Overflow protection of most significant 8 digits. Clear-display key erases last entry without losing problem. "Standard" keyboard configuration. American made LSI circuitry. Bright ½" red digits. 120 or 240 VAC operated. Desk-top black & white cab, 3½"×6"×10½"d.

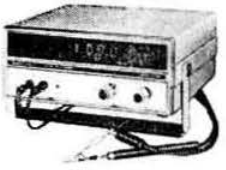
Kit K/IC-2008.

NEW Heathkit 8-Digit 120 MHz Counter—

Measures from 1 Hz to over 120 MHz with 8-digit readout plus overrange, gate and two range indicators. Pre-assembled TCXO time base. 1 megohm FET input. Automatic triggering level. Sensitivity 50 mV or less to 100 MHz, 125 mV to 120 MHz. Uses latest ECL (emitter coupled logic). Assembles in 15 hours. All ICs mounted on plug-in connectors. Plug-in fiber-glass circuit boards. 120/240 VAC.

Kit K/IB-1162.

NEW Heathkit Digital Multimeter—



3½ digit readout, quality digital components and easy calibration ,give lab-grade accuracy. Measures 100 uV to 1000 VDC in 5 ranges; 100 uV to 500 VAC, 5 ranges; 10 current ranges, 100 nanoamps. to 2 amps, AC & DC; 6 resistance ranges, 0.1 ohm to 20 megohms. 1000 megohm input on 2 V range, 10 megs on others. Overload protection. Automatic decimal. Overrange indicator. Calibrator included.

Kit K/IM-102.

Heathkit Portable Solid-state FET VOM

Solid-state circuit-FET input, 4 silicon transistor, 1 diode, 4 AC voltage ranges, 4 DC voltage ranges, 4 ohm ranges. 11 M Ohm input on DC, 1 M Ohm input on AC, 4½", 200μA meter. Battery powered. Rugged polypropylene case with self cover and handle includes storage space for test leads. Easy to build circuit board construction.

Kit K/IM-17u (less batteries)

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When you buy YAESU from their U.K. main distributor you get the best engineering standards in the world and superb performance too. All items carry the YAESU 12 months guarantee. We also dofree labour on warranty claims, and carry an excellent stock of spares. Remember, we were FIRST to offer YAESU on the UK market and FIRST to give you SECURICOR 24-hour delivery; a standard of service which cannot be surpassed.

SHE's A LITTLE BEAUTY! The FT-75 that is! A 10-80m. SSB TRANSCEIVER for ONLY £99 (carriage paid)

FT-75

FP-75

This latest addition to the ever expanding YAESU range is a real winner! Having tested it we can say the receiver side is very good and output power was not less than 15w. *R.M.S.* on any band. Operation could not be easier! You simply select the band, press the channel button and talk!

SPECIFICATION:

Receiver: Sensitivity: 0·5V for 10μdB. S/S + N.
Selectivity: 2·3kHz(—6dB.), 4·5kHz (—60dB.).
Audio o/p: 1·8w.

Transmitter: Modes: SSB or CW. Power: 20w. p.e.p.
Carrier suppression: better than —40dB at 1,000Hz.
Unwanted sideband: better than —40dB.
Response: ± 3dB, 400-2,700Hz.

General: VXO swing: 3·5MHz, 3kHz; 7MHz, 6kHz; 14MHz, 3kHz; 21MHz, 20kHz; 28MHz, 12kHz.
Size: 210w. × 80h. × 300d. m.m. Weight: 3·8 kg.

Current drain:	AC	DC
Standby	50w	1·4 amp.
Heaters on	50w	3·5 amp.
Transmit	80w	5·5 amp.

Microphone included and 4 crystals (3760, 7060, 21 300, 28 550kHz. Other crystals stocked.

You are welcome to test the FT-75 at Totton

AND HERE's THE NEW 2m. FT-2 AUTO SCANNING TRANSCEIVER

TUNE 144 to 146MHz in HALF-A-SECOND!

No laborious "Tuning High to Low" or "Low to High"! This highly advanced and superbly engineered YAESU masterpiece automatically scans eight channels in half a second! It will "lock-on" to any channel where a signal is present or can be set to always "lock-on" to a **PRIORITY CHANNEL** (your favourite frequency) whenever a signal appears.
Controls are: **AUTO-MANUAL** which selects the scanning facility, DX-LOCAL for attenuation of strong local signals: **UNLOCK** which re-starts the scanning sequence; **PRIORITY** which overrides other channels when on: **VOLUME, SQUELCH, AFC** and **HI-LOW** power (10w or 1w) output.

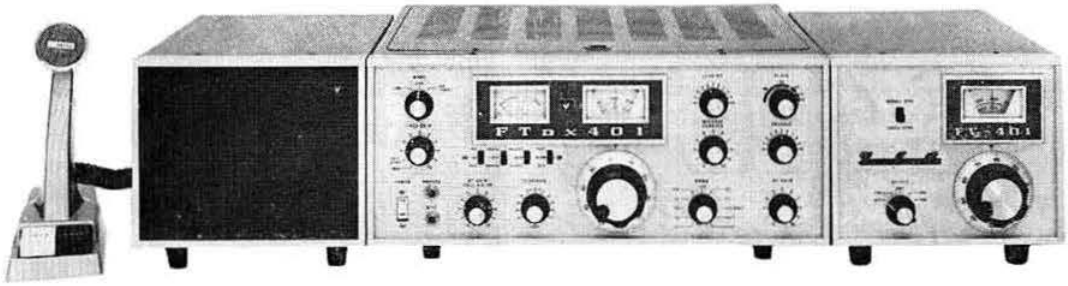
Weight: 4·2 kg. Size: 210W. × 95H × 270D (m.m.)

Mode: F3. Power requirements AC, 100, 110, 117, 200, 220. DC 12V

COST SAVING EXTRAS INCLUDED

- **BUILT IN AC AND DC PSU.**
- **BUILT IN SPEAKER.**
- **COMPLETE WITH MICROPHONE AND 5 CRYSTALS.**

PRICE: £146.00



THE FT401 offers a high power SSB/CW transceiver with many extra features a a minimum price.

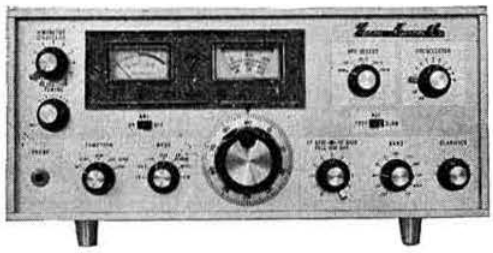
SPECIFICATION: Power i/p 560w. p.e.p. Built-in CW filter, noiseblanker and blower cooled pa. Complete coverage 80-10m. Plus WWV(10 MHz) to check the 25/100kHz calibrator plus 3 spare band positions. VOX is built-in (not an extra). Dial readout to 1kHz on all bands. Sensitivity 0·5μV for 20dB S/S + N. Selectivity: 2·3kHz (6dB). 3·7kHz (60dB). CW filter 600Hz. Clarifier 5kHz. Break-in CW with sidetone. Selectable USB/LSB.

ELECTRONICS (UK) LTD

BUYING A RECEIVER?

THEN DON'T FORGET TO DO YOUR HOMEWORK FIRST! CHECK OUR ARITHMETIC AGAINST THE FACILITIES YOU GET FOR YOUR MONEY ELSEWHERE. ADD-IN THE FINEST ENGINEERING STANDARDS IN THE WORLD AND A HOST OF OTHER "PLUSSES" AND YOU'LL HAVE TO AGREE THE ANSWER IS **THE FR400** FROM W.E.

FRDX400



160m.	√
80–10m.	√
Full coverage of 10m.	√
70–72MHz (4m.)	√
144–146MHz (2m.)	√
REJECTION TUNING	√
AM/CW/SSB	√
FM discriminator	√
1 KHz Readout	√
TRANSCEIVES (with FL400)	√
SUPERB PERFORMANCE	√
(ALL ADDS UP TO)	FR400SDX

+ 1 YR. GUARANTEE
+ AFTER-SALES-SERVICE
+ 24/48 HR. SECURICOR DELIVERY
= YAESU FROM W.E.

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HF TRANSCEIVERS	
FT-75. 50W p.e.p. 10–80m. 3 Ch. vxo	£99.00
FP-75. AC PSU and Speaker for above	£22.50
DC-75 DC PSU, SPEAKER and MOBILE MOUNT	£22.50
FT-200 240W. p.e.p. 10080m.	£134.00
FP-200 AC PSU and SPEAKER for FT-200	£38.00
DC-200 DC PSU for FT-200	£46.50
FT-101. 10–80m. AC & DC PSU built-in	£249.00
FT-101 as above + 160m.	£255.00
FT-401. 560W. p.e.p. 10–80m.	£230.00
VHF TRANSCEIVERS	
FT-2F 2m. 12 Channel, 10W. O/P	£84.00
FP-2AC AC PSU and SPEAKER	£25.50
FP-2 ACB. AC PSU/Spkr. and Ni.cad batteries	£36.00
FT-2 AUTO. 2m. 8 Ch. Scanning	£146.00
HF TRANSMITTERS	
FL 50. 50W. p.e.p. 10–80m. VXO control FL 50 fitted VOX.	£72.00
FL400. 240W. 10–80m. Transceiver with matching FR400 receiver	£146.00
HF RECEIVERS	
FR50. Double conversion 10–80m.	£59.00
FR50 fitted WWV and xtal. Calibrator	£63.00
FR400DX. 160m. 80–10m. (28-29MHz)	£120.00
FR400SDX. 160–2m. 4 Mech. Filters	£160.00
MATCHING SPEAKERS	
SP101, SP400, SP401	£10.00
REMOTE VFO's	
FV-101 for FT-101, FV-200 for FT-200	£38.00
FV-401 for FT-401.	£38.00
FV-50 for FT-75 and FL50	£27.50
FREQUENCY COUNTERS	
YC-305, 35MHz. AC or 12V DC	£85.00
YC-305D. 220MHz. Built-in pre-scaler	£111.00
LINEAR AMPLIFIERS	
FL-2100, 1200 W p.e.p. 10–80m. (Matches FT-101)	£148.00
FL-2000B. As above. Matches FL400	£148.00
FL-2500 2kW p.e.p. 160–10m.	£122.00

NEW/USED EQUIPMENT (3 month guarantee, carr. £1).

HEATH SB303 + CWF assbld. NEW	£238	KW ATLANTA, NEW	£210	Hammarlund HX-50	£90	HEATH HP13A DC psu	£25
HEATH SB301, v. good	£95	KW ATLANTA, mint	£160	Digital 500, Demo model	£225	HEATH HDP21 Mic.	£10
HEATH GR78, as new	£60	KW ATLANTA, v. good	£150	Trio 9R3905, mint	£47	Eddystone EB35, mint	£59
HEATH HW12, mint + DC psu	£60	KW Vespa 2, 6LQ6, Excellent	£95	Trio 9R59DS, New	£57.50	Codar AT5 + psu, excellent	£18
HEATH SB200, Excellent	£89	KW Victor, like 9 days old!	£49	Trio JR310, excellent	£59	Yaesu FT-401, 3 months old	£195
HEATH HM102, Power meter	£14	KW 2000 A's, excellent	£150	Eddystone 940, mint	£95	Yaesu FT-500, excellent	£149

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

Sim, John and Alan will be happy to demonstrate New Yaesu Gear by appointment. They also have a pretty good selection of second-hand trade-ins at the right price.

PRICES

When you realise that one now only gets 730 Yen (at the time of writing) for a pound note compared with 840 Yen a year ago, you'll no doubt accept the fact that prices of Japanese imports have to go up.

In the case of Yaesu Musen equipment we have to increase a few items. In the case of other imports, we will maintain old prices as long as stocks last—but please remember that any fresh stock costs us considerably more and this must be passed on to you. I will not insult your intelligence by urging you to buy now—I merely state the facts and leave it to you.

YAESU MUSEN EQUIPMENT

FT101 New model with improved performance and fitted 160m as standard **£255.**

FT200 This immensely popular low-priced rig remains the same fantastic value at **£134** with A.C. p.s.u. the same at **£38.** D.C. p.s.u. up to **£46.50.** HP terms from £14 deposit. Best value for money on the market.

FTdx401 This 560W p.e.p. fixed station with additional CW filter, fan and noise blanker fitted as standard goes up in price to **£230.** Even so, it is still the tops. Compare this rig with anything else on the market. This is Yaesu's top model developed from the FTdx400 of several years back, through the FTdx560 to the present FTdx401 with its high degree of development. HP £23 deposit.

FRdx400 The super de luxe version with all factory options installed including both 4m and 2m converters remains at **£160.** This Rx has everything at a price where others start to add the extras. HP from £16 deposit.

FLdx400 The companion 240W p.e.p. Tx increases slightly to **£146** which still ensures its place as top value. HP £15 deposit.

FL2000B Linears Increased to **£148.** HP £15 deposit.

Accessory speakers and VFO's for the above equipment remain unchanged in price.

FR50B Receiver Unfortunately the price must increase to **£59,** but it is still far and away fantastic value. An Amateur Band Rx covering 80 to 10m (28·0–29·2MHz) with excellent sensitivity, stability and freedom from spurii. The 2m fanatic may turn his nose up at the limited 10m coverage, the ardent CW man at the lack of CW selectivity, and the 160m enthusiast at the missing top band, but for the vast majority—this is an excellent Rx measured by any standards. HP deposit a mere £6.

FL50B Transmitter This uses the FR50B Rx VFO in transceive or xtal controlled separately, or the separate FV50B VFO. For the man with an FR50B Rx, it is a very cheap way of getting on the air with a nice 50W SSB signal. Price up to **£68**—but let's face it, not a bad price for a new SSB Tx with p.s.u. built in. HP deposit £7.

FT75 Transceiver Price up to **£99** A.C. p.s.u. **£22.50,** D.C. p.s.u. **£22.50.** For **£121.50** you have either a beautiful little mobile rig or a lightweight fixed station ideal for taking away on holiday. The mobile rig will fit the smallest of cars and gives incredibly good performance—even though xtal controlled, it's surprising how many people come back to a CQ. For mobile, crystal control has some very definite advantages. HP from £10. FV50C external VFO **£27.50.**

YC305D Counter This is a new product similar to the YC305, but it measures up to 250MHz. It's price of **£111** puts it a bit above the BC221, but for a direct reading frequency meter reading up to 250MHz to a cycle or two, the price is extremely low, and if you are interested in a sophisticated piece of professional test equipment at an Amateur price, you can't go wrong with the YC305D. HP deposit £12.

FT-2F 2m FM Transceiver For the time being, the price remains at **£84,** but I must emphasize that this is only because we have large stocks. When they're gone up goes the price! For 2m mobile (and fixed for that matter) these 2m FM mobiles are really FB. Once confined to the London Area, they are now country wide. HP deposit £9.

FT-2 Auto This is up to **£143** (HP deposit £15). This must surely be the most sophisticated package ever to come on the Amateur Market. This transceiver monitors up to 8 channels and whenever a signal comes up on one of the channels, it automatically locks on to it. Even if the signal is a bit off channel, the FT2-Auto a.f.c. will pull it in. There is also a Priority Channel and even if you are in QSO on another channel the FT-2 Auto keeps flicking over to the Priority Channel, monitoring it. If a signal comes up, it takes precedence, but there is of course a manual over-ride on all the automatic functions. This is a truly remarkable piece of electronics.

Other items of Yaesu gear, speakers, external VFO's and microphones remain unchanged in price.

OTHER EQUIPMENT

Inoue IC21 This is a very sophisticated 2m transceiver. Mains or 12 v.d.c., built-in SWR meter, built-in crystal check, built-in PA protection, R.I.T., etc., etc. There is a beautifully made, exceptionally stable VFO to match this rig. HP deposit from £12. IC21 **£120,** matching VFO **£30.**

Inoue IC20 Similar in performance to the FT-2F price **£94.** HP deposit £10. It's no wonder this FM gear is becoming popular —it is beautifully made, it gives top performance, it is trouble free, it is highly sophisticated and professional. AM can be added to any of the Rx's for an extra £10. After all, by the time you have bought a decent Tx, a top quality converter and tunable I.F. to go with it, the necessary p.s.u.'s, coax relay, and all the other bits and pieces, you could very well wind up with a pretty tatty station at just about the same price.

AERIALS

Fixed Vertical	Echo 8G 40-10 trap vertical **£18.50**	
	Diamond KB103 80 and 40 trap vertical **£26**	
	Diamond KB104 20, 15 and 10m trap vertical **£17.50**	
	Diamond KB105 80, 40, 20, 15, and 10m trap vertical **£34.50**	
Multi-Element Beams	Asahi full size 3 element 20m beam **£60**	Asahi full size 4 element 10m beam **£33**
	Asahi full size 3 element 15m beam **£32**	Asahi full size 3 element 10m beam **£18**
	Asahi full size 4 element 15m beam **£40**	
	Carriage paid on fixed antennas.	
Mobile Antennas	Diamond DP-100S complete 80–10m **£35** carriage paid	
	This includes bumper mount. "Cor! what a price", you say. Yes, but cor! what a beautiful mobile antenna.	
	Tavasu base loaded 160 to 10m complete set **£13.75** postage extra 30p	

G-Whips Tribander (20, 15, and 10m) **£9.45**
Duobander (160 and 80m) **£9.00**
Multimobile 71 (20, 15, and 10m) **£12.50**
160, 80 and 40m loading coils for Tribander and Multimobile **£4** each Top whip section for loading coils **70p.**
Base section for all G-Whips **£1.45**
Carriage The whips are too long to go by mail, so we send them British Rail costing 50p. We can, if you wish send them Securicor for £1.75.

2m Whips The G-Whips ⅝ vertical **£4.30** post paid
Diamond DP-SH144 ⅝ vertical with gutter mount **£9.50** carriage paid
Diamond NGR 144 ¼ vertical with suction attachment for roof mounting **£8.50**

Coaxial Cable
UR43 52 ohms, 5.1mm dia, 4.33 db attenuation per 100' at 100MHz **8p**/yard.
UR70 72 ohms, 5.8mm dia, 4.65 db attenuation per 100' at 100MHz **10p**/yard.
UR67 (equivalent to RG8/U) 50 ohms, 10.2mm dia 2.2 db attenuation per 100' at 100MHz **22p**/yard.

Balanced Twin Feeders
Type 302. 75 ohm 2.9 db attenuation per 100' at 50MHz **5p**/yard.
Type 306/B. 300 ohms 1.0 db attenuation per 100' at 50MHz **5p**/yard. Carriage extra on cable.

Wattmeter
Kuranishi switched 0–12; 1–120 watts. This wattmeter/dummy load presents a constant 50 ohm impedance with better than 1 : 1.2 SWR over the frequency range of 3 to 500MHz. Here is a piece of professional test gear at an Amateur price **£32.**

Rotators
AR22R for 2m beams or similar **£25.**
TR44 for bigger arrays **£45** and the Ham-M for full size, heavy beams **£70.**

Rotator Cable
For AR22R **15p**/yard, for TR44 and Ham-M **30p**/yard. This is heavy duty cable, well on top of the minimum requirement.

Headphones
Low impedance padded types, very comfortable. These are stereo and fitted with a moulded stereo plug. Easily converted to mono, instructions enclosed. **£2.75** post paid.

Morse Keys
Standard, plain brass with ball bearing pivots **£1** post paid.
Electronic Keyers, Katsumi EK9X **£8.50** post paid.

CW Monitors
A nice little monitor with built-in speaker and tone control. Requires 1½v per light battery. **£2.20** post paid.

Microphones
50K dynamic PTT. Teisco DM501 **£3.50** Yaesu YD846 **£5** YD844 Table Model **£12** Post Paid.

SWR Meters
The very popular Hanson SWR3 at **£4.70** post paid or the top quality Asahi twin meter at **£7.20** post paid.

VALVES

6AH6 **80p**	6BZ6 **40p**	6CB6A **42p**	6U8A **80p**
6CL6 **50p**	6AN8 **74p**	6EW6 **75p**	6EH7 **45p**
6BM8 **50p**	6AW8A **£1.15**	7360 **£2.10**	12BY7A **70p**
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This is an absolute MUST. A trade fair at which just about everyone in the Amateur Trade will be exhibiting—come and see the latest and best in glossy, expensive, new stuff, the best in the lower price field, great dollops of second-hand, sundries, components, surplus, etc., etc., to say nothing of specialist exhibitions. I confidently predict that this show will handsomely outshine the London Show of recent years.

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RADIO SOCIETY OF GREAT BRITAIN

35 DOUGHTY STREET, LONDON WC1N 2AE

FOUNDED 1913 — MEMBER SOCIETY

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PATRON: HRH THE PRINCE PHILIP, DUKE OF EDINBURGH, KG

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Current Comment

Value Added Tax

As many members will know, a new tax—VAT—is due to start on 1 April 1973. Not only will the tax hit our hobby by making the price of components higher, and equipment more expensive, but it might even cost the Society approximately £4,000 a year. As the current subscription was never intended to cover this sort of additional outgoing, prompt action may be necessary to offset it.

There are a number of possible ways in which this might be done, including an increase of subscriptions or the inclusion of VAT in the subscription. Another way could be to change the benefits of membership, with adjustment of membership fee, so that *Radio Communication* was available by subscription to anyone, and not distributed exclusively to members as a benefit of membership. Incidentally, no problems should arise with regard to the publication of books as this will escape the tax.

When the Government proposals eventually become law, which they are not at the time of writing, more concrete suggestions will be put forward, but members' views would always be appreciated.

J. O. Brown, G3DVV,
Honorary Treasurer

Affiliated Societies and Clubs

In view of the steep and continuous escalation of costs and consequent adverse effect on finances, the Council of RSGB has been forced to examine the financial viability of certain Society structures, including that of Affiliated Societies. In the case of this sector it has been noted that no change has been made in subscription rates for many years, and in consequence they are no longer in any way realistic. In addition, Council took into account the following considerations.

Affiliated Societies enjoy a privilege which is unique to their organization inasmuch as they are allowed to purchase Society publications at reduced rates for resale to their members at full price, and they therefore have a source of income which should adequately cover their affiliation fee.

Many fully licensed amateurs are members of Affiliated Societies but are not themselves members of the RSGB. They thus enjoy the protection of their interests on both national and international levels, and it does not seem unreasonable that some allowance should be made for this fact.

Two further amenities enjoyed by Affiliated Societies are free use of the QSL Bureau for handling their club station cards, and the Affiliated Societies Contest which has proved very popular in the past.

Taking the above facts into consideration, Council has decided that the scale of affiliation fees should be £2 per annum if *Radio Communication* is not required and £4 per annum including *Radio Communication*. This decision has been arrived at with great regret, but the Society must run as a viable financial organization, a fact it is hoped that all Affiliated Societies and Clubs will understand and appreciate. The new scale will take effect from 1 September 1972.

C. H. Parsons, GW8NP

QTC AMATEUR RADIO NEWS

Accounts for year to 30 June 1972

Members will be interested to learn that the provisional results, which are still subject to audit, for the Society's financial year to 30 June 1972 show a surplus of approximately £4,000.

Intruder watch

Action by the MPT on intruder reports submitted by the RSGB's IW organizer, Colin Thomas, G3PSM, resulted in 10 requests to other administrations to remove stations from amateur bands. These requests referred to two stations on 14MHz and eight on 21MHz. It is noted that Radio Moscow and Radio Italiana were the offenders in five out of the 10 cases. To the credit of ORTF, Paris, interference on 21,368kHz was rapidly cleared.

Reinforcements for the intruder watch are always welcome and if you feel able to assist please write to G3PSM, c/o RSGB headquarters.

Interference Committee

The RSGB Interference Committee has been invited to send a representative to attend meetings of the Interference Sub-Committee of BREMA—The British Radio Equipment Manufacturers' Association.

The committee has nominated Mr J. H. Hill, BSc, CEng, MIERE, FITE, G3JIP, for this position, and welcomes this opportunity to have the Society's views on interference matters more widely known to equipment manufacturers.

Postal rates and the QSL Bureau

In February this year new postal rates came into force but a large number of packets still arrive at the QSL Bureau weighing as much as 2½oz and bearing only 2½p or 3p stamps.

The current postal rates for letters are:

Not over	1st Class	2nd Class
2oz	3p	2½p
4oz	4p	3½p
6oz	6p	5½p
8oz	8p	6½p
10oz	10p	7½p
12oz	13p	8½p
14oz	15p	9½p
1lb	17p	11½p

West Middlesex ARC

The affairs of the Greenford ARS have been wound up and the society re-formed under its new name of West Middlesex ARC. It is hoped that under its new name the club will attract members from a wider area of West Middlesex, for which it will cater.

The club's meeting place will be: The Community Centre, Oldfield Lane, Western Avenue, Greenford, Middlesex.

ITU

The government of the United Arab Emirates has acceded to the International Telecommunication Convention of Montreux, 1965, and thus becomes the 143rd member of the ITU.

The administration of Ceylon has announced that henceforth the name of its country is the Republic of Sri Lanka (Ceylon).

The financial statements of the ITU make interesting reading. The high cost of international conferences has deprived the ITU of a great deal of its current reserves but if the debtors of the ITU settled their accounts then no doubt the position would be greatly improved. A cursory examination of the statement shows a great deal of money owed by some countries of Central and South America.

At a recent meeting of the ITU administrative council the contributions for 1973 were fixed. That for the UK is fixed on the 30 share class and amounts to an equivalent of £203,000. Each member of the ITU contributes according to its share class ranging between ½ and 30 giving a total of 480 units among all members. Other countries in the 30 share class are France, USA and the USSR. It would seem, therefore, that the four administrations in the 30 share class together contribute 25 per cent of the costs of the ITU while the remaining 139 members contribute the balance of 75 per cent.

Licence figures

The Ministry of Posts and Telecommunications advises that the following numbers of amateur licences were in force at 30 June 1972:

Class A	14,250	Class B/M	693
Class B	3,342	Television	225
Class A/M	2,774		

Can you help?

Cadets in the 2380 ATC Dartmouth Squadron wish to form a radio section but because of limited finances would be grateful for donations of any surplus books, components and equipment. All postage would be refunded and all letters answered.

Offers should be addressed to: Mr G. H. Barker, Training Officer, 2380 ATC Dartmouth Squadron, "Cemetery Lodge" Townstal Road, Dartmouth, South Devon.

Stolen property

Stolen from the Handy Shop, 109A Church Street, Croydon, on 22 July 1972: a professional model Midland Radio transceiver. This is an a.m. receiver with 27MHz walkie-talkie combined, in a black and chrome case 6in × 1½in × 2¼in with a 4ft telescopic aerial.

2nd G3XBF Constructors Award

The Barking Radio and Electronics Society is again holding a construction contest this year. Entry is open to all and covers all forms of radio and electronics in two sections: (*a*) for self-designed and self-constructed equipment; (*b*) for self-constructed equipment. All equipment should be functional; 240V 13A outlets will be available.

Closing date for entries is 25 October, and there is an entry fee of 20p per entry. Entry forms and further details obtainable from Alan P. Foss, G8EAY, 73 Coolgardie Avenue, Chigwell, Essex. Tel: 01-500 6034.

Scottish VHF Convention and Region 14 ORM

Shawlands Hotel, Glasgow

Sunday 1 October 1972

1200	Exhibition opens.
1400	Convention opened with welcoming speech by the chairman, Mr T. P. Hughes, GM3EDZ.
1415	Region 14 ORM commences; to be followed by talks by guest speakers Geoff Stone, G3FZL, and Harry Mackie, GM3FYB.
1900	Visitors to the convention assemble before dinner at 1930.
Tickets	Convention only . . . 25p Convention and dinner . . £1.75

Reservations Remittances in favour of "West of Scotland Amateur Radio Society", together with an sae, should be sent to: Arthur O'Lone, GM3EXX, 8 Kirklee Terrace, Glasgow G12 0TH. Telephone 041-334 2526. Accommodation can be arranged if required.

Talk-in Provided by Glasgow Raynet members on 70·26 MHz, 145·8MHz and 3·5MHz.

(Organized by the West of Scotland Amateur Radio Society)

Judging will take place on 9 November at the BRES HQ, Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex. There will be an overall winner and an award for each section—each will consist of a certificate and a cash prize.

NRSA Convention, 1972

In the report on the convention which appeared in the July issue, the winner of the Junior Home Construction Trophy was wrongly quoted as G3ZZJ. The winner was in fact Malcolm Monro, G8DLL, to whom we offer both our congratulations and our apologies.

S. Potter, chairman, NRSA.

INTERFERENCE PROBLEMS

Members accused of causing interference or who suffer interference from external sources are invited to seek the assistance of the Interference Committee in solving their problems.

Enquiries should be addressed to: The Chairman, Interference Committee, RSGB, 35 Doughty Street, London WC1N 2AE.

Thoughts on a multi-mode transmitter for 4m

by C. S. GARE, G3WOS*

WHEN the author first decided to attempt to transmit single sideband on 4m he started out in the conventional manner by transverting the attenuated output of a hf transmitter up to 70MHz [1]. But it was soon discovered that this method had serious disadvantages, for instance the need for four large boxes—hf tx and power supply, and transverter and power supply, plus all the necessary control and signal cables on the operating table. This did not leave much room for 2m ssb, or even the logbook!

The author's main interest is in portable operation, and such a clumsy system is out of the question when outdoor working is considered. The other factor to be taken into account is that with portable operation power is at a premium, and it seems wasteful to dissipate 200W from the hf transmitter in a dummy load.

Bearing in mind all these facts, the author realised that something a little better and simpler was needed, and so the transmitter which forms the basis of this article was born. It was decided that the main requirements were as follows. It must be (*a*) totally self-contained, (*b*) operated from 12V, and (*c*) vfo controlled. It must have (*a*) one-switch control for ssb, a.m., cw and fm, (*b*) a valve pa so as to be immune from rough handling, (*c*) an a.m. modulator, rather than use A3H, (*d*) a minimum number of front panel controls consistent with versatility, and (*f*) a power output meter for pa tuning.

* 17 School Close, Braunston, Rugby, Warwickshire.

The following is a description of such a transmitter, conceived by the author some 18 months ago, and in use for the last nine months. It is not intended as a detailed constructional guide, although complete circuits are given. It is rather intended to provide food for thought, and perhaps stimulate more people to attempt the construction of vhf ssb transmitters.

General circuit description

A block diagram is shown in Fig 1. The whole of the circuitry is transistorized up to the driver stage. The audio from the microphone amplifier is fed to a double diode balanced modulator which produces double sideband centred around 1·4MHz. The carrier oscillator driving it is matched, in frequency, to the crystal filter. Before the double sideband enters the filter it passes through a mosfet buffer stage which matches the modulator to the low input impedance of the filter. As the signal is attentuated when it passes through the filter, the output is amplified in a single transistor amplifier. The 1·4MHz ssb is now mixed, in a balanced mixer, with a vfo covering 4·9 to 5·9MHz, producing an intermediate frequency range of 6·3 to 7·3MHz. The tuned circuit in the mixer is ganged and tracked with the vfo so as to reduce any spurious mixer products. A second mixer then converts this to 70MHz by mixing the i.f. with the output of a frequency multiplier whose last stage is tuned to 63·7MHz. The signal then passes through an amplifier with a high Q tuned circuit in its collector. The driver consists of a QQV03-10 operating in Class A for all modes, this feeds the pa

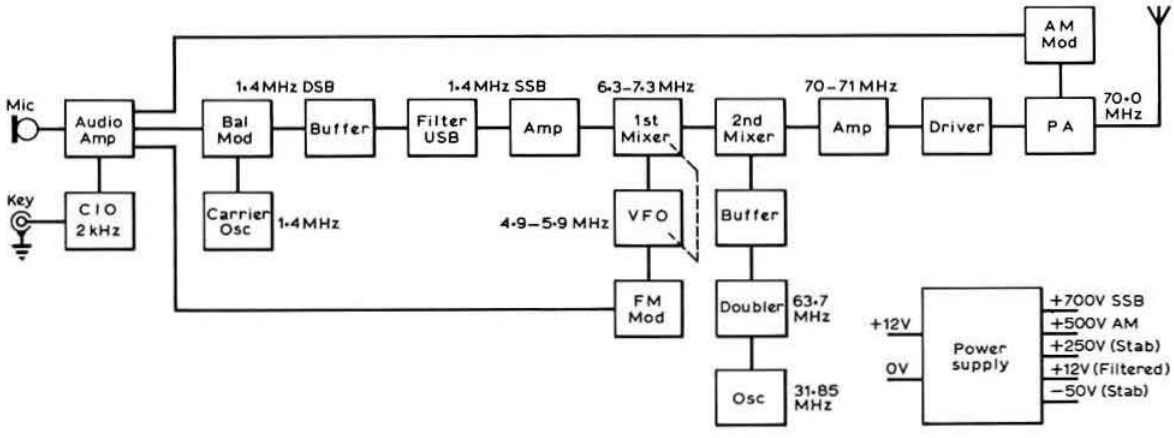

Fig 1. Block diagram of transmitter

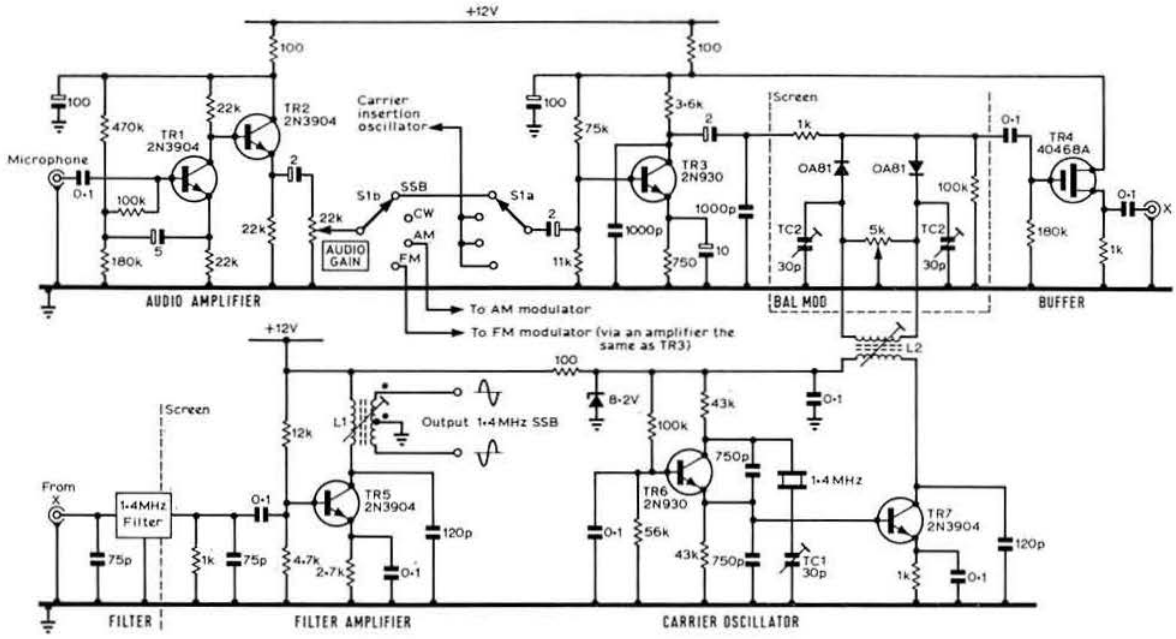

Fig 2. SSB generator circuit

whose class depends in which mode the transmitter is running. When the tx is in the a.m., cw and fm modes an audio oscillator is connected to the microphone amplifier thus inserting carrier. The power supply is basically an inverter driven from a 12-volt source, this supplies all the necessary voltages needed by the tx. There are four main modes of operation controlled by a front panel switch and a number of relays: each will be described in turn.

SSB mode

In this mode the tx operates as a conventional ssb transmitter in all respects, ie no carrier is inserted and the pa operates in Class AB1 with stabilized screen and grid supplies. The pa anode is connected to 700V. The audio from the microphone is disconnected from the fm and a.m. modulators and switched through to the balanced modulator. The a.m. modulator ht is turned off and the modulation transformer shorted out. When the transmit switch is open the driver is deprived of ht and the pa screen grid is open circuited. Also power is taken off all the mixer stages, the oscillator being left running. This does leave a slight carrier that can be detected on the station receiver due to static mixing, but it is at such a low level that it can be ignored.

CW mode

The tx behaves as above, except that all the audio circuits are shorted out and the carrier insertion oscillator is connected to the balanced modulator. The pa is left in Class AB1 as this obviates the necessity for a clamp valve and all the associated circuitry. The output of the cio is normally shorted out by a small relay but when the morse key is pressed it is unshorted and allows a carrier to be generated.

A.M. mode

When in the a.m. mode the tx pa is changed over to operate in Class C. This is realized by the use of a number of relays. The first relay drops the pa anode voltage down to 500V and changes the screen grid over from a stabilized 250V to a supply derived from the anode voltage so as to obtain anode and screen modulation. The second relay removes the short circuit across the modulation transformer and changes the grid over from the negative bias supply connecting it to earth via a resistor. The audio is routed through to the a.m. modulator whose ht has been applied by yet another relay.

FM mode

The tx behaves as in the ssb mode except that the audio is switched through to the fm modulator on the vfo. The audio gain for all modes is governed by a common gain control before the microphone amplifier.

SSB generator circuit (Fig 2)

The heart of any ssb transmitter is the ssb generator. It was originally decided that a phasing type exciter would be built to avoid the expense of having to buy a crystal filter. But after construction it was found to be very complex and needed realigning quite often to maintain peak performance. It was also very daunting, when setting up, to be faced with five controls for adjustment! A crystal filter was eventually bought and this was used in the final design, as this seemed to be the only reliable method of generation. The one used was a Cathodeon type BP4128/USB [2] with a carrier frequency of 1·4MHz. The circuit of the exciter is shown in Fig 2. TR1 and TR2 form a high impedance input stage to match the impedance of the microphone to the microphone

C •

amplifier TR3. Between these two stages is connected the audio gain control. The 1000pF capacitor joining the collector of TR3 to earth gives the amplifier an upper 3dB frequency limit of approximately 10kHz to stop any rf being amplified. The amplifier is connected via a 2μF capacitor, to maintain a good low frequency response, to the twin diode balanced modulator where the audio is chopped by the carrier oscillator TR6. The mosfet buffer stage, TR4, is to stop the modulator being loaded by the low input impedance

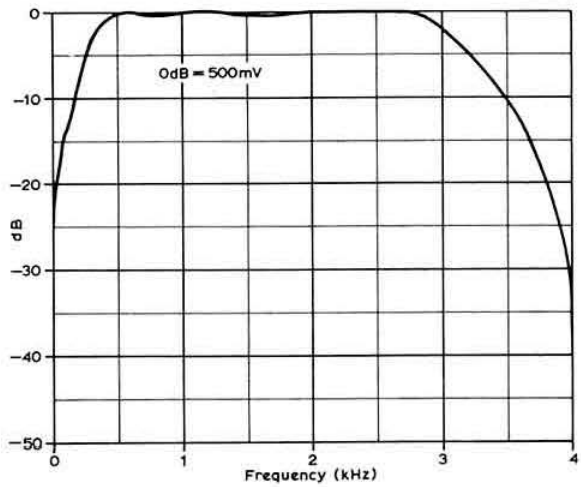

Fig 3. Output response of ssb generator

of the filter. For maximum performance and least in-band ripple it has to be fed from, and into, an impedance of 1kΩ and capacitance of 75pF. This is obtained on the input by the use of a 1kΩ resistor in the source of TR4. The filter amplifier has two functions, firstly to restore the level of the signal after being attentuated by 6dB in the crystal filter and secondly to act as a tuned phase splitter to drive the first mixer. The carrier oscillator frequency can be adjusted by TC1 for the best overall audio quality. The unit gives 500mV of ssb, before overload, with a 3dB bandwidth of 300Hz to 3·1kHz, the maximum in-band ripple being less than 0·2dB. To ensure good carrier and sideband suppression the balanced modulator is totally screened from the filter and carrier oscillator.

Mixer circuits (Fig 4)

On the mixer board the 1·4MHz ssb is converted to 70MHz, vfo controlled, ssb in two mixers. The vfo covers 4·9 to 5·9MHz and is mixed with the output of the ssb generator to produce an i.f. frequency range of 6·3 to 7·3MHz. The mixers used are balanced, ie they balance out the injection frequency, this is achieved by feeding the output of the vfo, in phase, to the emitters of TR8 and TR9. The mixer is balanced by altering with respect to each other the base bias of each transistor, with RV1. With this mixer 30dB attenuation of the injection frequency is easily obtainable. The anti-phase signals from the ssb exciter are fed into the bases of TR8 and TR9. The mixer is tuned by a variable capacitor ganged with the vfo, this enables a high Q coil to be used increasing the rejection of unwanted mixer products. The anti-phase output of the first mixer is fed straight into the

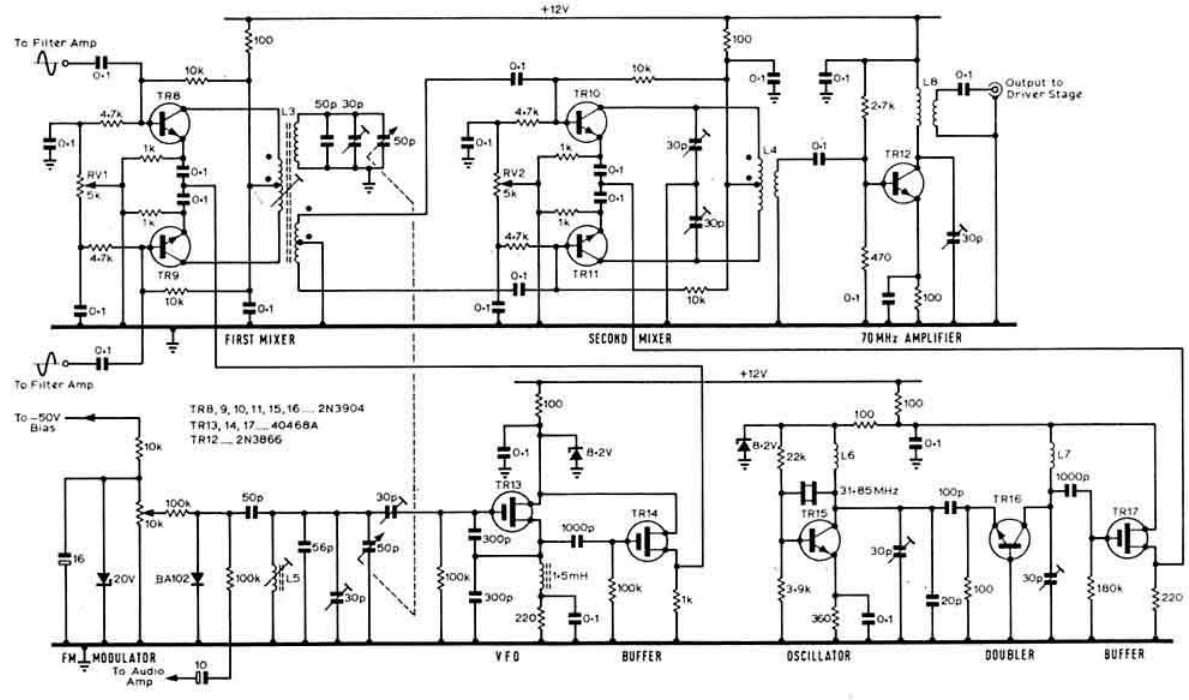

Fig 4. Mixer and oscillator circuitry

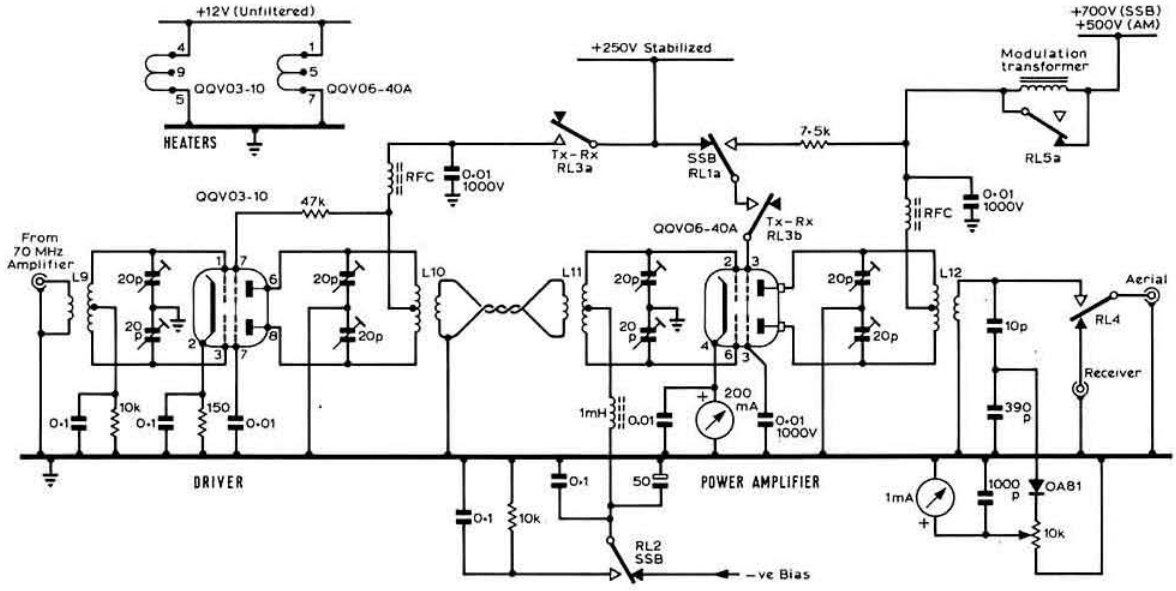

Fig 5. Driver and output stage

bases of the transistors in the second mixer, where the i.f. is mixed with the output of TR16. TR15 forms a third overtone crystal oscillator tuned to 31·85MHz, feeding a single transistor doubler stage, TR16. The second mixer is tuned by the use of a split-stator capacitor connected across the collectors of TR10 and TR11. The 4m ssb from the second mixer is put straight into a tuned amplifier, TR12, which drives the QQV03-10. Effective decoupling and screening is a must in these circuits; if it is insufficient, instability will result. The supply lines of the two oscillators are stabilized with a zener diode to ensure stability when the battery voltage drops.

The frequency modulation used in the transmitter is obtained by the use of an epicap diode connected across

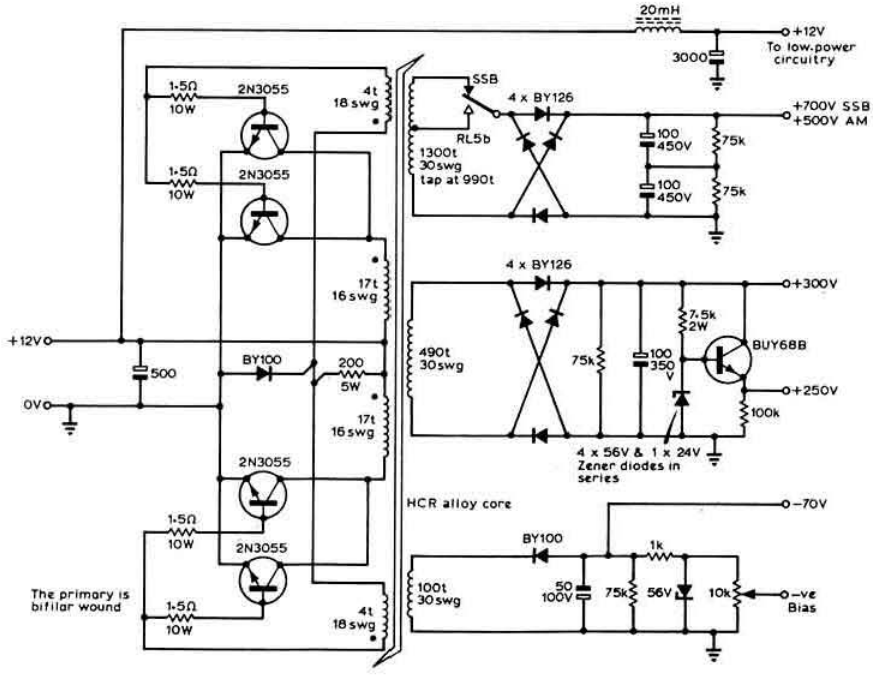

Fig 6. Power supply

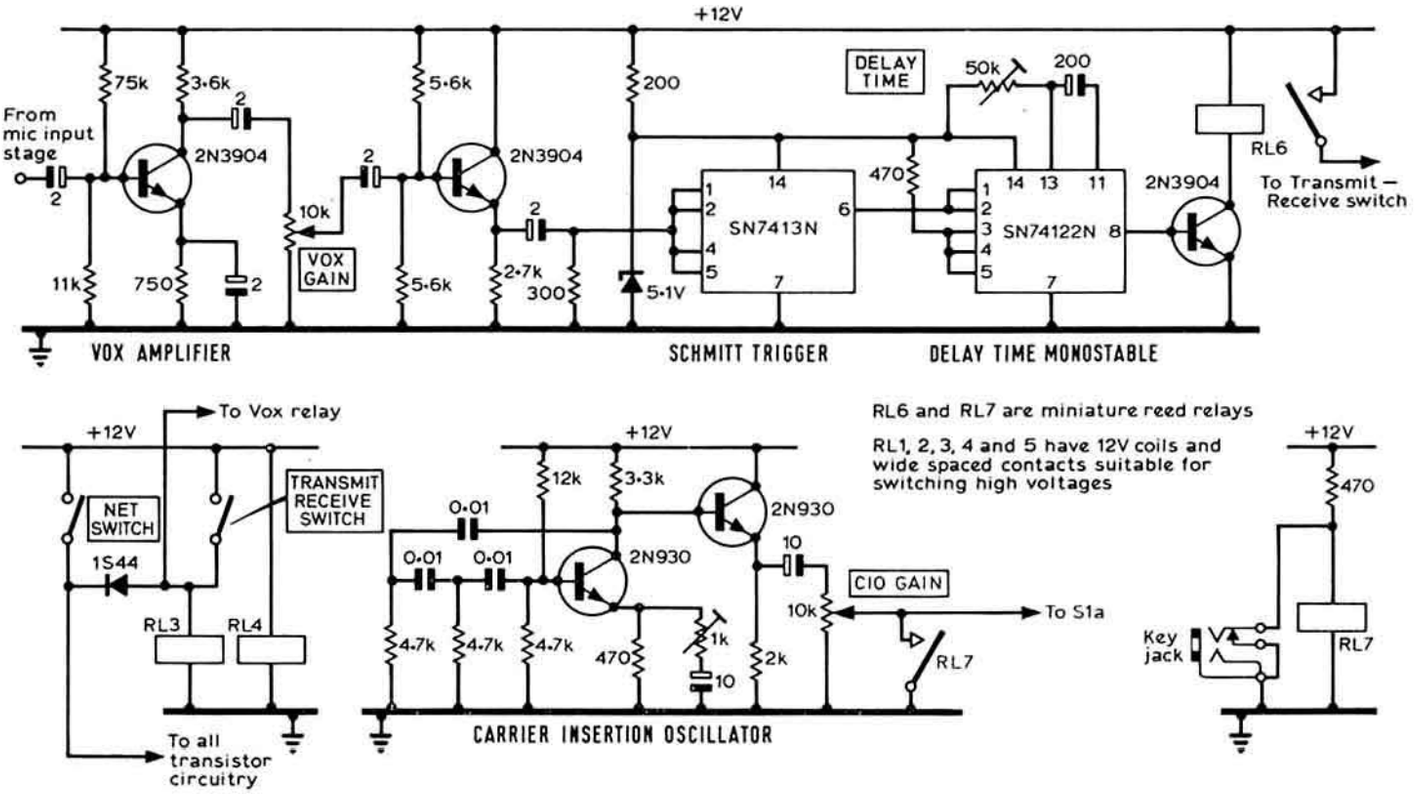

Fig 7. Miscellaneous circuitry

the tuned circuit of the vfo. When the diode is reverse biased it exhibits a capacitance whose value is dependent on the level of bias. (Any diode has this characteristic but usually, unless they have been specifically designed for this application, they have such a low Q that they can stop the vfo oscillating). This capacitance does not change linearly with bias voltage but usually a reasonably linear region can be found. This is best done by actually plotting a graph of bias voltage against capacitance using a capacitance bridge. When a suitable bias voltage has been found it is set by the use of the 10kΩ potentiometer connected to the diode. The correct deviation is best obtained by "on-the-air" tests.

Driver and power amplifier circuits (Fig 5)

The driver operates in Class A for all transmitter modes, the class of the pa being controlled by two relays, RL1 and RL2. RL1a switches the pa screen grid between a stabilized 250V for ssb and a resistor to the ht supply for a.m., so as to obtain anode and screen modulation. RL2 applies a negative bias to the control grid for ssb and shorts it to earth via a resistor for a.m. RL3a and RL3b are controlled by the transmit/receive switch so that during receive the driver is switched off and the screen supply is removed from the pa. This ensures a low standby current. The power output is monitored by a 1mA meter driven by a capacitative voltage divider connected across the aerial output socket. Before the aerial there are five circuits tuned to 70MHz to ensure reasonable attentuation of any unwanted signals. As all the valve circuits are tuned to the same frequency good screening is necessary between the grid and anode coils if unwanted feedback is to be avoided.

Power supply (Fig 6)

The power supply consists of an inverter operating from a 12V battery source. The circuit is quite conventional and is designed around an HCR square loop toroidal core No 8B which is capable of delivering up to 200W of output power without overheating [3]. The inverter operates at a frequency of approximately 2kHz. The paralleled 2N3055s are necessary because of the high primary currents involved. On receive, the transmitter takes 3A and when transmitting takes 15A on voice peaks. To prevent current hogging by one of the transistors, 1·5Ω resistors are put in all the bases. All the primary windings and interconnections should be in very heavy gauge wire so as to reduce copper losses. The minimum gauge recommended is 16swg. The transistors must be mounted on a large heatsink capable of dissipating about 15W with a case temperature rise of 40°C. Because of the high voltages involved good insulation must be used on the transformer such as Scotch polyester tape, if flash-overs are to be avoided. The 250V and –50V outputs are stabilized by the use of zener diodes and a transistor. With the transistor suggested, a maximum V_{ce} of 100V is recommended

if it is going to work well away from its second breakdown area. This means that the input voltage to the regulator must never exceed 350V. The 20mH choke is wound on a small, high permeability, ferrite ring and acts as a filter to remove the 2kHz ripple impressed onto the 12V line by the inverter. This smoothed supply is connected to all the low power transistor circuitry.

Construction notes

All the low power transistor circuitry was built on three separate boards, double-sided copper clad, with Lektrokit pins. The first board carries the ssb exciter, the second the vfo and first mixer, and the third holds the final mixer, output amplifier and the multiplier chain. The driver and pa were built onto an 8 by 2in square aluminium chassis and were totally screened from the other circuitry. The power supply was again built in a separate compartment, the heatsink forming the rear panel of the transmitter. All the preset controls such as the pa bias and carrier insertion level were mounted on this panel. The case of the transmitter was built up of 0·5in by 0·5in aluminium angling with a front panel made of 0·125in aluminium sheet. This framework was then covered in 20 gauge aluminium sheet held by self-tapping screws.

Conclusions

The design philosophy for the transmitter has evolved over the last 18 months, and although it has been in use for about nine of these there are many modifications still to make. Up to date the only part not completed is the a.m. modulator.

It should be realized that 80 per cent of the time spent in the construction of a project of this size can be expected to be spent in trouble shooting. For example, it took the author about three months and three rebuilds before the valve stages could be put into the same case as the transistor exciter, due to insufficient screening of the pa. Although a lot more work has to be put into the transmitter, it is hoped, in time, an ultimate design will evolve.

References

[1] The transverter was based on an article by G3KQR in the May 1967 issue of *Radio Communication*.

[2] The filter is obtainable from Cathodeon Crystals Ltd, Linton, Cambridge for a "one-off" price of £10.80.

[3] The inverter was designed from an article published in February 1967 issue of *Control*. The article and the hcr core can be obtained from Telcon Metals Ltd, Manor Royal, Crawley, Sussex.

Coil winding data

L1	40t 30g on ¼in slug tuned former
L2	primary 40t 30g on ¼in slug tuned former secondary 10t 30g
L3	primary 10t + 10t bifilar wound on ¼in slug tuned former tuning 20t 30g secondary 2t + 2t 30g
L4	primary 8t + 8t 18g ⅜in dia secondary 4t
L5	24t 24g on ⅜in slug tuned former
L6	10t 18g ⅜in dia
L7	6t 18g ⅜in dia
L8	5t 18g ⅜in dia
L9, L11	primary 2t 20g ⅜in dia secondary 8t + 8t 18g ⅜in dia
L10	primary 8t + 8t 18g ⅜in dia 4t secondary
L12	primary 8t + 8t 18g 1in dia secondary 1t adjustable coupling

A natural event

By R. A. HAM, FRAS, BRS15744

ON 1 August 1972 thunder static was causing many unwanted spikes to be drawn on the pen recording chart during the midday solar observation made by the author at 95 and 136MHz. At 1246bst both radiotelescopes recorded an 8min burst from the sun which was strong enough to blot out the prevailing static. This burst served as a solar warning that big events were to follow.

By first post on 2 August a postcard dated 1 August arrived from Robert Mackenzie, a BAA observer in Dover, which read:

Tremendous-sized spot group today. Be prepared for aurora, perhaps considerable aurora . . . spot chart follows.

By midday on the 2nd both radiotelescopes were observing the start of a solar noise storm, and their recording charts were showing an increase in the mean solar noise level accompanied by many bursts.

The solar observation the following day revealed that the prevailing noise storm was now very intense on both radio frequencies, indicated by the pens which were frequently at fsd. By evening the solar noise could be detected on both the 2 and 4m bands, using the normal vhf Yagis directed toward the setting sun. It was now obvious that this storm was reaching mammoth proportions.

On Friday 4 August the solar noise was so strong that the meteor equipment (70·31MHz) which normally switches on at 0900bst could not be used for three hours, and when the radiotelescopes switched on at midday, both pens were almost fsd for the whole two-hour period of the observation. By late evening the overcast skies had cleared and the author was at the Storrington recreation ground making preparations for Saturday's flower show. At midnight the "seeing" was magnificent, and at approximately 0030bst an aurora borealis manifested in the clear night sky to give a display of beauty which is rarely seen in the south of England.

The aurora was first sighted when an arc of light appeared about 5° above *our* northern horizon. From this arc came two beams of light about 15° apart (*with north at centre*) and each beam was about 3° wide and reaching high toward *our* zenith. These two searchlight type beams slowly separated, one toward the north-east and the other toward the north-west. The growing gap between them was soon filled by many similar beams of light, some of which were delicately tinted with red, green, and light blue. As time passed, this whole manifestation moved toward the east, and then re-appeared in the north-west, but this time the light was, for a short while, in large patches. At approximately 0130bst the northern sky was again filled with many fingers of light, and for a short period one could see a fantastic sight when the constellation of Ursa Major shone through the auroral glow. This rare sight was soon to fade away, and the aurora ebbed and flowed until about 0230bst.

Aerial masts and rotation systems

by R. THORNTON, GM3PKV, and W. H. ALLEN, MBE, G2UJ*

Part 2

Guying

A most comprehensive article on this entitled "Ropes and rigging for amateurs—a professional approach" was contributed to *Radio Communication* in March 1970 by J. Michael Gale, G3JMG, a BoT certificated yachtmaster (ocean). This contained a wealth of information on the various types of ropes available, both natural and synthetic fibre, together with details of knots and splices and approved methods of attaching all forms of cordage to masts and anchorages. The lay-out of guys for different dimensions of masts was also dealt with along with helpful hints on how best to tackle their erection.

It would be quite unfair to the author to attempt to precis this article, but for those interested its perusal is strongly recommended.

Reading through the answers to Mr Thornton's questionnaire on this subject revealed a deal of information on the pros and cons of various guy materials in the light of amateur experience. In the interests of brevity this detail is given below in note form. Unless otherwise stated the amateur concerned found his chosen material satisfactory.

Stainless steel wire-rope ⅛in diameter (surplus aircraft control cable) made off with eyelets and double clamps.

Nylon rope is superior in every way—expense apart. Care must be taken to prevent chafing on sharp metal edges. Nylon will wear into wood unless tight and if tied to a tree will become buried as the tree grows.

Hardware store galvanized iron wire should be replaced about every four years. A length of chain was employed between the tensioners and the pickets to effect a coarse adjustment in the length of the guys.

Number 8swg or stranded galvanized fencing wire lasted for 18 years on a 55ft mast supporting two vee beams.

One eighth inch wire rope is good for halyards and lasts well if kept greased.

Scaffold bands of 5-ton breaking strain, come in 16ft lengths and can be used "in series" where necessary.

Plastic covered stranded galvanised steel catenary wire is excellent. It may be clamped round the (fixed) mast with bulldog clips which, if carefully fitted, do not damage the covering. The ends should be sealed with bitumastic to prevent the ingress of moisture. Stranded metal clothesline is *dreadful* stuff!

Reverted to plastic covered multi-strand steel cable after experience with galvanized stranded wire which rusted badly.

Four guys made from Bowden cable, 3/16in diameter and 15cwt breaking strain held up a 24ft mast with a two metre 6 over 6 beam without stretching, chafing or breaking. The guys were secured to 2in diameter steel pipes 3ft 9in long driven 3ft into the ground 10ft from the base of the mast. The cable was made off on the mast by eyelets on to ring bolts fixed to the guy plate.

Polythene rope of 400lb breaking strain on a 42ft mast has stood known wind speeds of 60mph with only slight stretching. It is run through thick polythene sleeving where passing through the guy ring.

The flexible steel multi-strand cable was made off via thimbles, clamped with brass strip, and soft soldered.

Ordinary stranded galvanized iron wire (clothesline) has been found perfectly satisfactory with no corrosion provided the coating is not damaged by over-zealous use of pliers. The top guys on the 70ft mast have not stretched for two years after the initial 2in slack was taken up soon after erection. Sleeve with plastic tubing if there is any risk of chafing. The mast fell when two turnbuckles came undone during a prolonged gale. Lock nuts are now fitted and recommended.

Guy anchorages or pickets have been mentioned here and there in this article but it is felt that such important parts of the system deserve more detailed treatment.

Naturally, the form such anchorages take will depend upon the stresses involved and the type of soil. At an exposed site, for instance, or where a tall, heavy mast or tower is concerned it might be prudent to employ sizeable blocks of concrete into which the pickets or ring-bolts are cast. In heavy clay lengths of steel pipe or angle well driven in might be perfectly adequate, while with light or sandy soil it might be necessary to use two pickets, one a short distance behind the other, with a stout lashing between the top of the first to ground level on the second to distribute the load.

G8ARC described mooring blocks which he had made and found satisfactory in quite light soil. These were L-shaped, some 2ft 6in by 1ft, 8in wide and 5in thick and were quite easily formed in a wooden mould. Reinforcement would be advisable and could take the form of L-shaped pieces of steel rod or conduit placed in the mould when half filled. At the same time the required ring-bolts for guy attachment could be incorporated and, for additional strength, these should have two or more large nuts placed at intervals on their threaded shafts, to provide better grip on the concrete.

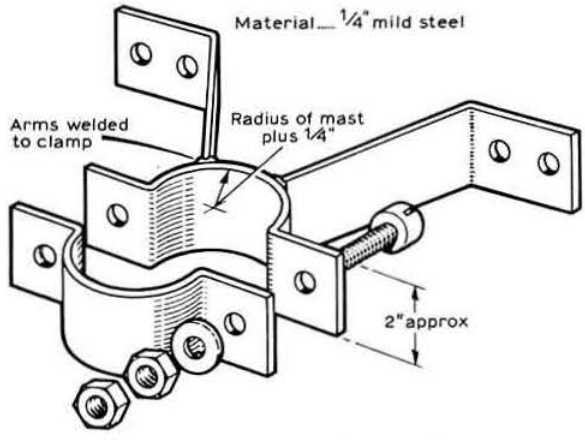

Fig 4. Sketch of bracket for supporting a rotating mast from a wall. The length of the arms and their angle will depend on requirements

* "Cobbs", Challock Lees, Ashford, Kent.

In many cases it will be possible to site the mast close to the house so that at least part of the support is provided by the building. Suitable brackets made from mild steel welded to a half-collar of similar material, with the other half of the collar bolted on after the mast is in position on the lines indicated in Fig 4, could probably be made up by a local blacksmith or garage at a reasonable cost. The collar should be made sufficiently oversize so that a well-greased piece of felt or rope could be inserted to prevent the mast rattling. All bolts should carry two nuts so that they may be securely locked or, alternately, wire should be wound in the thread at the free end of the bolt to secure the nut, as considerable vibration is produced in a mast by even a light breeze, and unlocked nuts speedily become loose.

As an alternative to fixing the supporting brackets to a wall, one may be screwed to a horizontal part of the eaves. Dexion angle could well be pressed into service here with shorter lengths bolted on to form a square cage into which a suitable bearing could be fitted. It is not normally necessary to provide a ball bearing at this point, and two shaped blocks of hardwood lined with well-greased felt can be adequate for the purpose.

If it is thought that excessive friction in the bracket would be a disadvantage, a design submitted by G3SSE and shown in Fig 5 might be considered. This has the advantage of not requiring a ball race sufficiently large to pass the mast, and entails no welding.

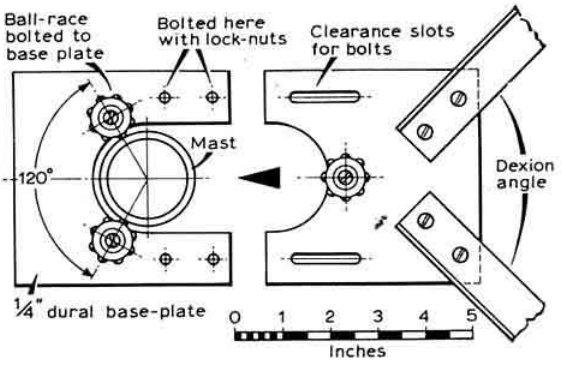

Fig 5. A suitable bearing for a rotating mast. Dimensions are only approximate and will depend upon the diameter of the mast and of the available ball bearings. Fixing may be to the eaves or wall of a building

Erecting masts

With short masts, say 20ft or so, even with a modest beam in position, "walking up" is the normal procedure, and if the guys have been carefully measured, as previously mentioned, there is little danger of the mast either swinging sideways or going beyond the vertical. With taller structures and/or heavy beams it is strongly recommended that the base of the mast be pivoted on stout supports well embedded in the ground or in concrete. Additional lift may be obtained by means of a short ladder positioned under the mast in addition to that provided by another person pulling on the back guy. In such circumstances it is particularly important that all guys be manned if they have not already been measured and secured as there is a real danger of unfortunate things happening very quickly if full precautions have not been taken.

An excellent method of raising a tall mast is the use of a gin-pole, a short mast attached to the foot of the main mast at right angles and to which at least the top guy is attached. The auxiliary mast is then pulled downwards, as a falling derrick, preferably by means of block and tackle. In the Services, 70ft masts were easily raised (and lowered) in this way using a gin-pole about 30ft long. It is also feasible to use a ladder as the falling derrick, the method being well described by G3JMG in the article previously referred to.

Rotation

The reports on electrical rotators covered many of the commercial types available with a bias, somewhat naturally, towards the cheaper and therefore lighter models. A number of failures, mostly mechanical, were noted among these, probably due to the owners expecting rather too much from units which were intended primarily for the rotation of television arrays in either the USA or on the Continent, or were units closely following such designs. In some instances the gearing proved insufficiently robust to withstand the considerable load imposed upon it by large arrays in high winds in the exposed locations naturally favoured by radio amateurs.

In most cases, however, the heavier duty commercial rotators gave excellent results for a number of years, whereas some of the users of the lighter types suffered trouble of one sort or another in a matter of months. Others, with identical models turning quite large beams, found them satisfactory for quite long periods. It was noteworthy, however, that these latter were, in the main, those who mentioned having taken active precautions against corrosion by inspecting their rotators regularly and coating vulnerable parts with heavy or silicone grease and generally attending to the weatherproofing of their units.

It was significant that of the many amateurs who had adapted government surplus prop-pitch or cowlgill motors for beam rotation, none reported mechanical failures despite the fact that several installations had been in operation for upwards of 15 years. Anyone who has compared the quality of the gearing fitted to these surplus motors with the aforementioned commercial units will appreciate the considerable difference in this respect. This, however, is the inevitable penalty of having to build equipment down to a price, and there would, in all probability, be few customers willing to foot the bill for a rotating mechanism built to really high engineering standards.

The majority of commercial rotators reported upon had a rotational speed of approximately 1rpm, and whereas hf band operators found this quite satisfactory, nearly every vhf worker said it was too slow and would have preferred 4 or 5rpm. Such speeds would, however, be quite unrealistic with the mechanical and electrical standards observed in the cheaper designs.

There is little doubt that for vhf work, where highly directional beams are in common use, direct hand operation is hard to beat for rapid and exact control although, in many cases due to siting and other considerations, this is not feasible.

Various modifications of the prop-pitch and cowlgill motors were described, mostly with a view to increasing the rotational speed. The former has a gear reduction of 10,000:1 and in its original condition is very slow indeed, but the torque is huge; as one correspondent put it, "If your aerial jams, the house goes round".

In one instance removal of the stops on the prop-pitch motor raised the speed to 15rpm (admitted to be too fast), but by supplying the motor with 12V instead of 26 this was brought down to 5rpm.

A similar result was achieved by G3FZL by turning off one ring in the epicyclic gear-box, and at the time of writing the unit had given 18 years of trouble-free service.

G4OV, with access to a lathe and the knowledge of how to use it, modified his prop-pitch motor by cutting away the whole of the teeth assembly using a diamond-faced parting tool. This produced a speed of 3rpm when fed from a 15V dc supply, and was employed in turning a TA33 hf beam and a six over six for 2m.

The cowlgill motor also benefited from a certain amount of modification. G6LL found that replacing the very thick grease in the gear-box with a thinner variety reduced the power consumption. By driving the beam via a pair of old lathe gears giving a 2:1 reduction, he was able to retain the original automatic stops and yet obtain 1¼ turns of beam rotation without risk of tearing the feeders away should the motor have been allowed to turn uncontrolled.

Two other correspondents mentioned removing the magnetic brake assembly, when the 600:1 epicyclic gear-box gave a speed of 6rpm.

As with any such apparatus operating out of doors, it is essential to provide some form of weather protection. The use of an aluminium saucepan, minus its handle, inverted and fitted to the mast immediately above the motor was mentioned by more than one correspondent. Plastic funnels in a variety of sizes are readily available from hardware stores and offer a convenient means of rain protection for motors and bearings. The method of use is to cut off the tubular part of the funnel and to slit the top of the bell in a number of places to a point where it can be made a push fit on the mast. The tabs formed in the slitting process are then sealed to the mast by means of insulation or other adhesive tape.

It is, of course, necessary to check the efficacy of any protection periodically and to deal with incipient corrosion. At the same time it would be as well to make sure that no moisture from condensation or other cause had entered the motor casing and, if necessary, to clean and adjust the brushes.

Only one operator reported using the surplus Type 34 drive unit originally forming part of the Bendix radio compass. This was found to be accurate to 0·5° in conjunction with a selsyn indicator and, moreover, was provided with means of correction every 10°.

G8BJZ/G6RGY/T used a 24V ac/dc motor with gear-box variable from one revolution in nine seconds to 0·5rpm, for turning a six over six 2m plus an 18-element 70cm beam for four years with evident satisfaction.

Among the other types of motors reported upon was a car windscreen-wiper motor which had been controlling a six over six 2m beam for two years without trouble. The only modification had been to disconnect the field winding from the armature supply and feed it with variable and reversible polarity dc.

A Drayton geared motor unit was used by G8AWW for two years. This had a motor speed of 1,500rpm reduced to 1rpm by spur gearing. Final drive was by chain to a sprocket on the mast.

A USA surplus gun-turret motor was employed by G3GEW. As would be expected, this was a precision engineering job and had a large step-down gear ratio giving a final speed of 1·5rpm. The ¾in output shaft was fitted to a plug pinned into the tube to be rotated and a Dessyn beam-direction indicator installed.

An extensive mechanical system of aerial rotation was described by G5WP in connection with his three-band quad, 35ft above ground. The scaffold tube mast carrying the beam rotated on a 7ft fixed section of the same material, the joint being made by means of a five-foot-long spigot of tubing inserted equally into both sections and bolted to the upper. A 7in aluminium pulley, bolted to an axle boss, was bored to fit the inner tubing and keyed to it, the rubbing faces of the boss and the fixed tubing being liberally coated with graphite-loaded grease.

Rotation was effected by means of a pair of wires some 150ft long running on double pulleys (ex Woolworths) mounted on 7ft high poles set at intervals, to allow free passage beneath, and terminating in 30in of chain running over a sprocket which in turn was secured to a car steering wheel in the radio room.

At the mast it was essential to ensure that the control wires were presented accurately to the 7in pulley, and to this end a substantial bracket was required on which a pair of pulleys could be mounted. The problem was solved by obtaining an old lorry connecting rod having a big-end bearing capable of encircling the fixed 2in diameter pole and being bolted securely thereto. The connecting rod was bent upwards through an angle of 90° by a local blacksmith and a piece of 1in steel angle welded to the end, after the small-end bearing had been cut off. Two single pulleys were attached to the horizontal and a further two to the vertical parts of the angle. Fig 6 shows the general arrangement. Despite the long haul, not all the way in a direct line, it proved quite easy to turn the beam with one hand although the inherent friction prevented the beam turning to any extent under the influence of high winds.

Bearings

Where it is desired to reduce the effects of friction as much as possible—particularly necessary when one of the smaller types of electrical rotator is in use—the weight of the mast should be taken on a thrust bearing. A useful source of supply for such items would be a motor junk yard. Should it not be possible to obtain a bearing capable of fitting the mast, a short length of hardwood may be employed to make the connection. If this is of square section, say ¼in greater than the mast diameter, the two ends may be formed, the upper of a size to fit tightly inside the mast and the lower to fit inside the thrust bearing, a small length of the square section of the wood remaining between the two cylindrical parts. Ideally this is a quick job on a wood-turning lathe, but with care the operation is perfectly feasible using chisel, rasp and sandpaper. The wood should be treated with a preservative or well soaked in oil for durability.

An ingenious and cheap bearing for a mast was described by Roy Trevitt, G3SSE, who has used such a device on a number of installations, including a weighty heavy-duty extensible mast over 30ft high. The bottom of the mast is furnished with a pipe-cap-off fitting into the centre of which is fixed a large rack-locating spigot, typically from ex-government equipment. This is of hardened steel and terminates in a blunt point. A plug of hard copper, brass or bronze is set in concrete and a shallow depression made in its centre by means of a drill, into which the spigot sits. An occasional application of waterproof grease ensures trouble-free rota-

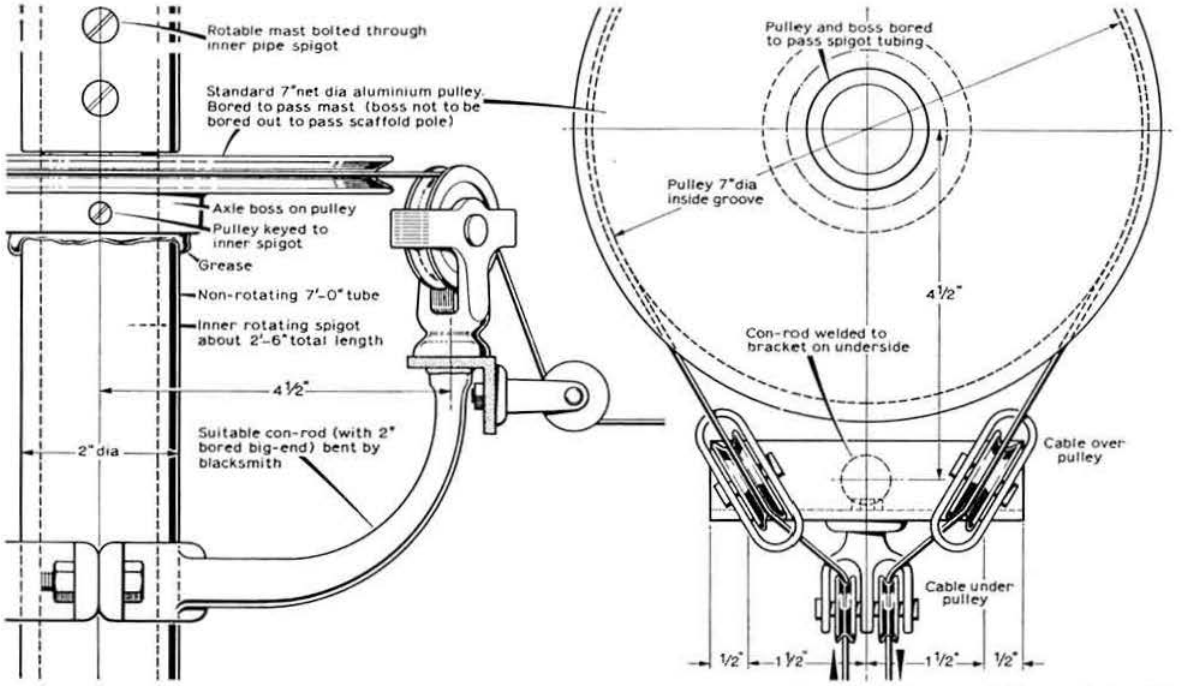

Fig 6. Details of a bracket devised by G5WP and described more fully in the text. The aim is to present the control cable accurately to the mast rotating pulley

tion for years, the wear being, contrary to expectation, almost negligible.

Another arrangement for a cheap but effective bearing was employed by the author for a number of years. This took the form of a metal pot, slightly larger in diameter than the mast, into which were placed several glass marbles in thick grease. The base of the mast was blanked off with a brass disc secured to a wooden plug. This took the full weight of a 40ft 2in dural mast carrying a large 2m beam for a number of years, and replacing the "bearings" was no costly undertaking. It was found advisable to drill a few small holes in the sides of the pot just above the grease level to prevent the accumulation of moisture, although a plastic funnel prevented most rain entering.

It is not, of course, necessary to rotate the entire mast, and this would be impossible if it were hinged in a tabernacle of, say, metal angle or heavy timber. In such cases the rotator could be fitted at the top, turning only the section of the mast on which the beam was mounted. This, however, has the disadvantage of additional weight to be raised during erection, a long control cable for the rotator and difficulties in regular inspection. Many consider that the best place for the motor is near ground level, and in G6LL's installation the mast is fixed in a tabernacle, the rotator in a weatherproof box is bolted to this, and drive is taken via a ⅜in diameter aluminium rod, with suitable couplings, supported in eye-bolts fitted to the mast at intervals. The beam is mounted on a smaller diameter tube forming a sleeve bearing 2ft 6in long in the top of the mast with ptfe bearing surfaces.

Direction indicators

Having arranged some form of mechanical or electrical beam rotation, a means has to be provided for knowing in which direction the array is pointing or, alternatively, to be able to set a control to a given bearing at the operating position which will cause the beam to assume that position.

In a hand turned system it is possible to couple a pointer moving over a direction scale to the wheel or handle by which the beam is turned. If the wheel has to be turned several times to move the beam through 360°, then a step-down ratio will be required for the indicator, and this may be done by using suitable diameter pulleys and a cord drive, or a slow-motion dial mechanism might be incorporated.

Various arrangements have been suggested for a visual indicator. One, where the lower end of the mast was inside a loft, had a wiper arm fitted to the mast which made contact with one of 32 studs arranged in a circle on a fixed insulated plate. A multi-way cable connected each of the studs to flashlamp bulbs arranged in a circular indicator. By providing a shield between each bulb, only one sector of the indicator lit up at a time, showing the approximate position of the beam. This was complicated from the point of view of wiring and it would have been difficult to weatherproof the rotary switch should it have been necessary to install it outside.

A system which overcame the latter difficulty was devised by G3KGA and mentioned in *Technical Topics* in the May 1971 issue of *Radio Communication*. In this case eight reed switches were arranged in a circle on two halves of the 4in diameter Perspex cylinder fixed concentrically round the 2in diameter mast. Each reed switch was connected to a 12V, 0·1A bulb, the latter being arranged in a circle indicating eight points of the compass. The reed switches were normally open but a bar magnet, 5 by 0·5cm, mounted in a plastic pill tube on the mast closed each switch in turn as the mast rotated, so completing the circuit and lighting the appropriate bulb. As a safety measure to prevent the

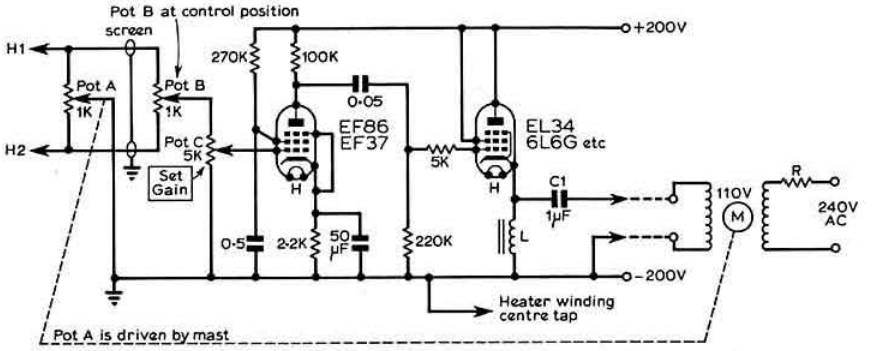

Fig 7. An easily-built beam rotator and indicator system

mast being rotated beyond a given point a relay was included in the lamp circuit at the chosen spot to open the circuit of the rotator motor.

A very effective indicator is employed by G2JF in connection with a mechanically turned beam. A map measuring some two feet square was drawn on tracing linen and mounted in a frame behind glass. Rear illumination was provided by fluorescent lamps which threw the shadow of a cursor driven from the turning gear on to the map from behind.

Immediately after the second world war amateurs were able to obtain items of surplus apparatus known as selsyns or magslips, the latter term being a contraction of magnetic slipring. Without going into the operation of these devices it is sufficient to say that they comprise a transmitter which is coupled to and rotates with the mast, and a receiver carrying a pointer at the operating position and connected to the transmitter via a 3-core cable. When ac, usually between 24 and 50V, is supplied to the two instruments, any movement of the transmitter is exactly followed by the pointer on the receiver.

Heavy duty magslips were available in which mechanical displacement of one was followed faithfully by the other at the far end of the line, so enabling a beam to be rotated either directly or through suitable gearing.

A somewhat similar device is the Dessyn indicator. This operates on 12 to 24V dc and was used in aircraft for remote measurement; eg a fuel gauge. The operating element in this case is a circular resistor tapped at three equal points on its circumference and having two moving contacts, insulated from one another and 180° apart. When a voltage is applied between the two moving contacts, which are driven by the mast, and a 3-core cable connected between the three tapping points and the indicator, the pointer on the latter takes up a position dependent upon that of the moving contacts.

Many of these indicators have given good service for a number of years but reliability depends upon the utmost care being taken in weatherproofing the exposed part of the equipment.

Commercial direction indication systems include two main types, exemplified by the German Stolle "Automatic" and "Memomatic" equipments. With the former, a dial at the operating position is set to the desired bearing, the motor starts to turn the beam and continues until that bearing is reached. Two lamps indicate in which direction the beam is turning and extinguish when it comes to rest. The basis of this type of control is that of a balanced bridge circuit, and a transistor amplifier forms part of the equipment housed in the control box.

The second system has a somewhat similar control box, but in this case the pointer is moved by a series of current pulses from a transmitter in the motor casing which step the pointer round in synchrony with the rotating beam. Control is by means of two push buttons, one for clockwise and the other for anti-clockwise movement.

The following simple aerial rotator and indicator was described in *Radio Communication* for February 1971 by Mr J. M. Smith of Moseley, Birmingham, who had used it for a number of years. From the circuit diagram, Fig 7, it will be seen that the device consists of a bridge formed by two potentiometers, pot A turning with the beam and the other at the control position. An amplifier feeds power at 50Hz to a motor winding so long as the bridge is out of balance. The other motor winding is permanently energized from the mains via a resistor chosen to allow the motor to run satisfactorily while reducing the stall-current to an acceptable value.

In the installation described the motor had seen service in a tape recorder and drove the aerial through a 1,000:1 gear box of government surplus origin. The output valve (or valves if necessary to supply the required power for another motor) feeds the motor winding via C1 and the value of this capacitor might have to be changed to suit another motor. The dc resistance of choke L, in the original author's case, was suitable for the cathode bias required by the output valve—approximately 170Ω—and if one of lower resistance were to be used the balance should be made up by an additional resistor in parallel with a 50mF capacitor.

Correct phasing of pot A, which is connected across the 6·3V lt supply, must be found by experiment; then the motor always runs in the right direction to zero the bridge. The leads to pot A should be run in screened cable to prevent pick-up of mains hum which would cause the device to hunt around zero. Pot C should be backed off until this tendency disappears.

The main advantages claimed for the system are cheapness, the absence of relay contacts to suppress and virtually no maintenance problems, except weatherproofing pot A.

* * *

We would like again to apologise for the delay in presenting the material supplied and trust that at least some of the information may be found helpful.

Errata

It has been brought to our notice that the estimated wind pressure on the 20m quad aerial in Table 2 of Part 1 is excessive and that a figure of around 260lb would be more realistic.

Simple no-cost curve tracer

by M. MANN, G8ABR*

MANY amateurs have a curve tracer and probably do not realize it, and this article shows how the famous Cossor 339 and 3339 oscilloscopes can be used as one without any modification.

The oscilloscope

The virtues of this rather dated oscilloscope are deflection coils and a sinusoidal calibration voltage, rarely found on modern instruments. However, a word of warning: some early models did not have a current limiting resistor in series with the calibration output, and short circuiting this output often burned out the mains transformer. Check by measuring the resistance between terminals "C" and "E" with the mains off; if it is about 2·5k Ω all is well, but if it is significantly less it would be worthwhile taking the cover off and wiring in a resistor to bring it up to this value.

The calibration voltage is about 17V rms (25V peak), coming from about 2·5k Ω. Thus the peak current available is 25V/2·5k Ω, 10mA. These peak values of current and voltage are quite safe for testing almost any semiconductor device, bearing in mind that they will usually only be conducting on half cycles.

The coils need to have their axis vertical so that they deflect the beam sideways, along the X axis. The axis of the coils can easily be adjusted after taking the cover off. The resistance of the deflection coils is about 40Ω, which is small enough.

Curve tracer

Wire up the oscilloscope with a diode as shown in Fig 1, making the connection to Y1 and setting the oscilloscope plates to "DC". The diode can be any type—OA91, 1N914, BY100 etc. Fig 2 shows the trace which should be obtained, but if not, reverse the diode and/or coil connections until it is obtained. The oscilloscope now shows the voltage/current characteristic with the voltage axis vertical and the current axis horizontal. The system is dc coupled and so the axis can be found from the stationary spot by disconnecting the wire from terminal C. The vertical voltage scale is rather cramped, so for detailed investigations at low voltages take the connection to A1 instead of Y1 as shown dotted in Fig 1,

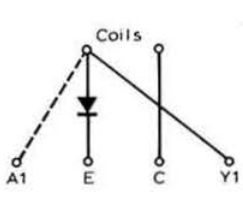

Fig. 1

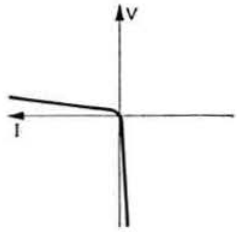

Fig. 2

and set the oscilloscope to "2Y1". This is much more sensitive but the voltage axis is ac coupled and so a stationary spot only indicates the zero of the current axis.

The calibrator output goes to the diode through the deflection coils. The diode current in the coils causes the X deflection, and the voltage across the diode is amplified to give the Y deflection. The curve can be shown in the traditional way with the current axis vertical but it necessitates amplifying the diode voltage and feeding this to the X plates. This shows "loops" in the curve due to phase shift in the ac coupled X input.

Results

Fig 3 shows what typical component curves look like, using either the A1 or Y1 method. The silicon diode shows more detail with A1, the knee characteristic being much clearer. The zener diode shows the zener voltage clearly, which is useful to check zeners of unknown voltage.

The radar diode shows the usual subtle change in forward and reverse resistance. This is a particularly easy way of sorting through some diodes to get a matched pair, as for bridge or ring modulators etc. The tunnel diode curve shows the discontinuity where the diode suddenly switches from one stable state to another. The 24V lamp is interesting because the slope slowly changes, showing how the resistance increases as the lamp warms up.

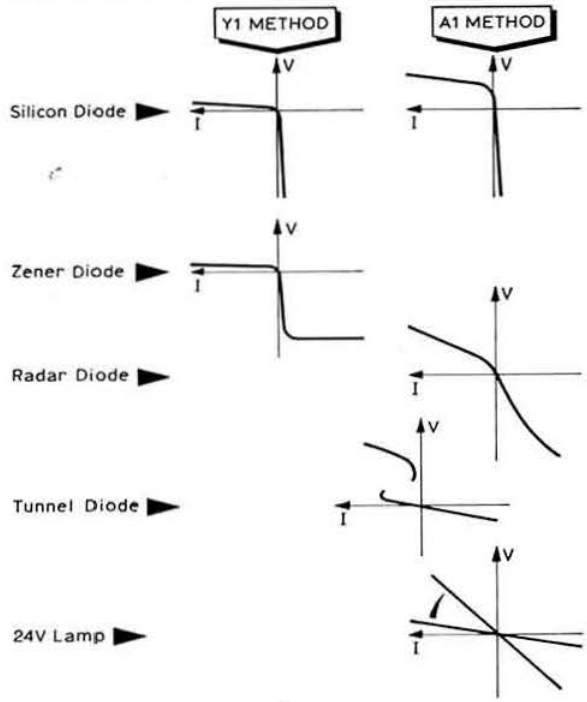

Fig. 3

Conclusions

Most amateurs probably never need a curve tracer, since it does not contribute to their communication efficiency in any way. However, it should prove useful for those amateurs who pursue the occasional experiment, especially where components with matched characteristics are needed, and if they have the oscilloscope already the curve tracer is free!

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Supergain aerials

by LES MOXON, BSc, CEng, MIEE, G6XN *

THE gain of an aerial system arises from its ability to concentrate energy in one direction at the expense of other directions. It is easy to see how this comes about in the case of a number of independent dipole aerials fed with equal shares of the transmitter power and phased so that in the desired direction, and only in this direction, the fields produced by the separate aerials all add up in phase. For the simple case of two dipoles, equal power-sharing means that each would have 70 per cent of the current obtained by feeding all the power into one dipole, but if the fields add in phase they will produce 1·4 times the field strength of a single dipole and therefore twice the power into a receiver. This argument requires only slight elaboration to prove that the power-gain ratio is equal to the total number of dipoles, whatever this may be.

For a reasonable degree of independence the dipoles have to be separated by about half a wavelength so that the total volume of space occupied is proportional to the number of dipoles and therefore to the gain. It is not altogether surprising to find that such an aerial, when used for reception, collects most of the signal energy contained in the space occupied by it, this being often referred to as the aperture. This leads in turn to the conclusion that the receiving gain (in terms of power, though not necessarily signal-to-noise ratio) is also equal to the number of elements, and this reciprocity of transmitting and receiving gain can be demonstrated in various ways.

The supergain theorem

The relationship between gain and aperture seems almost like a glimpse of the obvious but, though widely accepted as the whole truth of the matter, it has not gone unchallenged. Lurking obscurely in the background, periodically rediscovered and then forgotten [1] lies the "supergain theorem" which states unequivocally that *however small the aerial there is no limit to the directivity obtainable*. The reason for this obscurity lies perhaps in the fact that the few attempts so far made to bridge the gap between the highly esoteric mathematical theory and practical reality have yielded no usable practical designs; so why, the reader may well ask, complicate the already confusing subject of beam aerials by conjuring up an academic red herring?

Oddly enough this article has its origins in a search for a *simplified* method of presenting the theory of aerials; and an attempt to provide better physical insight into the operation of the small hf beam aerials, which are such an important feature of amateur radio, was found to be inseparable from predicting, or coming very close to predicting, most of the properties of supergain arrays [2]. By inference, it is therefore difficult to envisage the translation of supergain theory into physical terms without the ordinary close-spaced rotary beam acquiring the supergain label.

The 8JK aerial

The beams described above work on the additive principle, addition taking place more effectively in wanted directions. Alternatively we could achieve directivity by using subtraction, arranging this to be more effective in unwanted directions; this obviously requires close spacing of elements, since otherwise there must be some direction in which fields are additive. The well-known 8JK beam provides a good illustration of this principle, and has the particular merit of simplicity. It will be shown that other close-spaced beams can be derived from it by a succession of minor modifications, and that these beams all conform to supergain principles in so far as directivity is more-or-less independent of the dimensions, though efficiency and bandwidth decrease very rapidly with increase of gain or reduction of size.

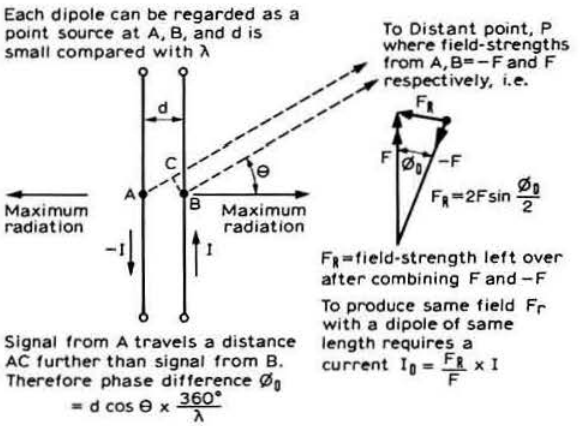

Fig 1. Mechanism of 8JK aerial

Fig 1 illustrates a closely-spaced pair of dipoles fed in opposite phase; this is the 8JK beam and it will be obvious that there is no addition of fields in the wanted direction, in fact there is just the opposite—a large degree of subtraction which is incomplete only because of the phase-difference resulting from the spacing. Energy is concentrated in the wanted direction by the fact that cancellation is even more effective in the unwanted directions, the incompleteness of this process in terms of relative field strength for different directions being proportional to the apparent distance apart of the two sources viewed from the appropriate angle. This distance being equal to d cos θ, the effect is to narrow the radiation pattern relative to that of a single dipole, which is multiplied by cos θ to form the pattern of the 8JK. Fig 2 shows the radiation patterns for a dipole, ie cos θ in the plane of the wire and omnidirectional around the wire; and the corresponding patterns $\cos^2 \theta$ and cos θ respectively for the 8JK. This narrowing of the beam-width adds up to a gain of 4dB provided the power is all radiated; this figure may be derived in several ways such as graphical or mathematical integration of Fig 2 or, as shown later, from knowledge of

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the mutual impedance between the elements, or perhaps just good guesswork based on inspection of Fig 2! In fact, if the gain is assumed to be equal to the narrowing of the "3dB down" beamwidth in each plane, expressed in decibels and added, the gain so obtained is 4·2dB and thus very nearly correct.

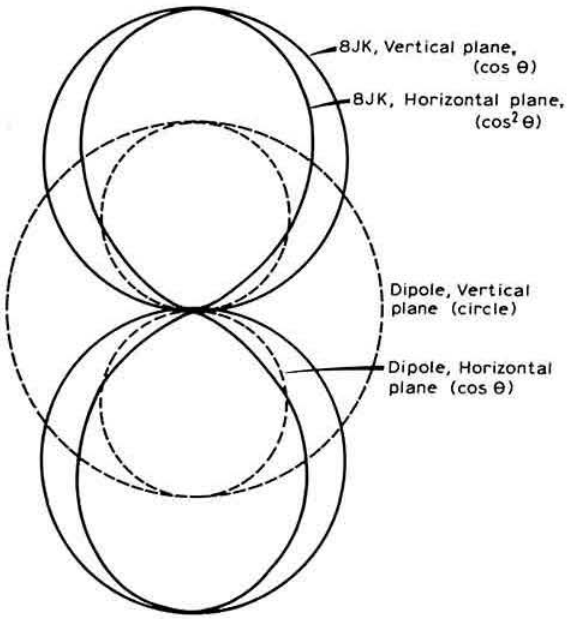

Fig 2. Comparison of dipole and 8JK radiation patterns (both aerials horizontal)

The important point to note at this stage is that the shape of the radiation pattern, and therefore the gain, involves direction (ie θ) only, being affected neither by the length nor by the spacing of the elements. Strictly speaking the cos θ pattern is correct only for a very short dipole, but this need not bother us unduly provided the length does not much exceed half a wavelength. Similarly the spacing of the dipoles, provided it is less than about 0·16 wavelength, has little effect on the pattern either. This is illustrated by Fig 3(a) which is drawn for the case of $\left(\frac{\lambda}{8}\right)$ spacing; because radiation from the forward dipole has one-eighth of a cycle start over that from the other dipole, there is a 45° phase difference which causes the radiation to add as shown in the figure, so that a current of 1A in each dipole produces a field-strength in the beam equal to that which would result from a current $\frac{F_R}{F}$ amps flowing in a single element of the same length. This is nearly equal to the angle ϕ_0, measured in radians, a relation which holds true within 5 per cent provided the angle is less than 60°, corresponding to a spacing of $\frac{\lambda}{6}$. More accurately $\frac{F_R}{F} = 2 \sin\left(\frac{\phi_0}{2}\right) = 0{\cdot}764$ for the present example, and for other directions ϕ_0 is replaced by $\phi_D = \phi_0 \cos\theta$.

We know, as already discussed, that F_R corresponds to a field strength of 4dB, ie 1·58 times greater than that from a dipole, so it follows that the element currents must each be $\frac{1{\cdot}58}{0{\cdot}764} = 2{\cdot}06$ times the current flowing in a dipole for the same amount of radiated power. It follows that $2 \times (2{\cdot}06)^2 \times R = R_d$ where R and R_d represent the radiation resistance for each element of the 8JK, and for a dipole, respectively. For a $\frac{\lambda}{2}$ dipole $R_d \simeq 73\Omega$ so that $R = \frac{73}{8{\cdot}56} = 8{\cdot}5\Omega$. The difference between 73 and 8·5, ie 64·5Ω, being entirely due to the presence of the other element, is defined as the mutual impedance between them and it is a pure resistance (ie non-reactive) only for a spacing of $\frac{\lambda}{8}$ and certain much wider spacings which do not concern us here. This example demonstrates the close relationship of gain and mutual impedance which is a feature of supergain aerials so that given one we can work out the other. Obviously every time we halve the spacing, S, the current must be doubled to produce the same field and this applies also to halving the length, l, of the elements, except for a further reduction-factor $\frac{\pi}{4}$ to allow for the shape of the current distribution

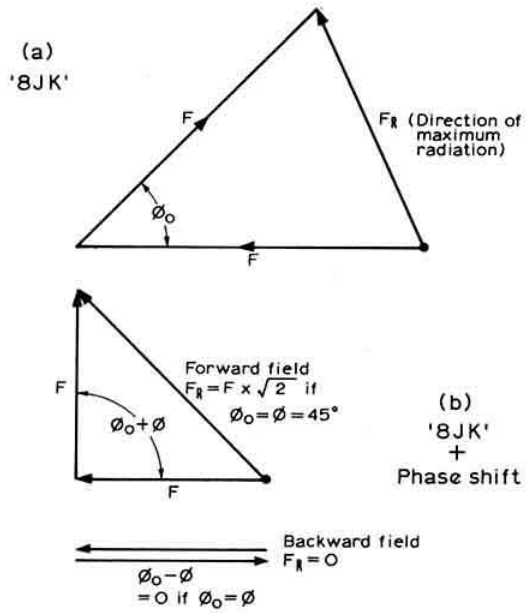

Fig 3. Effect of phase shift.

Vector diagrams are drawn to scale for the case of $\frac{\lambda}{8}$ spacing. Note that F_R is almost unchanged in going from $\phi = 0$ to $\phi = \phi_0$, but the radiation is now unidirectional. Also, F, and therefore I, are now much smaller. ϕ_0 is the phase-shift $\frac{d}{\lambda} \times 360°$ corresponding to the spacing

changing from sinusoidal to triangular (ie the tips of a sine wave) if the element is shortened considerably. Hence the radiation resistance of the 8JK is given approximately by $\frac{\pi^2}{16} \times 8{\cdot}5 \times l^2 \times s^2$ where l is measured in fractions of a half-wavelength and s in fractions of one-eighth wavelength. For $s = l = 0{\cdot}25$ the radiation resistance becomes 0·02Ω.

Now whatever the length of the elements, they must somehow be tuned to resonance, and the most efficient method is by means of a loading stub so that the total length of wire remains nearly constant. The larger the diameter of conductor, the less the losses and the wider the bandwidth but, even if 1in diameter tubing is used throughout and there are no insulation losses or proximity effects, the loss resistance will be about 0·06Ω [2] at 14MHz. Also any detuning introduces a reactance of about 0·6Ω per 10kHz. The efficiency is thus only 25 per cent, so the beam is 2dB worse in effective power gain than a dipole, and its bandwidth is barely wide enough to accommodate a single ssb channel. In fact, but for the losses, it would be only 700Hz. If a 14MHz 8JK aerial could be shrunk down to matchbox size and losses eliminated by, for example, cooling the elements to render them superconductive, the possible 4dB gain would be fully realized but the bandwidth would be so narrow that the speed of keying would be restricted to a maximum of about two words per day, and the tuning of transmitter and receiver, together with adjustment of the lengths of the elements, would have to be correct within about one part in a thousand million.

A somewhat less extreme problem would be presented by the need to balance the currents in the elements: thus with "matchbox" spacing, 0·6 per cent imbalance would produce more field strength than the phase-difference, and the radiation pattern would in large degree revert to that of a dipole. The required accuracy of balance is inversely proportional to the spacing.

Unidirectional beams

Suppose the current in one element of an 8JK is advanced in phase by an amount "equal to the spacing", ie 45° for a spacing of $\frac{\lambda}{8}$. This gives the radiation from the advanced element a total lead of 90° whereas the phase-difference and therefore the radiation in the opposite direction is now zero, leading to the cardioid pattern shown in Fig 4(a). Fig 3(b) shows the new addition of vectors, and it will be seen that for the same forward field F is now almost halved in length, increasing the radiation resistance by a factor of nearly four times. These two conditions give almost equal gain, so that as one might expect, maximum gain occurs about half-way between them, as demonstrated by Fig 5. There will, of course, no longer be a null in the rear direction but this is only because its position has shifted, and it has split into wo, since nulls will appear in any direction for which the apparent spacing is equal to the phase shift. For 22·5° phase shift, therefore, nulls will appear at plus and minus 60° from the back direction as shown by Fig 4(b). It will be obvious that this pattern also is unaffected by spacing or length of elements, provided the ratio $S : \phi$ of spacing to phase-shift stays constant. Fig 5 shows the relation between gain, nominal back-to-front ratio, radiation resistance and phase shift, for a spacing of $\frac{\lambda}{8}$ which is typical of practical

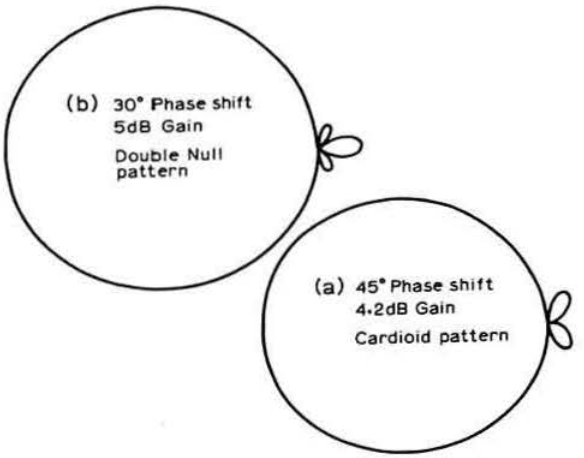

Fig 4. Variation of polar diagram with phase angle

beams and simplifies calculation because the mutual impedance between the elements is then a pure resistance with no reactive complications, a point which will be appreciated by readers of the appendix which explains the method of calculation. The gain and front-to-back ratio curves apply approximately to any spacing provided ϕ is adjusted to be proportional to the spacing, and the limits of $\frac{\lambda}{6}$ for the spacing and about 0·6λ for the length of the dipoles are not exceeded. *They apply also as a good approximation to quad-type elements.*

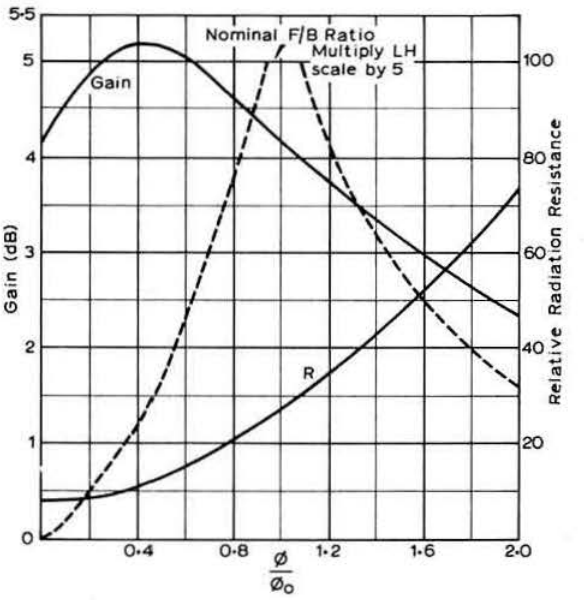

Fig 5. Variation of gain, radiation resistance and f/b ratio with $\frac{\phi}{\phi_o}$. Resistance scale is correct in ohms for each of a pair of dipoles spaced $\frac{\lambda}{8}$ (equal currents are assumed)

A quad loop is often regarded as a vertically-stacked pair of dipoles but the stacking distance $\left(\frac{\lambda}{4}\right)$ is small compared with the $\frac{\lambda}{2}$ spacing stipulated for useful additive gain at the beginning of this article. This gain decreases rapidly with spacing, as can be readily demonstrated by the use of mutual-impedance curves (see the *Radio Communication Handbook*, p 13.6), and the benefit in the case of the quad is only 1dB; in other words the quad loop is much closer to resembling one than two separate point sources of radiation, and obeys the same rules more or less. For a driven quad of conventional size, the radiation resistances derived from Fig 5 should be roughly doubled, and for folded dipoles they should be multiplied by four.

Parasitic beams

So far it has been assumed that the two elements carry equal currents, and if it is desired to have complete control over phasing without upsetting the equality of current amplitudes, both elements must be driven, ie connected to the transmitter, and a number of strict rules must be observed. Because these rules are not widely understood, and a variety of practical difficulties arise, driven arrays usually operate with unequal currents, and it is generally easier and almost as good to use "parasitic" excitation, ie reflectors or directors energized by mutual coupling from a single driven element. In the case of a quad, the mutual coupling contains a reactive component which operates to boost the current in a parasitic reflector to near-equality with that in the driven element but renders directors very inefficient.

It is obviously immaterial how the current inequality occurs, and from the point of view of the radiation pattern it can be taken into account by assuming two elements carrying equal currents plus a third wire co-located with one of them and carrying the difference current. Though contributing radiation of appropriate phase, it will have a dipole pattern and the consequences may be inferred from vector diagrams such as Fig 6(a) which shows that with very close spacing the 8JK radiation is in quadrature with the dipole

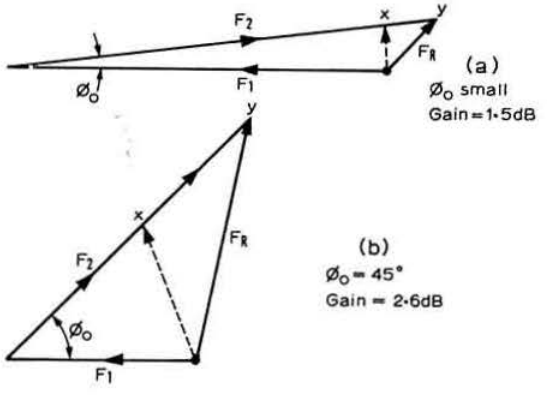

Fig 6. Effect of unequal currents
Resultant F_R can be considered as made up of an 8JK and a dipole component (equal in these examples). These are the dotted vector and xy respectively. Only 28 per cent of the power is in the 8JK mode

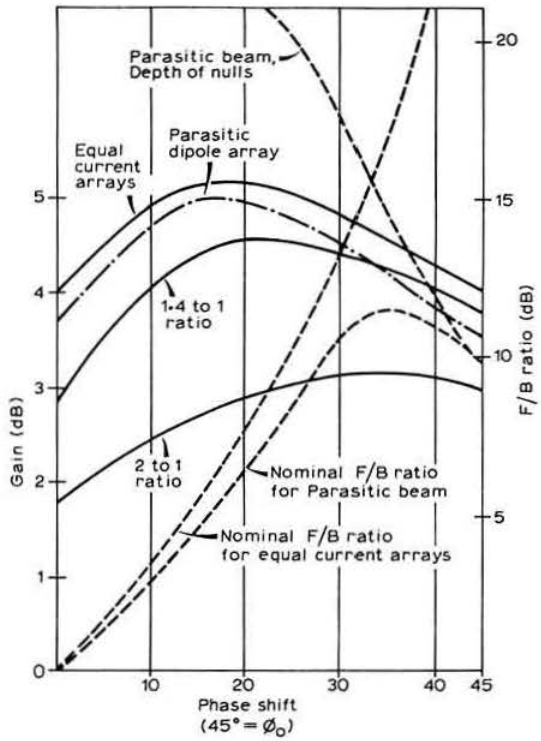

Fig 7. Gain and f/b ratio for 2-el arrays with equal currents, compared with equal current arrays. Spacing = $\frac{\lambda}{8}$

radiation. For the case illustrated most of the power goes into the "dipole", and it can be estimated that gain will be reduced thereby from 4dB to 1·5dB. This case is academic in so far as practical aerials use much wider spacings. Fig 6(b), which is drawn for the case of $\frac{\lambda}{8}$ spacing, shows that the dipole current is tending to add in phase rather than otherwise, so that the gain will be rather less affected, although the dipole radiation "fills in" the nulls in the back direction. Fig 7 shows gain as a function of phase-angle, calculated for current inequalities of 2 : 1 and $\sqrt{2}$: 1 and compared with the gain curve for 1 : 1 ratio taken from Fig 5. The gain and front-to-back ratio of a typical parasitic beam, for which the current ratio varies with phase angle, are also shown. It will be seen that the standard curve for driven elements is not badly out when applied to parasitic beams except for large current inequalities or large phase-shifts. Radiation resistance for a parasitic beam may be obtained approximately from Fig 5 over the range of main interest by using a multiplying factor of 1·7 which allows for all the power being fed into one element and for the current inequality. For a reflector-type quad the currents are nearly equal and the multiplying factor is 2·8.

Back-to-front ratio

Fig 8 shows the backward field strength as a function of angle for various phase-shifts including the so-called maximum back-to-front ratio condition, (d) and (b) being the polar diagrams of Figs 4(a) and (b) re-plotted for comparison

and in a form more convenient for averaging. In terms of the total angle over which the backwards field is reduced, say by 20dB or more, curve (c) is better than the "maximum front-to-back ratio" condition (d), besides giving 0·5dB more gain. Judged in this way even curve (b), corresponding to near-maximum gain, is only very slightly worse than (d).

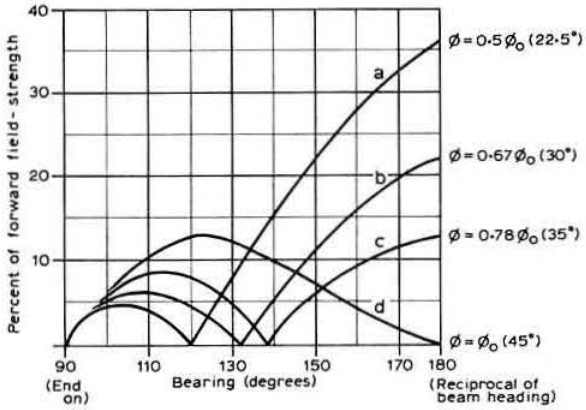

Fig 8. Variation of backward field-strength with bearing and phase shift. (Angles in brackets apply for $S = \frac{\lambda}{8}$)

Arrays with more than two elements

The non-mathematician is faced with considerable difficulty if he tries to apply the above methods to more than two elements, but in view of the drastic reduction in radiation resistance and bandwith which occurs in going from one element to two elements it is difficult to believe the process can be extended to additional elements without running into major difficulties. This belief is not erased by reference to the available literature which, though mainly theoretical, also contains some experimental results. Uzkov [3] has shown that the maximum gain obtainable from n omnidirectional radiators is n^2, so that the gain in decibels theoretically obtainable from any given number of elements, instead of being reduced, is actually *doubled* if they are stacked closely enough! Omnidirectional elements exist of course only in mathematical fiction but the result has been extended to dipoles and proved experimentally for four elements by Bloch and others [1] who predicted theoretically a gain of 10·1dB and actually obtained 8·7dB. For dipoles the gain is slightly less than n^2, eg 5dB for two elements as already demonstrated. At first glance the extension to any number of elements may seem obvious, since the two dipoles of the 8JK may be replaced by an antiphased pair of 8JK aerials thereby multiplying the patterns by an additional cos θ, and in principle (and at a price) this process could be extended indefinitely. Unfortunately, instead of gaining 5-6dB each time, the beamwidth is reduced only by $\sqrt{2}$ in each plane and the gain is thus proportional to n; this is evidently a non-optimum procedure and the n^2 rule still awaits a simple physical explanation. This is in line with its limited practical relevance apart from enabling one to discount the "impossible" gain figures sometimes claimed.

In the Bloch array the four elements are all driven with accurately-specified amplitudes and phases, the driving-point resistances and reactances being different in each case. The bandwidth is about 1·6 per cent, which is insufficient for coverage of the 14MHz band and even this has only been achieved by using a boom length of 0·6λ. It is noted that the bandwidth would decrease rapidly as the spacing is reduced, and it is reasonable to suppose that, as before, cancellation effects will be twice as effective at half the spacing so that radiation resistances will be proportional to S^2. For a boom-length of 0·25λ, which is about the maximum acceptable for a 14MHz rotary beam, a bandwidth of 0·28 per cent could be expected, with less gain as an alternative. The construction, adjustment, and maintenance of an aerial of this type would in any case be beyond the resources of most amateurs, and practical designs of close-spaced driven arrays are invariably limited to two elements. Gain figures claimed for amateur beams, if they approach even remotely the figure obtained by Bloch, for his four-element driven array, must therefore be discounted.

For further evidence on this we may turn to the paper by Walkinshaw [4] who obtained a gain of rather over 7dB for a three-element Yagi but with a radiation resistance of only 4Ω, or we may consult the *Radio Communication Handbook*, fourth edition, p 13.65 which describes a practical three-element Yagi having a gain about 1dB greater than that of a two-element beam. If the second element produces 5dB gain, and the third only a further 1dB, it seems improbable that much more than 6dB can be expected from a practical system.

Conclusions

All hf beams suitable for rotary use rely to some extent on the supergain principle. Knowledge of this helps to provide insight into their operation and underlines the essential similarities of different types all of which, when correctly designed, provide a gain of 5–6dB. If one aerial appears to have markedly more gain than another, or to have more than 6dB gain over a dipole, the explanation must lie either in a measurement error, different polarization, unnecessary losses or some environmental difference, eg height, or a ground slope aiding one aerial but not the other [5]. Reliable measurements are extremely (and often deceptively) difficult.

Some systems are much more foolproof than others, and due to interdependence of amplitude and phase there are some restrictions on the use of parasitic excitation. There are also many ways of incurring losses and some of these can be highly elusive. It is intended to discuss some of these aspects in a later article.

The supergain principle can be exploited to a much greater degree for reception than transmission since external noise levels in the hf band are relatively high, and it is possible to make receivers with very low noise factors. This means that 20, 30dB or more can be sacrificed due to attenuation or mismatch in aerial systems before receiver noise becomes an insurmountable problem. Within this limit the full directivity advantages of the aerial can be realised and for an 8JK there is virtually no change of directivity with frequency. Unfortunately, however, the various methods of producing the phase-shifts required for a unidirectional pattern are frequency-sensitive.

The credulity of the reader may be strained by the implication that a supergain aerial however small is able in principle to accept all the energy passing through a large volume of space, ie despite small size it appears to have a large aperture! This is because it is essentially a high-Q system, and it is common experience that a high-Q circuit needs only

very loose coupling to another circuit in order to absorb all the available energy from it. The supergain aerial can be regarded as rather loosely-coupled into space, making up for this by its narrow bandwidth (ie high-Q) so that the narrow bandwidth is not just an unfortunate accident but inherent in, and inseparable from, the high gain.

Ground effects have not been included in the discussion because the extent to which the ground-reflected wave assists or impedes the radiation of signals at any given low angle of elevation is the same for all horizontal aerials at the same mean height and in the same position, with the possible exception of vertically-stacked arrays at low heights (lower element ineffective) or over sloping ground (situation complicated). Mutual impedance between a dipole and its image causes a slight variation of effective gain with height but this effect is usually negligible with supergain aerials, except at very low heights, since each element "sees" images of opposite phase at almost the same distance.

References

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[2] L. A. Moxon, "Evaluating aerial performance", *Wireless World*, February and March 1959.

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Appendix

Gain of the 8JK

In the 8JK aerial a voltage E is applied to one dipole and $-E$ to the other, producing currents I_1 and I_2 respectively. These currents induce voltages $I_1 . Z_m$ and $I_2 . Z_m$ respectively in the other dipole, where Z_m is the mutual impedance. At a spacing of $\frac{\lambda}{8}$, Z_m is equal to a pure resistance R_m.

Hence for the first element:

$$E = I_1R + I_2R_m$$

Similarly:

$$-E = I_2R + I_1R_m$$

In these expressions R represents the radiation resistance which is assumed to be the same for both elements.

Solving these equations $\frac{E}{I_1} = R - R_m$ and $I_1 = -I_2$. The radiation resistance for each side is therefore given by $R - R_m = 73 - 64{\cdot}5 = 8{\cdot}5\Omega$ for $\frac{\lambda}{2}$ dipoles spaced $\frac{\lambda}{8}$. To obtain the gain relative to a dipole, $2I_1^2(R - R_m) = I_D^2R$ where I_D is the current flowing in the dipole for the same applied power.

Hence $I_1 = I_D\sqrt{\frac{73}{17}} = 2{\cdot}07I_D$

From Fig 3 the field strength in the beam is equivalent to that obtained from a current $2I_1$ sin 22·5 flowing in a dipole, ie to a current $4{\cdot}12 \times 0{\cdot}386I_D = 1{\cdot}59I_D$ or a gain of 1·59 times in field strength, which is equal to 4dB.

It is next required to introduce a phase shift while maintaining equal current amplitude. The method is immaterial but one which provides an easy starting point for calculation (and can also be used in practice) is to insert a reactance $+X$ in series with one element and $-X$ in series with the other. The equations now become

$$E = I_1(R + jX) + I_2R_m$$
$$-E = I_2(R - jX) + I_1R_m$$

From these we obtain:

$$\frac{E}{I_1} = \frac{R^2 + X^2 - R_m^2}{(R + R_m)^2 + X^2}(R + R_m + jX)$$

The phase shift is therefore given by $\tan\phi = \frac{X}{R + R_m}$ and after some manipulation the real term, which is the effective radiation resistance, simplifies to

$$R - R_m . \frac{1 - \tan^2\phi}{1 + \tan^2\phi}$$

This reduces of course to $R - R_m$ for $\tan\phi = 0$, ie the 8JK condition. Similar results are obtained for $-\frac{E}{I_2}$ except that $\tan\phi = \frac{-X}{R + R_m}$. The total phase shift between the two elements is of course 2ϕ.

So long as we are working with small values of ϕ, these results can be further simplified by substituting ϕ for $\tan\phi$, but the accurate expression has been used for calculating Fig 5.

The effect of unequal currents may be discovered by putting $I_2 = (a + jb)I_1$ where (b/a) is the tangent of the phase difference and the ratio of current amplitudes is given by $\sqrt{a^2 + b^2}$. We then find the radiation resistances are given by

$$R_1 = R - aR_m \text{ and } R_2 = R - \frac{aR_m}{(I_2/I_1)^2}$$

Knowing that the total radiated power is equal to $I_1^2R_1 + I_2^2R_2$ the vector diagrams may be completed and the gain and f/b ratio estimated. There is a tendency for R_1 to be negative, ie the first element returns to the transmitter some of the power which it has received from the second element.

For a parasitic beam the phase-shift, radiation resistance and current ratio may all be obtained by putting

$$E = I_1R + I_2R_m$$
$$O = I_2(R + jX) + I_1R_m$$

In this case X represents the amount of reactance by which the parasitic element is detuned. Solving, as before, the total phase shift (designated by 2ϕ for consistency with the previous examples in which the currents are each phase-shifted by ϕ, in opposite directions) is given by

$$\tan(2\phi) = X/R$$

and the radiation resistance is

$$R\left(1 - \frac{R_m^2}{R^2 + X^2}\right) \text{ or, if preferred } \frac{1 + \tan^2(2\phi) - r^2}{1 + \tan^2(2\phi)} . R$$

where $r = \frac{R_m}{R} = 0{\cdot}882$ for $\frac{\lambda}{2}$ dipoles spaced $\frac{\lambda}{8}$. The relative

magnitude of I_1 and I_2 is given by

$$\left|\frac{I_2}{I_1}\right| = \frac{R_m}{\sqrt{(R^2 + X^2)}}$$

Gain calculations are rendered more laborious by the current inequality and the easiest way to proceed is by calculation of $\frac{I_1}{I_D}$ (as before, from the radiation resistance), 2ϕ and $\left|\frac{I_2}{I_1}\right|$. Drawing the vector diagrams to a scale of $I_D = 1$, the voltage gain is then given directly by the length of the resultant of I_1 and I_2.

For spacings other than $\frac{\lambda}{8}$, R_m becomes partly reactive, ie it must be replaced by $Z_m = R_m \pm jX_m$. Values of R_m and X_m for different spacings (or Z_m and its phase angle) are to be found in various handbooks, eg [5], but the algebra is now much more complicated. The main effects of X_m are that the radiation resistances of the two elements become unequal, and it is found that a negative value of X_m increases the current in a reflector and reduces it in a director, a situation which exists with the quad aerial. Nevertheless, provided the currents are not too unequal, Fig 5 remains valid and the experimenter using spacings other than $\frac{\lambda}{8}$ or elements other than dipoles, (while possibly noticing a few anomalies) will not be unduly bothered by the theoretical complications.

The Intruder Watch

by C. J. THOMAS, G3PSM*

RSGB Intruder Watch organizer

SINCE the publication of the Summary of Intruders in the April 1972 *Radio Communication* much has happened in the field of the Intruder Watch organization.

Firstly the IW organization in the UK was allocated the call GB2IW and this callsign is used to maintain contact with observers within the UK and also IW organizations in other countries. Since this move DARC have been issued with DL0IW and SRJ are to ask for YU0IW. Stations wanting to contact GB2IW are advised to listen on 3,740kHz at 1200gmt on Sundays, or to write to arrange either A1 or A3/A3j skeds.

At the IARU Region 1 Conference in Holland, proposals tabled by the RSGB Intruder Watch resulted in the formation of the International Amateur Radio Union Monitoring System (IARUMS) within Region 1. It is thought that an international organization devoted to the protection of the amateur bands will have greater effect than individual national organizations.

During the first six months of 1972, IW activity has been maintained at a high level. On 40m there are again no significant changes apart from a possible loss of a Radio Peking outlet on 7,095kHz. On 20m there was again a slight increase in numbers, the majority being printer transmissions of Soviet origination. Correspondence is currently being exchanged with the Soviet society RSF on this problem. A slight decline in activity on 15m is shown, with a number of regular intruders having not been heard. Against this, however, new intruders of Chinese origination have appeared on the band.

A further concentrated effort on 10m has shown the band to be far from flat at times during the early part of the year. It is significant to note that of 41 listed intruders on this band five are 2nd harmonics, seven are known to be 3rd harmonics and no less than 14 are 4th harmonics. From this it is obvious that insufficient attention is being paid to harmonic suppression of the 3rd and 4th order. This applies especially to broadcast transmissions.

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Summary of Intruders—Region 1
1/1/72—30/6/72

Freq	Emm	Date	Times (UT)	Calls	Country of origin	Comments
7,010	A3	XX72	1800-2300	Radio Peking	China	1
7,020	F6	0172	2000-2100	—	USSR	1
		0672	0001-0100			
7,035	A3	XX72	1800-2300	Radio Peking	China	1
7,050	A3	XX72	0300-0400	Radio Cairo	Egypt	1
			1700-2300			
7,058A	A3	XX72	1700-2200	Radio Peking	China	1
7,062A	A3	XX72	0300-0400	Radio Tirana	Albania	1
			1500-0030			
7,064	A3	0372	HX	Radio Iran	Iran	1
7,075	A3	XX72	1700-2000	Voice of the Arabs	Egypt	1
7,075	A3	XX72	1800-2200	Radio Peking	China	1
7,090	A3	XX72	1800-2200	Radio Tirana	Albania	1
14,008	F1	0572	0530-1830	QRA De DBZ2/DBZ3	DDR	1. Spurious of 13,950/ 14,410kHz
14,024	A1	0272	0700-0900	UASH De RCI	USSR	
	F1	0572	0715-1500			Printer
	F1	0672	0300-0400	De RCI		
14,024	F1	0672	2315-0030	RHQ76 De RDN91	USSR	Printer
14,032	F6	0672	HX	RBK56 De RBI30	USSR	1. 2. Printer
14,040	F1	0272	1100-1200	—	USSR	1. Printer
		0472	1330-1600			
14,055	F1	0372	1100-1200	ULK60 De UIV22	USSR	2. Printer
14,055	F1	0672	0400-0500	RCY55 De EOY23	USSR	Printer
14,057	F1	0572	1400-1500	—	USSR	Printer
14,064	F1	0272	1100-1400	—	USSR	1. Printer
14,072	F1	0472	0700-1700	—	USSR	1. Printer
14,075	A1	XX72	HX	(Changed daily)	USSR	1. Four character calls
14,080	F1	0372	0800-1400	—	USSR	1. Printer
14,097	F1	XX72	HX	—	USSR	1. Printer
14,104	F1	0372	1100-1500	—	USSR	1. Printer
		0472	1500-1700			
		0572	1200-1500			
14,112	F1	0572	1200-1800	—	USSR	Printer
14,125	F6	XX72	HX	—	USSR	1. Printer/ morse and associated vox
14,136	F1	0272	HX	—	USSR	1. Printer
		0372	1100-1300			
		0472	1300-1400			
14,145	F1	XX72	0800-1430	—	USSR	Printer
14,145	A7a	XX72	HX	—	—	
14,150	F1	XX72	0800-1800	—	USSR	Printer
14,150	A1	0572	0500-0815	De KWN90	USA	1, Spurious of 14,359kHz
14,177	A1	0172	1000-1500	(Changed daily)	USSR	1, Four character calls
		0272				
14,184	F1	0372	HX	EOP56 De RB139	USSR	1. Printer/ morse
		0472				
14,184	A1	0472	0700-0900	IOZ	—	
14,191	F1	0372	HX	RB138 De EOP33	USSR	2. Printer/ morse
14,199	F6	0373	HX	JVO De UOA76	USSR	2. Printer/ morse
		0472				
		0572				

Freq	Emm	Date	Times (UT)	Calls	Country of origin	Comments
14,210	A3	XX72	0330–1400	Radio Madagascar	Malagasy	2f 7,105kHz
14,216	F1	XX72	HX	—	USSR	1. Printer
14,225	F1	0572	0700–1900	—	USSR	1. Printer
		0672	0700–2300			
14,230	F1	0472	1300–1400	—	USSR	Printer with
		0572	1800–2300			voice association.
14,248	A1	0572	HX	—	USSR	High speed
		0672				morse
14,275	A1	0172	0930–1630	(Changed daily)	USSR	1. Four character calls
14,280	A3j	0672	1300–1400	—	Kuwait, Saudi Arabia	3.
14,300	A3	0572	2000–2300	Radio Moscow	USSR	2f 7,150kHz
		0672				
14,335	F1	0472	1600–2300	De BZP54	China	New China Press
		0572				
21,016	A1	0472	HX	De RCI	USSR	1.
		0572				
	A1, F1	0672				
21,020	F1	0472	1400–1700	—	China	New China Press
21,050	A1	0572	0400–1030	GNR, KUM	—	
		0672				
21,050	A1	0572	0600–1100	CLB	—	See LKC/CLB
		0672				on 21,090kHz
21,078	A1	0372	0800–0815	BQZ61	China	1.
		0572				
		0672				
21,080	F1	0172	1100–1600	RHP29 De RNB25	USSR	Printer
		0372				
21,090A	A1	XX72	0800–1000	LKC/CLB	—	See CLB
						21,050kHz
21,090	P	0272	HX	—	USSR	
21,095A	A1	0472	0800–0815	SFQ	—	Diplomatic
		0572				
		0672				
21,095A	A1	0372	0700–0800	JDY	—	1. Diplomatic
21,100A	A1,F1	0372	0800–0830	VTF	—	Diplomatic
		0472				
		0672				
21,100	A1	0172	0800–1015	MGW	—	Diplomatic
	F1	0372				
21,100	A1, F1	0172	0900–0915	FRA	—	Diplomatic
		0272				
		0372				
21,105A	A1, F1	0172	0900–0915	ZTR	—	Diplomatic
		0272				
		0372				
21,105A	A1	0572	1000–1100	HZUA, HZUK	Saudi Arabia	
21,105	A1	0472	0800–1100	XFM	—	Diplomatic
21,110	A1, F1	0172	1000–1015	KJG	—	Diplomatic
21,110	A1, F1	0272	0800–1200	ZGA	—	1. Diplomatic
		0372				
		0472				
21,115	A1	0172	1000–1015	SXY	—	
		0272	1115–1130			
		0472	0800–1200			
21,120A	A1	0172	0900–1100	HZUA, HZUK	Saudi Arabia	
		0272	1000–1200			
		0472				
21,122	A4	0172	0600–1500	—	USSR	1. Weather charts
		0272				
21,125	A1	0172	1000–1030	XFM	—	Diplomatic
21,170	F1	0172	0900–1330	RUZU De ULV	USSR	1.
21,180	P	0272	HX	—	USSR	
		0372				
21,192	F1	0172	0900–1500	RUF de RKD48	USSR	1. Morse/printer. See 28,200kHz
		0272				
21,263	F1	0172	1300–1430	RUM54 De RSF22	USSR	Morse/printer
21,300	F1	0172	0900–0930	RTU De RND79	USSR	Morse/printer
		0272		RWR2 De RPC27		
				RWR2 De RND79		
21,345	A1	XX72	0800–0900	De BIM41	China	1.
21,370	A1	XX72	0800–0900	De BXS63	China	
21,375	F1	0172	0800–1600	—	USSR	
21,400	F1	0372	0800–1300	RWR2 De RPC27	USSR	Morse/printer
		0472				
21,402	F1	0372	1150–1230	OLD De BBA22	China	2f 10,701kHz
		0472				
		0672				
21,395	A1	0272	0900–0915	K22	—	
		0372				
21,395	A1	0472	HX	OMZ De 5Y3	Czechoslovakia	
		0572				
28,125	F1	0272	0900–1300	—	USSR	Printer
28,194	F1	XX72	HX	—	USSR	Printer
28,200	F1	XX72	0900–1500	RKD48 De RUF	USSR	Printer. See 21,192kHz
28,255	F1	0172	0900–1300	—	USSR	Printer
		0272				
		0372				
28,272	F1	0272	HX	—	USSR	Printer
		0372				2f 14,136kHz
		0472				
28,280	A3	XX72	0800–1800	—	—	Broadcast
28,290	F1	XX72	0900–1300	—	USSR	2f 14,145kHz
28,300	F1	XX72	0800–1430	—	USSR	2f 14,150kHz
28,320	F1	0172	0900–1215	—	USSR	Printer
		0272				
		0372				
28,350	A3	0172	0900–1430	Radio Moscow	USSR	3f 9,450kHz
		0272				
		0372				
28,360	A3	0172	1030–1515	Radio Tirana	Albania	4f 7,090kHz
		0272				
		0372				
28,380	F1	0372	1135–1530	—	USSR	Printer
28,385	A3	0172	0900–1700	—	—	Broadcast
		0272				
		0372				
28,400	A3	0372	0900–1300	Radio Budapest	Hungary	4f 7,100kHz
		0472				
28,416	F1	0672	0830–1600	—	USSR	Printer
28,420	A3	0472	1030–1830	Radio Nacional	Spain	4f 7,105kHz
		0572		Espana		
		0672				
28,432	F1	XX72	HX	—	USSR	2f 14,216kHz
28,440	A3	0472	0930–1000	Voice of America	USA	
		0572	1800–1830			
		0672				
28,470	A3	0172	0830–1300	Radio Moscow	USSR	
		0272				
		0472				
		0572				
28,480	A3	0172	1000–1430	Radio Moscow	USSR	4f 7,120kHz
		0272				
		0372				
		0472				
28,480	A3	0272	1700–1800	BBC World Service	Great Britain	4f 7,120kHz
		0472				
		0572				
28,520	A3	0172	0800–1300	Radio Moscow	USSR	4f 7,130kHz
		0272				
		0472				
28,530	A3	0372	0800–1600	Radio Moscow	USSR	3f 9,510kHz
28,545	A3	XX72	1000–1830	Radio Ankara	Turkey	3f 9,515kHz
28,600	A3	0172	HX	Radio Moscow	USSR	4f 7,125kHz
		0272				
28,680	A3	0372	1800–1900	Voice of America	USA	4f 7,170kHz
		0572				
		0672				
28,710	A3	XX72	1000–1800	Radio Moscow	USSR	3f 9,570kHz
28,740	A3	XX72	0900–1715	Radio Moscow	USSR	4f 7,185kHz
28,800	A3	XX72	0900–1830	Radio Moscow	USSR	4f 7,200kHz
28,824	A1	0372	0900–1045	CQ De CMR	—	2f 14,412kHz
28,830	A3	0172	1030–1400	Radio Moscow	USSR	3f 9,610kHz
		0272				
		0572				
		0672				
28,880	A3	0672	1730–1830	Radio Budapest	Hungary	4f 7,220kHz
28,890	A3	0572	0830–1200	SBC	Sweden	3f 9,560kHz
		0672				
28,940	A3	0572	1745–1930	Rome Radio	Italy	4f 7,235kHz
28,965	A3	0172	0915–1400	Radio Moscow	USSR	4f 7,370kHz
		0272				
		0372				
29,020	F1	0172	1000–1500	—	USSR	Printer
		0272				
29,040	F1	0372	0900–1600	—	USSR	Printer
		0572				
29,115	F1	0572	0800–1830	—	USSR	Printer
		0672				
29,160	A3	0572	1200–1830	Radio Moscow	USSR	
		0672				
29,295	A3	0172	0930–1500	Radio Moscow	USSR	3f 9,765kHz
		0272				
		0372				
29,320	A3	XX72	0900–1800	Radio Moscow	USSR	4f 7,330kHz

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

Comments: A — Suffix to frequency indicates average frequency.
HX— Station active intermittently throughout 24 hours.
XX— Station active throughout complete six month period.
1 — Station heard on this frequency during previous periods.
2 — Station also heard by monitoring stations outside Region 1.
3 — Commercial activity. A number of net stations located in Kuwait also hold amateur station licences.

Consumer integrated circuits in amateur design

by J. R. HEY, Tech (CEI), MSERT G3TDZ*

Part 2. FM receivers

TRANSMITTING fm on our vhf bands is fairly popular mainly due to tvi considerations and reduced circuitry, but receiving this mode seems not to be undertaken with quite the same enthusiasm. The success of slope detection on which many stations are forced to rely depends upon the i.f. characteristics of their receiver and many, the author suspects, are less than satisfactory. In any case, slope detection foregoes the advantages conferred by limiters and a discrimator in the matter of noise reduction.

Modern television, and to a lesser extent the fm broadcast band, have caused a proliferation of ICs specially made for fm; almost every manufacturer has introduced at least one combined i.f. and detector ic. The earliest of these employed diode rings in their detector stage but soon the transistor double balanced coincidence detector became dominant.

Basically a high-gain limiting amplifier feeds two of the connections to the detector; the signal is then coupled to the quadrature circuit where it is shifted through 90° and applied to the other two detector inputs.

Sometimes an audio preamplifier is included, this being divided into drivers suitable for feeding valve audio stages and those for transistor circuits, which means they may be built into existing receivers. More recent ICs have remote volume control facilities.

A representative selection likely to be encountered is:

ATES TAA591, TAA691. Toshiba TA7028P.
RCA CA3042–43, CA3013–14, CA3041, CA3075, CA3065, CA3089.
SGS TAA661, TBA261B. Mullard TAA570, TBA480.
Texas SN76660. Sprague ULN-2117.
Motorola MC1357. Plessey SL432A.
Siemens TBA120A, and no doubt dozens more.

Two examples chosen to illustrate what goes inside a typical ic are one of the simpler modern examples, the TBA-120A (Fig 11), and just about the most complicated ever seen, the RCA CA3089 (Fig 12). The latter offers not only i.f. and detector but agc for tuner stages, audio muting or squelch, afc output for local oscillator control, and output for tuning meter, all of which is obviously aimed at the hi-fi stereo tuner rather than for tv; which is reflected in its price.

The TBA120A

Looking inside the first of our two examples of fm ICs, the TBA120A, we see the basic outline common to most, that is a high-gain limiting amplifier followed by a balanced coincidence detector. Support circuitry such as bias supplies accounts for the remainder of the components seen.

A series of long-tail pairs are dc connected, TRs1–2 to TRs11–12, with overall dc feedback to stabilize the working points of the whole chain, externally connected from pin 13 back to the input at pin 14.

Long-tail pair differential configuration affords excellent stability even over a loop as great as this. By making the ac decoupling which is necessary at pin 2 a capacitive divider with its centre returned to the input, a degree of neutralizing is realized ensuring unconditional stability.

As a dc path is necessary between pins 13 and 14, a load resistor whose value is that suggested by the filter manufacturer or one winding of an input coil may be wired here. Typical resistor values are 330Ω and 2·2kΩ.

Emitter followers TR13 and TR14 feed the push-pull signal to each of the balanced detector tail transistors TR17 and TR18; also to pins 6 and 10, the coupling points which feed into the quadrature circuit.

Small coupling capacitors of equal value connect externally between pins 6 and 10 and the quadrature coil with its resonating capacitor and pins 7 and 9, bases of emitter followers TRs 23–24 which feed the signal now in phase quadrature into the top half of the balanced detector, TRs 19 to 22. perfect balance is aimed at throughout; the cross-connected collectors returning directly to supply in one leg and through the load in the other.

As we shall see, this is perhaps one of the simpler ICs, yet by careful design and balanced circuitry, excellent stability, noise figure, and a.m. rejection is achieved.

To expand on those components not mentioned so far: a string of diodes D2 to D6 provide a voltage reference for the detector which together with TR16 form a stabilized supply for the amplifier stage. A constant current tail for the detector is formed by TR25. TR15 with D1 provides a means of remote volume control for tv receiver application.

The CA3089E

Examining now the internal organs of the CA3089E we first experience a nasty shock from the apparent complexity, but close study soon exposes a few familiar land marks.

As seen previously, the input at pin 1 must have a dc path from pin 3 with a capacitive divider decoupling pins 2 and 3.

Three long-tail pairs form the gain package, the first of which, TRs1-2-4-5, is cascode connected to reduce input noise, eliminate Miller effect and prevent the input filter from being mis-terminated on impulse noise. Each stage is coupled to the next by twin emitter followers and tail resistors replaced by constant current transistors: TRs3, 12, 18.

HT is supplied to each amplifier group via individual current amplifiers from a common zener reference, Z1.

The p-p swing applied to the detector system is further limited by crossed diodes connected across the common push-pull input to the detector and quadrature limiter.

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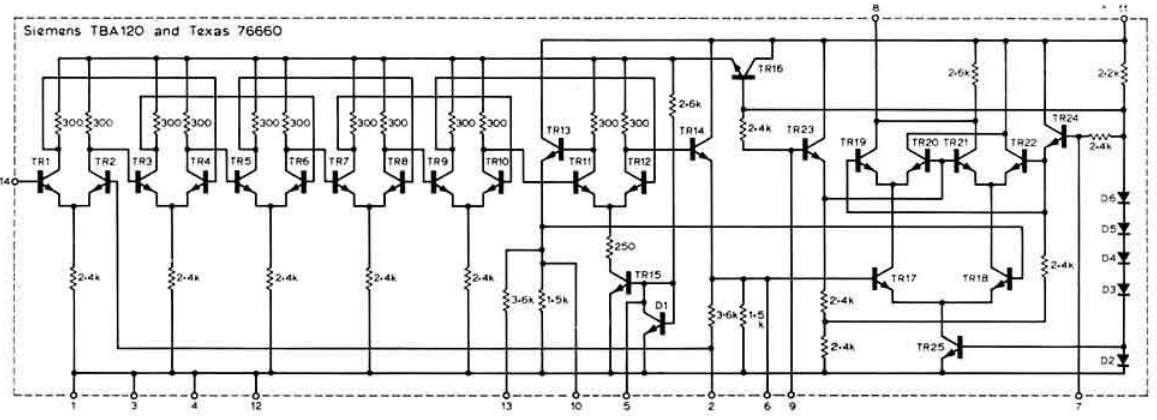
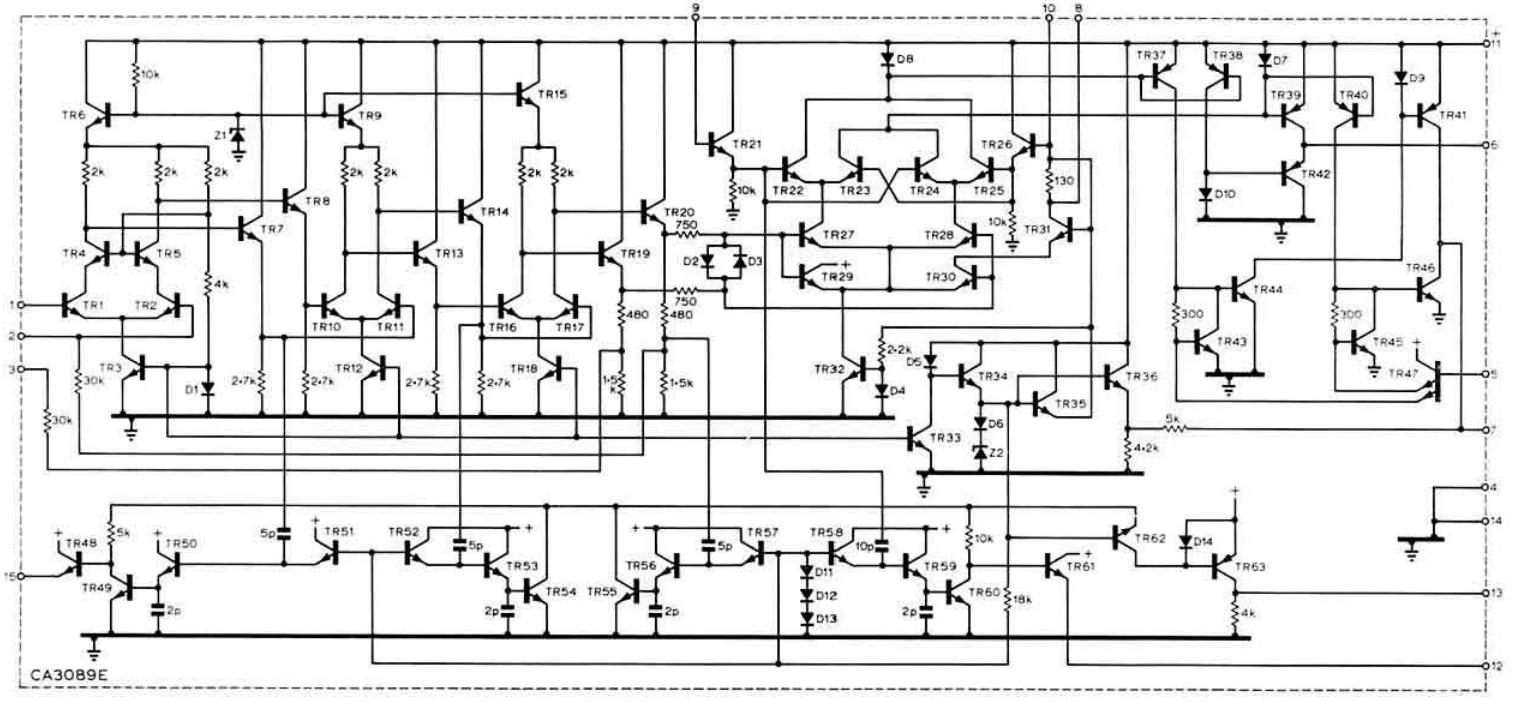


Fig 11. Theoretical circuit of TBA120A

Fig 12. Theoretical circuit of CA3089E



The double-balanced detector input TRs27–28, and the quadrature limiter input TRs29-30 are driven symmetrically so that the same delay distortion is encountered in both channels. The quadrature limiter drives the cascode transistor TR31 to further enhance the symmetry of the drive currents in the upper part of the detector TRs22-25 and in the current driving the quadrature tuned circuit which flows through R25. The voltage at pin 8 is coupled to the quadrature tuned circuit through an rf choke which equalizes the delays in the signal path.

Use of an rf choke rather than a capacitor to couple to the quadrature circuits has the advantage that the i.f. harmonic content across the latter is substantially reduced.

The detector output is taken from both sides and combined differentially to produce the desired balanced audio and afc voltage. At centre frequency both currents are equal; any shift producing either a positive- or negative-going voltage. The audio is obtained in the same way except that the differential current output is controlled by the squelch detector. The afc output, D7-TR38 and D10-TR42, translate the output current in one side of the detector so that it is replicated at TR42, the npn collector. Similarly D8-TR39 translate the current in the other side so that it is replicated at TR39, the pnp collector. Accordingly the current available at the junction of TRs39-40 collectors is the desired afc differential, and may be used as a current output or a voltage output.

The squelched af output is obtained in the same way as the afc. Two variable gain translators R26-TR43-TR44 and R27-TR45-TR46 are driven from the output of the squelch detector through the dual emitter follower TR47. As TR47 drives the bases of TRs43–45 in the positive direction, the base voltage of TRs44-46 is reduced thereby reducing the gain of the two translators.

The af output impedance at pin 7 is 5kΩ, chosen to provide a reasonable level of audio at a convenient output impedance.

Four level detectors TRs50-53-56-59 monitor the signal at each limiter and at the detector, from the quadrature limiter. TR50 also provides drive for the tuner delayed agc, while TR60 provides the drive for the squelch circuit.

A common bias supply for all four level detectors consists of the diode connected transistors D11-12-13 driven from R31 which establishes the zero signal output current of each detector. TRs58-59 function as a voltage doubler detector and TR60 is an amplifier; with a further emitter follower TR61 feeding the squelch or mute voltage to pin 12.

The sum of the level detector circuits' currents is also sensed by TR62 and fed via TR63 to pin 13 for driving a tuning meter.

Needless to say the complexity of this ic is well supported by impressive performance figures making it more suited to top class hi-fi applications than cut-price tv or amateur service.

Amateur service

Using circuits extracted straight from the entertainment industry might prove disappointing, as tv deviation is about 50kHz and fm broadcast 75kHz which means our amateur 3kHz deviation would produce a rather feeble recovered audio signal. Stepping up the af gain would only result in an inferior signal to noise ratio.

One glance at the quadrature circuit values gives the game away when you recover from the shock. "0·01μF at 455-kHz?", this gives a massive 200mV of audio from 3kHz deviation.

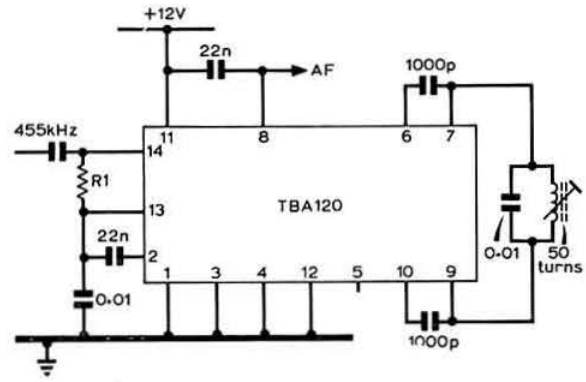


Fig 13. Circuit showing TBA120A as used as an nbfm detector

All these ICs make liberal use of the well-loved long-tail pair throughout giving good common mode rejection, that is decoupling requirements are minimized. Some are single-ended amplifiers, each stage coupled to the next by an emitter follower, others are push-pull over the entire i.f. The result is enormous gain with high stability and good limiting.

For our amateur needs we must choose an ic which does what we require, does it easily with few extra components and contains no unwanted extras for which we would have to pay. All of the ICs listed require but one coil although some employ odd value rf chokes feeding the quadrature network.

The ic to be described is offered by both Siemens, their TBA120A, and by Texas, the SN76660. Very few components are required; a supply of 12V is chosen.

Resistor R1 (Fig 13) depends upon what impedance the preceding filter or tuned circuits demand. One commercial filter has a load requirement of 300Ω while another states 2·2kΩ. If the ic is to be fed from an existing i.f. can, a link coil is wired between pins 13 and 14 in place of R1.

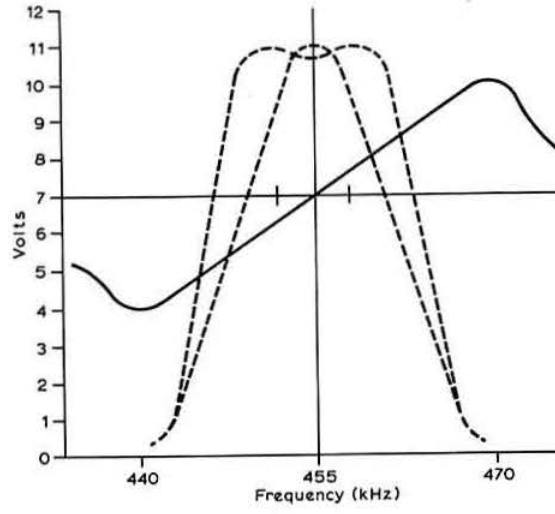


Fig 14. Detector output voltage shown against typical i.f. response curves

The circuit is easy to align and is very stable. A signal generator is placed in the centre of the i.f. passband and a voltmeter is connected to pin 8, the af output. A reading of some 7V is obtained while idling. As the slug of the quadrature coil (50 turns on a $\frac{3}{16}$in diameter former) is screwed in, a point is reached when the needle rises to about 10V, then swings linearly down to 4V, then slowly rises to its original 7V. The correct tuning point is between the 4 and 10V readings, that is 7V again.

Fig 14 shows the voltage swing described, which is the detector characteristic; on top of this are plotted some approximation of i.f. responses.

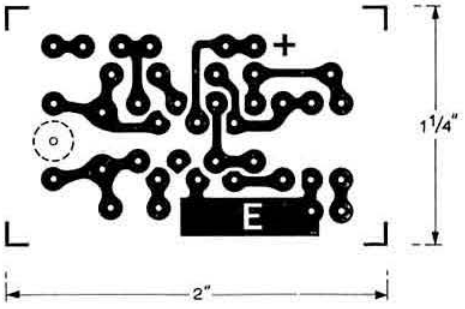


Fig 15. Printed circuit layout for circuit of Fig 13.

Performance

The only snag found so far is no matter how much gain is available, there is always going to be one station too weak to produce full limiting. Here the noise tends to be startling but dies to almost zero once a stronger signal is received.

For those building a new receiver, a section of printed circuit is shown in Fig 15 to help inclusion of this ic in the design.

In the photograph, the ic coil can be seen tucked in among the other components of a 2m transceiver.

Although this layout is only suitable for the TBA120A and SN76660 ICs, it should not be difficult to plan a layout for any modern ic. Perhaps the Mullard TBA480 would be a good choice; it is of advanced design with a few interesting

IC and quad coil tucked into a 2m transceiver (Detail from photograph in Part 1)

features, easy to get going as few extra components are required, and perhaps more easily obtainable.

Conclusions

Whether the individual feels the need to fit an f.m. detector or not is up to him. What the author has endeavoured to illustrate is how easy these new and inexpensive ICs make the task for us.

Addendum

Since this article was prepared, another interesting ic has come to light, employing a different principle to those described above. The ITT TAA710 has a mixer and oscillator which converts the fm signal to a low frequency i.f., which after amplification and simple low-pass filter, is applied to a pulse counting detector.

It will be interesting to see whether this method overtakes the established ICs in popularity.

To be continued

(Part 3 will look at power ICs)

Catalogues received

Electrovalue Ltd have recently published their catalogue No 6 which contains 96 pages of items of interest to every constructor. Approximately half the catalogue is devoted to semiconductors and integrated circuits while the remainder covers a variety of individual components. In addition there is a considerable amount of valuable information on equivalents and base connections. The cost of the catalogue is 10p post free while all orders from the UK over £2 are despatched post free.

Copies of catalogue No 6 can be obtained from Electrovalue Ltd, 28 St Jude's Road, Englefield Green, Egham, TW20 OHB.

Tronic Sales Ltd have recently published a 44-page catalogue covering a large range of accessories and components. Many of the items are of a type usually unobtainable at shops outside the larger cities. A feature of the catalogue is the dimensioned illustration accompanying each item. There is no minimum order, and post and packing is free on orders over £5. Below this figure there is a charge of 15p.

Copies of the catalogue, which costs 6p, may be obtained from Tronic Sales Ltd, 1 Buckwell Place, Wellingborough, Northants.

TECHNICAL TOPICS

by PAT HAWKER, G3VA

THE links between amateur radio and professional communications are very much two-way—both sides adopt ideas from the other; both play an important role in the progress of ideas out of the research and development laboratories into the testing world of practical operation. Any study of the history of radio communications will reveal many instances of ideas thrown up by amateur operation being hurriedly (or not so hurriedly) absorbed into commercial practice—and vice versa. So the amateur has to keep an eye on what is happening outside his own sphere of activities—and so, if he is wise, will the commercial communicator.

This year, two major professional communications events have taken place in the UK: "Communications 72", the first of what will almost certainly become regular biennial events; and the IERE conference on radio receivers at the University College of Swansea. Both these events brought forth a number of interesting papers on hf and vhf techniques and trends, and we have been reading through them carefully to pick out any items of concern to amateurs. This month we would like to draw attention to some papers on high-performance hf receivers—noting that a great deal of attention is now being devoted to improving front-end performance (a subject about which *TT* has long been concerned!).

Improving mixer performance

For example, A. E. J. Poultney of Plessey Radio gave an interesting survey at Swansea of the problems of dynamic range with semiconductor receivers and how these are currently being tackled, as the following extracts indicate:

"The principle source of non-linearity in superheterodyne receivers is the mixer. A great improvement in receiver linearity could be achieved if mixer linearity could be improved and amplification at signal frequency omitted . . . the advent of FETs raised high hopes; however, although good results have been obtained at vhf and uhf, FETs operated as non-switching mixers (ie in what are known as cnl or continuous non-linear modes) have not performed as well as was hoped at hf . . . Better performance has been obtained from developments of the switching mixer.

"A commonly used switching mixer is the double-balanced diode ring; using hot carrier (Schottky) diodes and oscillator drive of 1V emf, third-order intermodulation products of two input signals at levels of 100mV are typically 40dB below the level of the wanted output signals with insertion loss of about 7dB. The level of IPs produced by a switching mixer depends mainly on the effectiveness of the switching element; ideally the switch should change instantaneously from fully-on to fully-off . . . the greater the deviation from this ideal condition the higher the level of IPs. So a first step in improving mixer performance is to ensure the transitions from "on" to "off" take place as quickly as possible. One way is to drive the mixer with a signal with very fast rise and fall times . . . some experiments have been made using a pair of step-recovery diodes to produce a square-wave local oscillator signal . . . however, Racuse has shown that better performance can be obtained when using MOSFETs as the switching elements.

"The use of MOSFETs in a modification of the diode circuit of Fig 1 has led to a mixer giving IPs more than 90dB down on the wanted outputs for two input signals at levels of 200mV emf."

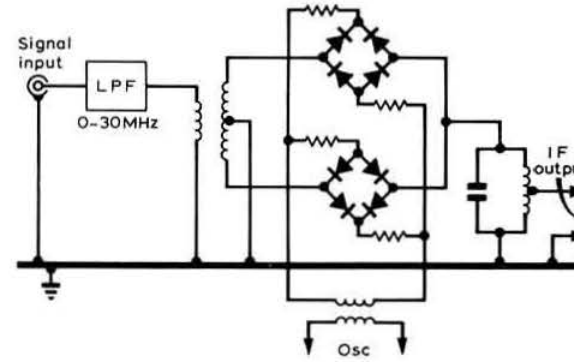


Fig 1. Diode mixer circuit from A. E. J. Poultney's paper. An improved version uses MOSFETs instead of diodes as the switching elements

It may be recalled that the use of FETs in a diode-ring type mixer was illustrated in *TT* in September 1971, but the above remarks clearly underline the importance of this approach to high-performance mixing. And if this seems just an academic exercise, it may be worth quoting briefly from a *Comm 72* paper by G. J. Lomer of Racal Communications.

"Receiver performance is principally determined by the performance of the first mixer itself, together of course with any rf amplification which may be necessary . . . accordingly a very large amount of effort has been expended in the last few years on all aspects of linear mixer design. This in itself is at first sight a contradiction in terms, since the requirement is for a mixer to behave as a perfectly linear device, which introduces a frequency translation in the signal path, yet to introduce this translation it must clearly behave in a highly non-linear fashion as far as the oscillator and signal mixing process is concerned."

This theme is found in a number of papers, and again shows that we are gradually approaching the stage when solid-state receivers begin to rival the very best valve models—but equally indicates that many of the so-called "high-performance" solid-state receivers marketed since the mid-'sixties have to be viewed with some caution—good though they may be in other respects.

We hope to refer to some of the other techniques described at these conferences on another occasion—for the moment we will just note in passing that a direct-conversion vhf receiver was described at Swansea. The Swansea papers are

in "Radio receivers and associated systems" *IERE Conference Proceedings No 24.*

The coaxial collinear array

In searching through the professional journals for ideas that might offer something of real practical interest to amateurs, a phrase such as the following can be calculated to attract attention: "There are a variety of situations in present day hf or vhf radio/radar applications that require a directional antenna which is lightweight, portable, easily-erected and reasonably inexpensive." You can say that again!

And this, in fact, is the promising start of an item, "A portable coaxial collinear antenna", by B. B. Balsley and Warner Eckland in *IEEE Transactions on Antennas & Propagation* (July 1972, pp 513–516). Further reading revealed a down-to-earth description of the construction of a 26-element aerial for 49·8MHz having a half-power beamwidth of 5·6°, using a technique which could readily be applied to similar or much less ambitious arrays for amateur hf or vhf work: Fig 2. Basically the principle is very simple: it is to form a collinear array by connecting together a string of $\frac{1}{2}\lambda$ (electrical) sections of coaxial cable, interchanging the inner and outer conductors at each junction. In this way it is clearly possible to form a collinear array (because the "wrong-phase" sections are shielded within the cable) without any of the usual phasing sections. Further, since the velocity factor of the cable is about 0·67, each half-wave will be only about a third of a wavelength long physically.

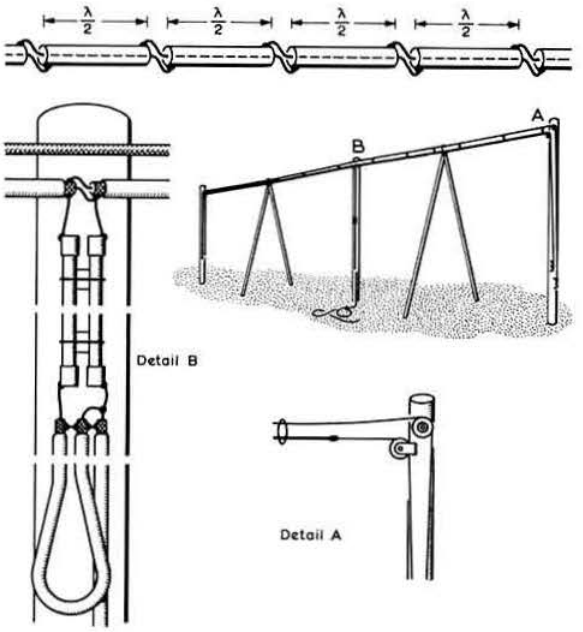


Fig 2. Basic principles of the coaxial collinear array and details of the 26-element array described in *IEEE Trans*, with coaxial aerial mounted on three poles. The nylon messenger line and polyethylene slip rings used to connect to the aerial are shown in inset A. Inset B shows feed arrangement consisting of balun and a quarter-wave matching transformer. All the electrical connections are waterproofed

Although the authors state frankly that the idea has been around for some time, and used before, it was new to me. However, a few days later, when talking to Vic Hartopp, G8COB, technical director of J-Beam, he immediately recognized the technique as having been used commercially in West Germany and also (for marine applications) by his own firm, though he agreed that little use appears to have been made of the principle for amateur operation.

The 49·8MHz aerial is formed from RG-8 coaxial cable (for use with radar peak powers up to over 100kW) with each junction carefully sealed and weatherproofed, and then suspended from three poles (plus guying between poles) using a series of slip rings and a $\frac{3}{8}$in nylon messenger line. The array is centre-fed from coaxial cable via a balun and quarter-wave matching section, although a balanced twin-line 300Ω feeder would probably be suitable where, as in this case, there are a considerable number of elements, with rather lower impedance for fewer elements. At the junctions the outer braid of the cable is peeled back about 1in from each cable end to expose the polyethylene insulation; the inner core is bound round and soldered to the outer braid of the next section. The weather sealing consists of first coating the entire connection with silicone sealant and then covering the joint with heat shrink tubing (such joints are claimed to withstand temporary tensions of over 300lb). The aerial is fed at the two outer (braid) conductors of the centre elements. (I am not sure from the diagram whether the inners are actually connected at this point, although from theoretical considerations this would appear to be immaterial).

The entire 26-element array, including messenger line, weighs less than 30lb and can be stored in a container 2ft by 2ft by 1ft; it is stated that total construction cost was about three times the cost of the coaxial cable; installation time (assuming the support poles are in place) less than one hour. Bandwidth to vswr of two is about 1MHz for the 49·8MHz array. The authors also indicate that by using four of these 26-element arrays (representing 104 elements), correctly phased, a half-power beamwidth of only 1·4° was achieved.

Probably few amateurs would aim even at 5° but with many less elements it should be quite easy to achieve, say, 15° in the two lobes (see *Radio Communication Handbook*, p13.56, Fig 13.96, for polar diagrams of collinear arrays with five elements and less). With two arrays and appropriate phasing, it would be possible to make a unidirectional aerial along the lines of the G8PO and ZL-special.

So, though we stress G8COB's comments that this is not a new idea and is not foolproof, it seems well worth bringing it to the attention of amateurs, for hf and vhf fixed beams, and for portable applications.

Polarization switching made easy

In *TT* (July 1970) when describing a vertical-T or inverted ground-plane aerial that I had been using on 14MHz, I stated: "The ease with which a dipole aerial can be converted to a vertical-T suggests that it should be relatively easy to develop an aerial which could be switched from horizontal to vertical polarization and vice versa". At the same time attention was drawn to a Telefunken mf broadcasting aerial which allows polarization to be changed at dusk to reduce interference.

Now in *CQ* (July 1972), Ken Glanzer, K7GCO, follows up this suggestion and describes "The 10°–90° antenna for

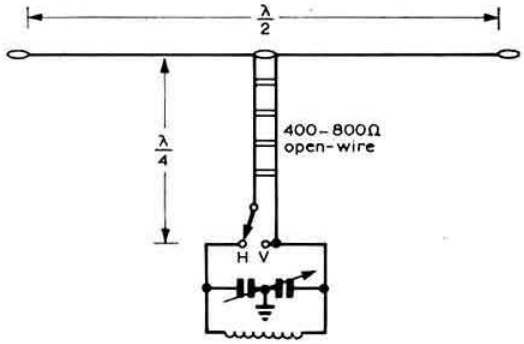


Fig 3. The K7GCO aerial for 3·5 and 7MHz can be switched from vertical to horizontal polarization using the inverted ground-plane or vertical-T principles described in *TT* (July 1970)

75 and 40 metres": the two angles referring to the predominant vertical radiation angle—90° with the fairly low horizontally polarized dipole and (hopefully) 10° with the aerial in its vertical-T configuration. Those who recall the original *TT* notes (also *ART3* and *4*) will have little difficulty in sorting out the K7GCO arrangement of Fig 3. The twin open-wire feed is used as such for horizontal polarization, but switched so that both wires go to the same side of the matching coil to form the voltage-fed ¼λ top-loaded vertical. In his implementation of this arrangement, K7GCO incorporates remote switching and remote (selsyn) tuning of the matching unit, in his belief that it is very useful to be able to switch rapidly between the two polarizations to take advantage of propagation quirks, noting that there may even be occasions when it is better to switch to a different polarization for reception than transmission—which is in line with our remarks in the August *TT*.

Simple rf noise bridge

A number of descriptions have been published on simple rf noise bridges using zener diode noise generators along the lines of the well-known Omega-T unit (reviewed by G2BVN with circuit details in *Radio Communication* October 1968). One example was a home-constructed bridge described by Don Nelson, WB2EGZ, (*Ham Radio* December 1970), and this triggered off basically similar units by Phil Williams, VK5NN, (*Amateur Radio* October 1971), and now more recently by Fred Johnson, ZL2AMJ, (*Break-in* May 1972) and Vekko Aumala, OH2CD (*Radio-amatööri* June 1972). On the premise that any unit that has gone through this number of metamorphoses must clearly have more than proved its use, the ZL2AMJ circuit and full constructional details are given in Fig 4.

While it would be over optimistic to expect a simple unit to provide the sort of facilities found in high-grade professional rf bridges costing hundreds of pounds, there is equally little doubt that the zener noise generator plus bridge can provide a useful means of finding out a good deal about the impedance of the transmitter or receiver end of an aerial feeder, even when incapable of truly separating the resistive and reactive components. As WB2EBZ put it: "The rf bridge takes over where the vswr bridge leaves off . . . I feel certain that building this bridge will be the most rewarding project the experimenting amateur will undertake this year." ZL2AMJ is a little more restrained but says: "Provided the limitations of this unit are accepted it is a

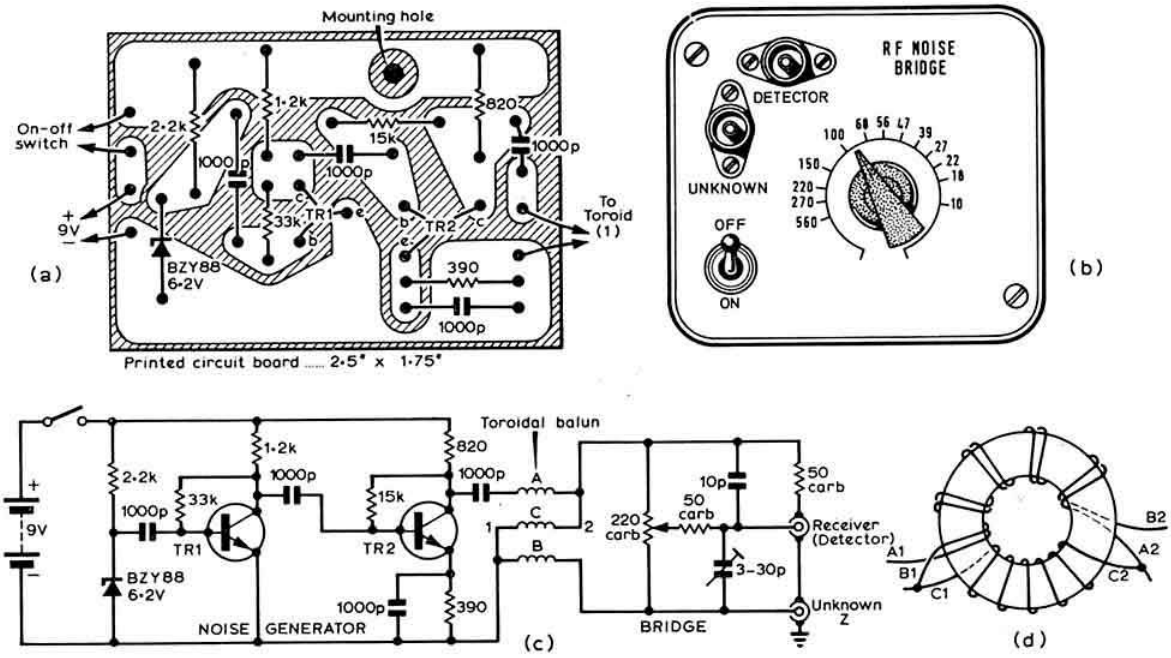


Fig 4. The ZL2AMJ version of the simple rf noise bridge with zener diode wideband noise generator

very worthwhile device for those hams undertaking antenna changes . . . it is a vast improvement on the antennascopes of yesteryear."

The upper frequency limit depends very much on the construction of the bridge and the reduction of unbalancing stray capacitances. Little difficulty need be expected below 30MHz but it may be tricky to extend this to 144MHz, though WB2EBZ considers that by carefully compensating for circuit strays it would be possible to extend the limit to 450MHz and claimed his unit as satisfactory to 220MHz. Strict attention needs to be paid to the toroidal balun, and the type shown is designed to have significantly better broadband characteristics than the more common trifilar-wound units. The toroid used by ZL2AMJ was a Philips (Mullard) type 2P65347 4 C4 grade Ferrox wound with 26swg enamelled wire, although other toroids should prove suitable. Windings A and B of the balun are 26swg enamelled copper wire twisted together (three twists per inch) before winding on to the core. Nine turns of this twisted pair are wound on the coil. Winding C is also nine turns of the same wire, continuing the A and B winding direction and joining between A2 and B1. It is advisable to use a multimeter to determine all wire ends before finally connecting. All wiring of the bridge section should be with thick copper wire using shortest possible lengths. The trimmer capacitor is adjusted for optimum null during calibration and then left fixed.

In theory, if not in practice, the potentiometer will balance any resistance placed in the "unknown" arm of the bridge, but it will usually be advisable to limit its use to around 20 to 300Ω. WB2EBZ used a 100Ω linear potentiometer; ZL2AMJ a 220Ω carbon potentiometer which happened to be available. Calibration is done at low frequency using non-inductive (carbon) resistors of known value. The station receiver is used as the null detector, and the impedance to be measured plugged into the bridge. The unit is adjusted for minimum noise from the receiver and the unknown impedance simply read off.

The following notes on its use for aerial matching are taken from the original WB2EBZ article:

(1) Connect rf bridge directly to the aerial or at an electrical half wavelength away from it (you can determine the electrical half wavelength with the bridge by setting the bridge to zero and placing a short-circuit across the end of the transmission line—cut small lengths from the line until a null is obtained at the frequency of interest. In this way the bridge is effectively placed at the aerial, reducing transmission line errors.

(2) Tuning the aerial to frequency: you can find its resonant frequency by a null on the receiver. A sharper null will be seen with the bridge adjusted by the impedance of the aerial system. Adjust aerial length until the null occurs at the desired frequency.

(3) By adjusting the matching section, tune your aerial to the desired impedance as shown by the rf bridge.

WB2EBZ also points out that the bridge can help you determine the optimum tap position for input matching to converters, pre-amplifiers, receivers etc. Procedure is the same as before except that the unknown terminal is connected to a receiver input. Then with the bridge dial set to the desired impedance, the tap is adjusted for best null. And of course any series-resonant circuit can be checked if placed across the "unknown" terminal; it is also possible to get some idea of a resistance in series with L and C.

High-performance af filters

Reference was made last month to the series of articles in *Electron* by T. W. H. Fockens, PA0KDF, covering in detail the design of a three-band direct-conversion receiver. In the July issue he describes two high-performance audio filters; one for ssb (with out-of-band rejection about 60dB); the other for cw (875Hz). Both filters (Fig 5) are designed for an impedance of about 2,100Ω, and could of course be used

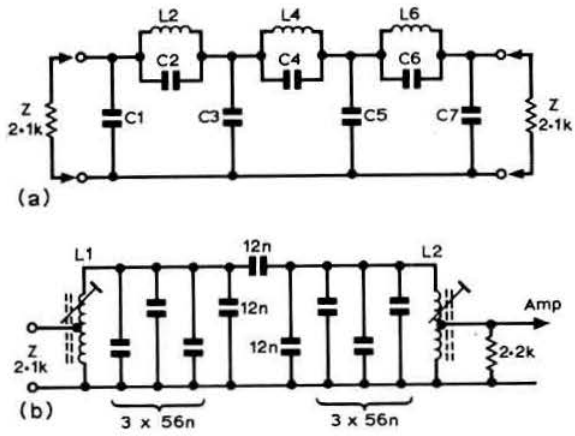


Fig 5. The phone and cw filters used by PA0KDF in his high-performance direct-conversion receiver

for applications other than dc receivers, provided the impedance was of this order. The capacitor values which follow are design figures, with an indication of how these can be made up reasonably accurately with standard values.

C1 37·26nF (made up of 33,000 + 2,200 + 1,800 + 220pF); C2 3·871nF (3,300 + 560pF); C3 51·87nF (37,000 + 4,700 + 150pF); C4 19·06nF (18,000 + 1,000pF); C5 46·41nF (39,000 + 6,800 + 560pF); C6 13·53nF (12,000 + 1,500pF); C7 29·85nF (27,000 + 2,700 + 150pF); mica or polyester or styroflex types; L2 168·2mH (540 turns); L4 124·5mH (460 turns); L6 129·5mH (470 turns) using P30/19·3H1 pot cores, 0·25mm enamelled wire.

For the cw filter the capacitors are cylindrical polyester or styroflex types, 5 per cent or 1 per cent. L1 and L2 are 550 turns with tap at 165 turns on a pot core of the type used for the ssb filter.

Transistorized harmonic detector/field strength meter

Barry Priestley, G3JGO, and Roy Stevens, G2BVN, have drawn attention to a sensitive harmonic detector described in *Radio-REF* (July 1972). This covers the ranges 45–100MHz and 100–220MHz with a sensitivity of the order of 5μV for 22μA deflection. Since the original design included some rather odd component values and two of the transistors in the i.f. amplifier were found to "bottom", G3JGO has modified the circuit and Fig 6 shows his suggested arrangement. He adds:

"The high-sensitivity untuned mixer also seems less than ideal for "witch hunting" close to a transmitter: a dual-gate

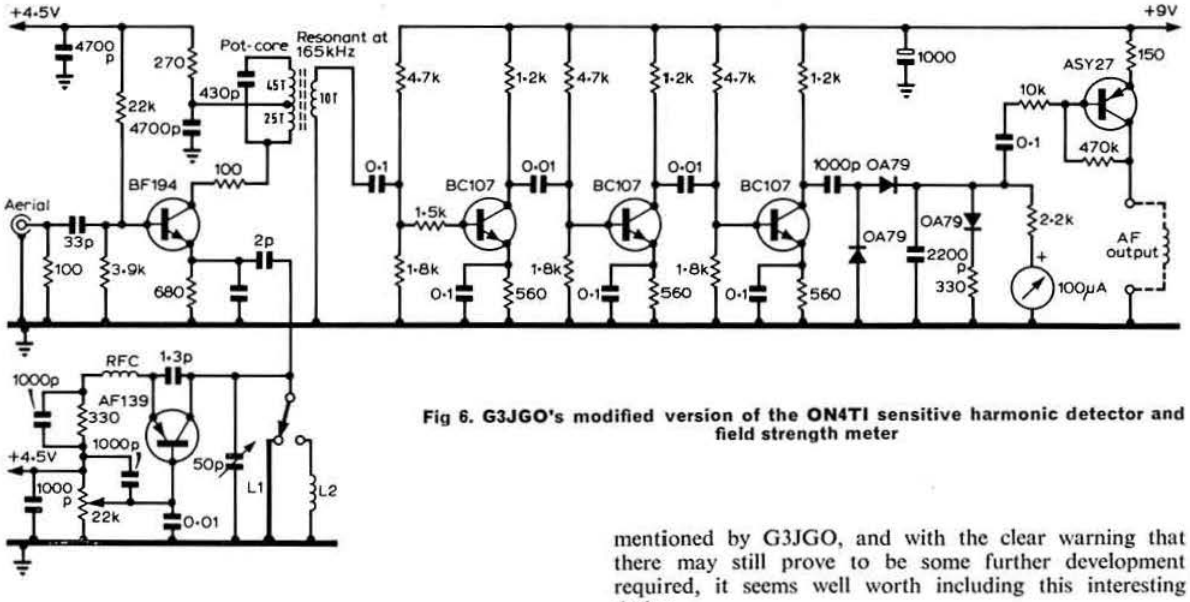


Fig 6. G3JGO's modified version of the ON4TI sensitive harmonic detector and field strength meter

mosfet mixer with an input circuit ganged to the oscillator would seem more attractive. But the principle seems ideal for a portable field strength meter for any frequency, or as a simple receiver if a second channel only 330kHz away is not too annoying. Both G2BVN and I feel that if a few members take up the development, a useful device could evolve.

"Two points: L1 is formed by the 1in leads to and from the wavechange switch to the 50pF capacitor. Secondly, the capacitor across the mixer emitter resistor is said to be 0·01µF and yet 200–300mV of oscillator injection is applied across it! If the value is in fact a more credible 100pF there will be negative feedback at 165kHz due to the 680Ω resistor; this will reduce the mixer gain without improving its overload performance, but not having tried this part of the circuit I cannot speak from experience."

For a long time, those investigating tvi have sought a sensitive detector comparable to the valve types that were widely used a few years ago. So despite the reservations mentioned by G3JGO, and with the clear warning that there may still prove to be some further development required, it seems well worth including this interesting design.

Improved simple squelch

A simple method of applying effective squelch to a valve receiver is reported by R. A. Stratford in *Radio-ZS* (May 1972): Fig 7. This uses a second diode to overcome the problem of noise leak through the low back resistance of a germanium switching diode without introducing the unwanted capacitance leak of a silicon diode.

The 220kΩ resistor in series with a silicon diode D1 forms the usual series-type agc-controlled squelch arrangement. But a second diode (D2) plus the capacitor C1 prevent noise breakthrough when no signals are present by effectively shorting the noise output to ground.

In the absence of an incoming signal, the squelch control is adjusted so that D1 is biased slightly beyond cut-off; when a signal arrives, the agc reduces current through V1, causing the screen voltage to increase, D1 now has its anode more positive than its cathode and conducts.

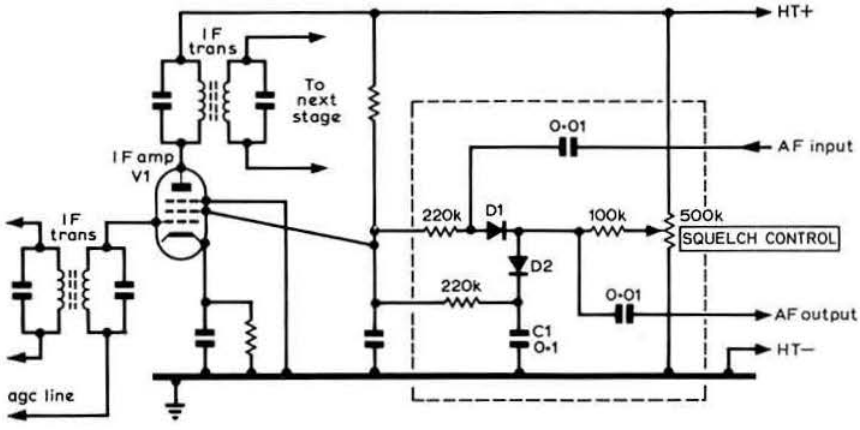


Fig 7. Simple squelch arrangement using extra diode to reduce noise leak-through

IC crystal clocks

There is a good deal of interest these days in crystal oscillators or "clocks" using the gates of integrated circuits. Alan Bosworth, G3GUD, reports good results with the arrangement shown in Fig 8, using the popular SN7400N device. This has worked well with crystals from about 1 to 11MHz and was found included by Hank Olsen, W6GXN, in a survey article in *Ham Radio* (July 1969) as being suitable for use with ttl logic. In this connection, G3GUD is a little concerned at sometimes finding circuits presented in amateur journals as though they were original developments when they are not. A difficult problem indeed! On the subject of oscillators for calibrators and counters, he notes that most amateurs start with a 1MHz crystal, but recalls the advice of W6FFC to start at higher frequencies. G3GUD, with his interest in vhf, starts at 8MHz.

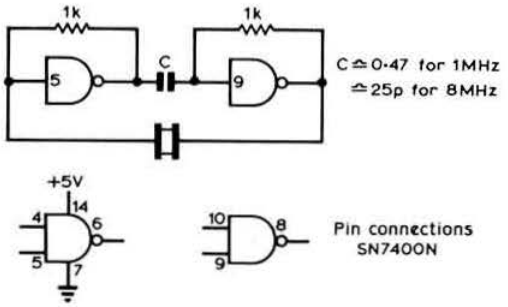


Fig 8. G3GUD recommends this ttl logic arrangement for the crystal clock for digital calibrators/frequency counters etc

The "Fetron"

Edgar Janes, G2FWA in the *Cheltenham Group RSGB Newsletter* draws timely attention to a recent article in *Electronics* (10 April 1972) on the "Fetron"—a semiconductor device designed specifically to be a direct plug-in replacement for such valves as the 6AK5 and 12AT7 without having to modify the existing circuit or equipment.

These devices (being produced by Teledyne Semiconductor, Mountain View, California) use high-voltage junction field effect transistors (jfet) able to withstand the ht voltage of valve equipment. Two basic packages are used: one has a single jfet; the other uses two cascode-connected jfets to provide high amplification. These devices, with any necessary components, are built into an oversized ic metal can having the same pin configuration as the valve it is intended to replace. As G2FWA points out, the pictures show that they look rather like tiny EF50s.

Apart from the 6AK5 and 12AT7, Fetron replacements for the 6BA6 vari-mu pentode and the 6AQ5 or 6V6 power output valve (ideal for transmitter applications?) are proposed.

These devices are clearly intended for the still large professional market for valve replacements (the USA telephone system alone still has some 150-million valves in use). The article suggests indirectly that (at least in large quantities) the price of a Fetron would be under $5—though of course this is a good deal more than most of us now pay for valves in these categories. But the Fetrons could provide higher amplification factors, lower noise and higher maximum frequencies than the valves they replace; they would operate at lower temperatures without power waste in heaters or screen grid circuits; and should provide lifetimes an order of magnitude longer than typical valves; and would be physically tougher. Apparently high-voltage jfet technology was developed for American military systems several years ago.

The l.e.d. voltage indicator

Peter Davis, G3ZXV, was interested in the French "automatic battery indicator system" (*TT* June 1972) but feels that more could be provided with an even simpler circuit based on the use of a light-emitting diode (l.e.d.). In recent months these most useful little devices have become readily available and are not at all expensive taking into account their long life and the fact that they do not need a holder. As G3ZXV points out they can easily be pushed through a small hole drilled in an existing panel. For those not yet familiar with these devices, they can be thought of simply as tiny little indicator bulbs operating on a fairly wide range of current values (easily visible from a few milliamps to 20mA or more).

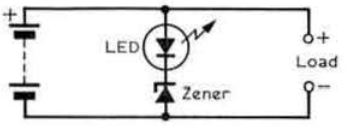


Fig 9. G3ZXV's simple battery-state indicator based on a light emitting diode

Fig 9 shows G3ZXV's suggested arrangement to give a useful indication of the state of the battery voltage during the entire discharge process—and with negligible current consumption in the "battery low". The zener diode backs-off most of the battery voltage with the result that only voltage variations appear across the l.e.d. The zener is selected to be about 0·5 to 1V less than the minimum working voltage of the equipment. If it is found that the current variation through the l.e.d. during battery life is excessive this can be reduced by putting a small resistor in series with the l.e.d. Like a zener, the l.e.d. exhibits non-linear resistance characteristics and there is a large current change through it for small voltage changes across its terminals.

Loop aerials for mf and 1·8MHz

B. Walsh, BRS32233, confirms the details given last month of the medium-wave loop aerial and also the effectiveness of such aerials for nulling out European signals while searching for mf dx. He says he has also used one for 1·8MHz reception and found that signals which were extremely weak on a long-wire became adequately readable on the loop when interference had been nulled out. Because of the modest size they are easily rotatable, and his own loops stands next to the operating desk. These aerials have become very popular with members of the "Medium Wave Circle" of which BRS32233 is a member.

Here and there

Several more comments have been received on ssb speech processing and we hope to report on these shortly.

SWL NEWS

by BOB TREACHER, BRS32525*

IT seems as though Yaesu-Musen have come up trumps again by bringing on to the market their FR50B receiver. This is a conveniently priced receiver which covers 10-80m, plus WWV, and provides a high degree of sensitivity and selectivity. It has found its way into many swl shacks already and those who have written seem highly delighted with its performance. Basically, it is very much the same as the more expensive FR100B. It has 1kHz readout, built-in speaker, S-meter, noise limiter and many other features, and it seems to be a very fine buy indeed.

The holiday mail

Final copy date for this issue was well and truly in the middle of the holiday season and as a result comments are mainly about /A locations, aerials draped around picture frames at holiday hotels and the lack of sunshine. However, the sun certainly seems to have shone for Bernard, BRS25901, on 15 and 20m recently. He heard the expedition to Fernando de Noronha Is (off the coast of PY) PQ0MI, KX6AA, VP2VV/FS7, 5U7AS and 9L1VW (a speedy QSL returned via W9FIU) to name but a few. Latest QSLs to hand include K9KNW/CE0, VP1BH, 4U4ITU and XX7IK.

Your scribe spent the late evening hours during June and July trying to winkle out the dx on the lf bands. The QRN level, especially on 80m, was S9 + 20dB at times but stations heard included five ZSs, ZS2MI (Marion Island) ZS3PT (SW Africa), CR6 and 7, TN8, 5Z4, 9G1 and many South American stations at the top end of 80m. On 40m there seemed to be the same half dozen dx signals audible. The terrific bc QRM must surely frighten the dx off this band. As a matter of interest the best QRGs to QSX for the dx on 40m are around 7,045kHz and between 7,080 and 7,085kHz.

The period in question gave Chris Henderson, A7460, some choice Pacific dx on 15m in the shape of KC6, KX6 and VR4 but he remarks that he is still waiting for an elusive C21. Nauru is, of course, one of the rarer Pacific islands which is on the wanted list of many European dxers. Neville Spry, BRS17567, and Stuart Phillips, A6686, comment on the interference problems on the lf bands which was raised by R. A. Beament last time. Stuart quite rightly points out that 80m is a shared band but that the interference which we are anxious to stop is that caused by people blowing into and scratching microphones, playing music over amateur transmissions, and various other forms of deliberate QRM. Much has been said both in magazines and over the air about this, and for the time being we will unfortunately have to grin and bear it. Stuart also wishes to correspond with ex-DL5XC and ex-DL5XD. The address of the latter is N. G. Cooper, G3LMO, 40 Helston Drive, Emsworth, Hants. Any reader with information of the whereabouts of ex-DL5XC please let the writer know and he will forward the information on to Stuart.

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

David Johnson, A7511, sends an entry for the countries table but unfortunately it does not quite reach the qualifying mark. However, David's plans for the summer holidays included building a 2m aerial and mounting it on the roof and constructing a console to put the operating equipment in.

Several G3s have written commenting on the excellent reporting on their mobile signals by Nick Bainbridge, BRS 32388, the format which Nick uses for his reports shows by way of a graph signal strengths and readability over a period of time along with detailed comments on the transmission and band conditions. This goes to prove that a carefully and well prepared report does meet with distinct approval from innumerable licensed stations.

The Countries Table

The response for entries into the Countries Table has been really fantastic and as a result it is beginning to take over the feature. We have, therefore, had to draw a line and include only those entries with a total of 100 or more; it is unfortunate that this action has to be taken but as soon as the qualifying score is reached let the writer have an entry and it will be included. Entries must be based on the RSGB Countries List only.

Updatings for the 1972 Countries Table

	10	15	20	40	80	160	Total
BRS17567	108	181	185	33	77	5	589
A7460	91	167	128	65	55	9	515
BRS25901	67	131	181	61	71	3	514
A4483	111	136	140	58	58	4	507
BRS33364	49	125	109	34	36	2	355
A7780	77	108	93	30	42	5	355
BRS32524	20	95	119	39	55	3	331
A6686	49	96	96	17	20	6	284
A7159	37	55	73	22	45	2	234
A8037	36	68	60	18	22	1	205
BRS33231	12	40	72	14	27	2	167
A7254	12	50	63	8	30	1	164
ORS30694(ON)	4	40	70	22	12	3	151
A8054	0	0	109	30	0	0	139
A7925	7	47	64	5	10	2	135

SWL contests

Many readers will have seen the notice in last month's *Radio Communication* regarding the swl contest organized by the Cray Valley RS to be held on 23–24 September. This society runs a yearly contest for SWLs and this one will be the fourth. Entries have been received from many parts of the globe in previous years and it is hoped that this latest one will be no exception.

Remember that there are receiving sections to both the RSGB 21/28MHz and 7MHz contests in October and November.

Finnish swl awards

The Finnish Short Wave Listeners Club has sent details of awards from their society as follows:,

HSGWA (Ham Spirit Goodwill Award): This certificate is awarded to any radio amateur who has received and answered swl reports from at least 30 OH swl stations.

HAOH (Heard All OH): Awarded to any swl who has received at least 25 different QSL cards from OH including at least six different OH prefixes (Prefixes from OH1 to OH0).
HAOHE (Heard All OH and Europe): Available to any swl who has received one QSL from at least 15 countries in the continent of Europe.
OHHAWAC (OH-Heard All WAC): Those who have received one QSL card from each of the six continents can claim this award.

The rules are the same for each, and each application must be certified by two licensed amateurs. The callsign, date, gmt, band and mode must be given. QSL cards are not required to be sent. The cost of each award is eight IRCs and the address to which applications should be sent is SKA Club, Box 150/00141 Helsinki 14, Finland.

All correspondence for the November issue to reach the writer by 5 October.

RAE COURSES, 1972-3

Bangor, Co Down. Further Education Centre, Bangor, Co Down. Course tutor, C. Billington, GI3WSS, further details from the principal at the college.

Bath. City of Bath Technical College, Bath. Enrolment 7 and 8 September, room 121. Class commences Wednesday 20 September. Instructor, P. A. Bubb, G3UWJ.

Birkenhead. Birkenhead Technical College, Borough Road, Birkenhead. Classes held on Thursday evenings, course tutor Mr L. Roberts, G3EGX. Further details from the college.

Brighton. Brighton Technical College, Pelham Street, Brighton BN1 4FA. Two evenings per week. Further details from Faculty of Engineering, at Richmond Terrace. Course ref No C & G No 765 (55).

Cambridge. Cambridgeshire College of Arts & Technology, Collier Road, Cambridge. Enrolment Monday 18 September, 5.30-7.30pm, and Tuesday 19 September, 10-11.30am, 2.30-3.30pm and 5.30-7.30pm.

Canterbury. Canterbury College of Technology, New Dover Road, Canterbury. Course tutor, G3LCK. Further details from the college.

Chatteris, Cambs. The Chatteris Evening Centre, Wenny Road, Chatteris, Cambs. Enrolment Wednesday 13 September (evening), class Wednesdays 7.15-9.15pm, commencing 20 September. Course under the guidance of G3SPK and G3NVM. Further details from the college, tel Chatteris 2527.

Chingford, London. Chingford Community Centre, Friday Hill House, Simmons Lane, E4. Enrolment 18-20 September, 7.30pm. Classes commence 25 September, 7.30-9.30pm. Fees for two terms plus, seniors £2.65, juniors (under 18) £1.25. Instructor, G2HR, QTHR.

Crawley, Sussex. Crawley College of Further Education. Enrolment on 11, 12 and 13 September. Further details from G. Bowden, G3YVR, 51 Leighlands, Pound Hill, Crawley, Sussex, tel Pound Hill 3253.

Dundee. Kingsway Technical College, Old Glamis Road, Dundee. Classes held each Thursday, 7-9pm (morse 6.30-7.00pm). For further details contact the instructor, Mr F. Baxter, GM3VEY, or the college at the above address. The college has a flourishing ARC operating GM4AAF.

Glasgow. Glasgow Corporation Further Education Department, at the College of Nautical Studies, 21 Thistle Street, Glasgow C5. Commences Tuesday 12 September, held on Tuesdays and Thursdays, 7 to 9.30pm. Enrolment at 7pm on the opening evening. Fees £3 per course, no fees for students under 18.

Heanor, Derbyshire. South East Derbyshire College of Further Education, Ilkeston Road, Heanor, Derbyshire. Enrolment 7 and 8 September, 6.30-8.30pm. Commences Wednesday 27 September, 7-9pm.

Hull. Hull & District Amateur Radio Society will be running RAE courses on Friday evenings at 9.30pm, commencing Friday 8 September. Further details from club sec, Mrs M. E. Longson, 4 Chester Road, Wold Road, Hull HU5 5QE.

London Borough of Merton. Merton Technical College, Morden Park, London Road, Morden. Enrolment 11 and 13 September, 6-8pm. Lectures every Wednesday, 7-9.30pm, commencing 18 September.

Loughborough. Loughborough Technical College, Radmoor, Loughborough, Leics. Enrolments 11, 12 and 13 September, 6-8pm. Lectures every Tuesday (morse practice 6-7pm, theory 7-9pm), commencing 19 September. Lecturer D. R. Doughty, G3FLS. Fee £4.65.

Manchester. Openshaw Technical College, Manchester 11. Enrolment 11, 12 and 13 September. Classes begin 26 September. If there is enough support, a short course for licensed amateurs on "The elements of microwave technique" may be held. Enquiries re both courses to G3IOA (course instructor), 201 St Marys Road, Moston, Manchester 10, M10 OBN.

Northwood, Middlesex. Northwood AEC, Northwood School, Potter Street, Northwood, Middlesex. Enrolment 9 September, 10am-3pm, and 11 September, 6.30pm-8.30pm. Further details from G4AGB, H. Hardy, BEM, 12 Lawn Close, Ruislip, Middlesex.

Perth. Perth Technical College, Crieff Road, Perth. Students should enrol at the college immediately, lecturer GM3YEW.

Pontefract, Yorks. Pontefract and Castleford Institute of Further Education, Knottingley High School, Knottingley, Yorks. Enrolment Friday 15 September, 7-9pm. Classes held every Wednesday, 7-9pm. Instructor, A. E. Ashby, G3HCW.

Princes Risborough, Bucks. Adult Education Centre, County Secondary School, Princes Risborough. Enrolment 5, 6 and 7 September, 7-9pm. Courses held 7-9pm Mondays (theory—lecturer R. Whiting, G3POF) and 7-9pm Thursdays (morse—instructor S. Ford, G4ACV), commencing 18 September. Fees £3 per course.

Scunthorpe, Lincs. North Lindsey College of Technology, Kingsway, Scunthorpe, Lincs. If there is enough support, a course will begin mid-September. All enrolments/enquiries to the secretary at the above address, as soon as possible.

Sheffield, Yorkshire. Crosspool Adult Education Centre, King Edward VII School, Darwin Lane, Crosspool, Sheffield 10. Enrolment during week commencing 25 September, commences on Wednesday 4 October. Further details from J. Bell, G3JON, QTHR, tel 367774 (home), 732333 (office).

Southend-on-Sea, Essex. Southend-on-Sea College of Technology, enrolment 11-14 September.

Wembley, Middlesex. Wembley Evening Institute, Copland School, High Road, Wembley. Enrolment 11 to 14 September. Classes 7-8pm (morse), 8-10pm (radio theory), each Monday, commencing 18 September.

Wolverhampton, Staffs. Ounsdale Schools, Wombourne, Staffs. Classes every Wednesday, 7-9pm, commencing 13 September. Instructor, Bob Tomkys, G3NOW.

FOUR METRES AND DOWN

by JACK HUM, G5UM*

GM-pathy (or book now for 1 October)

"The timing of this year's Scottish VHF Convention to coincide with the Region 14 Official Regional Meeting was deliberate, in order to expose as many operators as possible to the fascination of vhf in the hope of getting more converts", says GM3UWX.

This positive exercise in good tactics coincides with a substantial growth of interest in Scotland in 4m and 2m activity that promises well for the success of this year's vhf convention at the Shawland's Hotel in Glasgow on Sunday 1 October. Previous Scottish vhf conventions have shown that the GM event yields nothing in technical flavour and a general sense of togetherness to its southern springtime counterpart at Whitton, a fact which will probably persuade many members south of the border to make the journey to Glasgow next month.

Accenting the theme of "UHF and upwards", the convention will open at noon with equipment displays, and the official opening ceremony will follow at 1400. Principal speakers will be the Society's VHF Manager, Geoff Stone, G3FZL, and Harry Mackie, GM3FYB. Members may expect 'FZL to bring them up to date on (among other things) the two major events of 1972 most likely to vary the picture of metre-wave activity as we see it today; these are repeaters and the highly important decisions taken at the IARU Conference in May.

Between the afternoon session and the dinner (1900 for 1930 hours) plenty of time will be provided for the informality of personal QSOs, always an opportunity to do a bit of brain picking from those of one's fellows who know far more about it all than oneself.

The committee has held prices down to 25p convention only, and £1.75 for convention and dinner. Send sae and remittance in favour of West of Scotland Amateur Radio Society to Arthur O'Lone, GM3EXX, 8 Kirklee Terrace, Glasgow G12 0TH, who is available on the landline at 041-334 2526.

We are told that accommodation can be arranged if required, a matter of some importance to the dx travellers. It is desirable to make your accommodation requirements known well in advance to 'EXX.

By the way, as a concession to mobileers who have not yet got themselves fully metre-waved, there will be a talk-in station on 80m as well as on 4m and 2m.

ERP in the field

In terms of persons participating, September's VHF National Field Day ranks as the Society's most popular contest. Many explanations may be adduced for this, not the least of which is that the event is largely a telephony one. The table on this page shows its growth since it began a decade ago.

In spite of the huge entries for other vhf contests this year (107 for the March two-bander 144/432MHz and 93 for the May 144MHz) it is a fair guess that more metre-wave rf will have been generated during VHF NFD this month than at any other time of the year. And in spite of the 25W power limitation this rf, radiated from chosen prime sites, will have piled up the points by making big sounds in the right places at long distances.

Sound in the *wrong* place is noise, and how much of this emerged from VHF NFD this year (if any at all) will become apparent in due time as RSGB monitoring stations cross-check whatever complaints of clobbering they receive. In broad terms it may be said that the more the erp, and the better the site, the harder the clobbering; which has some relevance to the discussion sparked off in this column in July about how much (or little) power is in fact necessary to do justice to a metre-wave transmitting contest.

People stuck with poor sites will tell you that the popular 25W limit, as VHF NFD, will simply discourage them from entering contests at all. But for portable events there is much support for a lower limit still, and G3XUS-G3YZN-G4AOL say 5 to 10W is enough, adding: "Possibly the VHF Contests Committee would give active consideration to a QRP portable contest next season", supporting the G8BQX suggestion (this page last month) for a 5W contest. John Ridd himself remarks: "Set the power limit low and leave it to individual operators how they employ this power. The last thing wanted is to stifle people's initiative in making full use of the best linear there is, one that works in both

A miniaturized history of VHF National Field Day

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

1963 45 entries, winners Surrey Radio Contact Club, G2RD/P-G3ODY/P, using 70, 144 and 432MHz. Three contestants used 1,296MHz.

1964 54 entries, winners Wolverhampton Group in conjunction with Severn Valley ARC, GW3KMT/P-G3SVR/P, using 70, 144, 432 and 1,296MHz. Ten contestants used 1,296MHz.

1965 54 entries, winners the GB2GC Group, using 70, 144, 432 and 1,296MHz. Twelve contestants used 1,296MHz.

1966 57 entries, winners the GB2GC Group, using 70, 144, 432 and 1,296MHz. Fourteen contestants used 1,296MHz.

1967 66 entries, winners the GB2GC Group, using 70, 144, 432 and 1,296MHz. Sixteen contestants used 1,296MHz and one contact was reported on 2,300MHz.

1968 91 entries, winners Mid-Essex VHF/UHF Contest Group, G3VPK-ORL-LTF/P using 70, 144, 432 and 1,296MHz. Twenty contestants used 1,296MHz, three used 2,300MHz and one (G3WZR/P) the 10GHz band.

1969 105 entries, winners Mid-Essex VHF/UHF Contest Group, G3VPK-ORL-LTF/P using 70, 144, 432 and 1,296MHz. Twenty-three contestants used 1,296MHz, four used 2,300MHz and one (G3RPE/P) the 10GHz band.

1970 123 entries, winners Mid-Essex VHF/UHF Contest group, G3VPK-SKT-LTF/P using 70, 144, 432 and 1,296MHz. Twenty-four contestants used 1,296MHz.

1971 129 entries, winners Mid-Essex VHF/UHF Contest Group, G3VPK-SKT-LTF/P using 70, 144, 432 and 1,296MHz. Twenty-seven contestants used 1,296MHz.

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

directions, the one at the top of the mast (this aphorism copyright G3ZQB)".

(Parenthetically, G8BQX disassociates himself from the G3RSD suggestion for a four-hour cw period in a 24-hour contest: "One begins to think that perhaps cw has a hidden disadvantage compared to phone on vhf if cw operators require four hours longer than phone operators to complete their traffic".)

In the context of encouraging initiative, a QRP contest would promote increasing use of transistor pa stages, where more rf out for dc in is realized. Typically, G3XTQ/P measures 10W into his aerial from the 2N3632 linear fed with 15W at 30V. As semiconductors take over from the popular 3/10, the G8BTU point made here last month about the use of filters will need watching.

From QRP in contests on now to QRP in general. . . .

Enough to do the job

"Overkill" is the macabre word the military use to describe an uneconomical expenditure of energy (if you like, "just another megaton or two to make sure").

This sort of bellicose utterance in the mild mannered columns of *Four Metres and Down* will not surprise members who note that it has a parallel in our metre-wave affairs, which, put simply, is this: *there is no need to use more power than is required to sustain communication.* For moonbounce this means kilowatts of erp. For run of the mill local and semi-local talks on 2m, it means nothing more than a watt or two or three into a high gain aerial. Any more than is required to lay down an S9 signal to the man you want to talk to is power wasted.

It has already been said how, in contests, low power on high sites will do all that is necessary. And of course outside of contests the same is true, eg Staffordshire's G3OGD, who does a lot of portable work with a 50mW transmitter using the J. R. Hartley pcb and a halo clipped on to the car window (100 contacts in a few months simply by picking good sites), or G8BDO's 80mW sender on 70cm which from a hill-top home in Notts bends distant S-meters as effectively as if a hundred times the power was used.

Sonde and Artob

Sunday 17 September is the likely date of the launch of the next French transponder balloon, Sonde 5. Up frequency is 432·1 to 432·4, which means your signal should come out between 145·6 and 145·9, delivered from a 4W balloon-borne transmitter at an altitude of 28km. The French request European amateurs to refrain from transmitting within the above frequency band between 1400 and 1600gmt to give the down signal on 2m the best chance of being heard. Of course you will have to send on the up channel on 70cm if you want to trigger Sonde 5.

The device will accept any mode, and should be at maximum effectiveness after about 1420gmt. Before the launch, F6BSE will give last-minute news on 3,750kHz at 1330gmt.

Tell *FMD* if you hear or work anything via Sonde 5. But first get a quick report off to F1NK, Georges Guinard, 15 Route de Villers 54520, Laxou, France.

The German Artob transponder will fly again several times this year if finances permit, Sunday mornings at 1100gmt, up channel 432·0 to 432·1, down channel 145·315-145·515, accepting telegraphy and sideband only. A 50mW telemetry channel will operate on 145·621MHz.

Get in lane (again)

The strange things people do: during the brief July opening on 2m to Scandinavia ". . . there was much QRM by vfo-controlled a.m. and fm stations on the sideband channel, making it most difficult for us this side of the Pennines, and a practice to be deprecated", as G3PFR of Warrington puts it in milder terms than some sidebanders would use.

To distant operators monitoring 145·41 with bfo in, co-channel a.m. and fm resolve as an annoying mush of whistles incapable of competing with the speech spurts of ssb. Non-sidebanders wishing to work ssb stations can try announcing that they are *listening* 145·41 but not sending on it in the hope that sidebanders equipped with split will adopt the hint dropped here a month or two back to search beyond "Point four one" for different people to talk to.

Sidebanders not equipped to work split frequency are all of a piece with those mobileers you hear bawling their heads off on 145MHz saying "Listening this channel only" mindless of half a dozen fixed stations calling them on either side of it.

Further to 145MHz; this calling channel, thanks to recent diatribes, is clearer than it was from fixed stations hogging it for chit-chat. London in particular suffered some noteworthy examples, but trespassers who got in lane trespass no longer, and have risen many decibels in the esteem of their locals.

On 4m the problem is still with us. "We mobiles are blotted out for hours on end on 70·26 by recently issued call-signs of fixed stations using the calling channel as a local natter frequency", reports G3HBG from Surrey. Apart from the ethics of the thing, another reason for keeping 70·26 clear is that this is where ZB2VHF sits. Both G3HBG and G2DN heard it emerge for a brief 10min twice last month. Mercifully, no trespassers were on 70·26 at the crucial moments.

Super dx

So sensational was the solar storm of early August that even the *Financial Times* could scarce forbear to cheer. Many 2m telegraphists did when the consequent aurora arrived on 5 August, a convenient Saturday afternoon. Exotic prefixes such as HG and UR were noted at the bottom end of 2m, and nearer Europeans in quantity gave gargling Tone-A telegraphy into British headphones until the manifestation petered out at about 1530gmt.

Curious things happened as they always do in Ar conditions, eg GM3UAG worked by some southern stations was a "gotaway" to others of equal or greater power even though they called him co-channel. Meanwhile, on 4m the foreign fm broadcasters held up for minutes on end, markedly different from the usual brief bursts. Sporadic-E no doubt, but . . . ?

"Turn beams north" is the auroral axiom: but G3LTF says: "Look at the geometry if you want to work the real dx like UR and UQ. It comes in between NE and E, and sometimes only 10° N of E for the best results".

Discussing another area of super-dx, Peter Blair believes that the e-m-e signal from the 60ft dish at W2NFA should be copyable on this side of the Atlantic if a 6ft dish were used with a receiver of 3dB noise factor. For latest news on the e-m-e front from the other side he recommends listening to the weekly Monday sked with W2NFA, 14,260kHz, 2130gmt.

As for e-m-e on the next band down in frequency, the long standing G3LTF world record on 70cm was surpassed when

WA6HXW worked VK2BHL. The Californian uses 32 by 11-el Yagis on 432MHz. At Chelmsford G3LTF has four 11-el beams at two wavelength spacing, 18dB gain minus 2dB feeder loss, used with a receiver front end having a 2dB noise factor. This set-up permits 1-2dB of solar noise to be detected at sunset or just before.

It so happened on 18 July there was almost no need for the weekly hf band schedule. Copy was so good on 1,296MHz by e-m-e that cw contact, held with W2NFA for over an hour, enabled a conversation-type QSO to develop. This was one of three 'LTF-'NFA contacts via e-m-e made during July on 23cm. In Denmark excellent copy of the G3LTF signal was reported by OZ9CR, himself another e-m-e pioneer, who on 13 July put over a big signal one-way to W2NFA, running 8—9dB over noise in a 1kHz bandwidth.

Also in July SM7BAE worked VE7BQH and W6PO on 144·003MHz. Both he and DK1KO continued e-m-e tests on 2m during the moon-favoured days of August.

* * *

Now, meteor scatter: we are asked by SM5LE to print a request for 2m schedules with GC, GD and GW. With 500W and a 32-el J-Beam, his total of countries worked by m-s is eight. Operators in GC/GD/GW write to Sven Nordin, Henriksdalsringen 101, S-131 OO, Nacka, Sweden.

In the other direction SM5LE has nightly m-s schedules with YO7VS on 144·086, starting on the hour 2100–0200gmt.

Another Swede, SM6PU, whose wish to work the UK on 4m was reported here last month, was heard by G3RFG at 1935gmt on 28 July on 28MHz sending "QSX 70". Has anybody yet worked the SM cross-band? If not, it is worth looking out for him on 10m when sporadic-E on 4m boils up.

Beacon news

Any reports from the UK on HB9HB 145·985MHz, radiating 10W from a 2-el at 4,600ft from DH66F, should go direct to HB9AAA, PO Box 17, Bienne 4, Switzerland. The device, Pye-powered, is on the air 24 hours a day.

Now the Germans have a 23cm beacon. It is DC6MR at Dortmund and is radiating 1,296MHz westerly.

A new frequency for PA0VD, a popular marker on 70cm during past openings. It is now on 431·025 radiating 10W output.

More metre-wave certificates

It takes more than usual perspicacity and patience on the part of a receiving member to gather in 432MHz cards for three countries and 20 counties in order to put in a claim for an FMD award. On this band ranges are shorter and stations fewer than on 2m. And it could be murmured that a lot of seventy centimentalists seem to have grown out of the QSL habit.

All the more credit, then, to A6812, Nicholas Richardson, of Wendover in Buckinghamshire, for roping in the needful 3 + 20 by dint of sending detailed reports of real value to their 70cm recipients. Some wrote on their cards that they were surprised and pleased to know from A6812 that their signals were getting that far.

Now Nicholas has 432MHz Receiving Certificate No 3 on the radio room wall to accompany his 144MHz No 18 earned a year ago. Followers of this journal's new swl feature may be spurred by this example to devote more time to the metre wavelengths to secure the several listeners' certificates available to them (details on page 461, July *FMD*). All claims direct to the VHF Awards Manager, not to RSGB headquarters.

And a word to clubmen who have in their local societies numbers of listeners not yet identified with RSGB. Tell them they can get themselves a BRS number (British Receiving Station) by joining the national society (an "A" for junior associates), and that any QSLs they send out have greater status if overprinted with this BRS or "A" identification.

* * *

Four Metres and Down Transmitting Awards issued lately included two more 144MHz Seniors. One of them went to Frank Howe of Colchester, G3FIJ, already the holder for many years past of the Standard Awards for 4m, 2m and 70cm. Now he has 144MHz Senior No 39 to add to them. Senior No 40 went to Roy Stringer of Coventry, G3DKF, who found the QSL return rate somewhat slow (eg in 1971 he sent 89 and received only 22). But some of the expeditions were meticulous in obliging with cards (which after all is what expeditions are for: see G3VPS comment later). Six Scottish counties came to G3DKF from GM3IUB/P operations and six Welsh ones from G3BA/G4LU sorties, all raised with a modest 20W rig and 8-over-8 at the Coventry end.

Without all this expeditionary activity and willingness to QSL, people back home would find vhf operating awards in general, and the Seniors in particular, infinitely harder to get. From what claimants tell us, there is widespread appreciation amounting to admiration for many of the /P efforts which are mounted. For example, it is rare for a 70MHz claim to come in without some comment or other about the consistency with which G3VPS/P activates otherwise unworkable counties. How does this look from the 'VPS end? Says Peter Lennard: "At first when I went portable I religiously sent a card to everyone who asked for one. After getting through a few hundred cards and a few hundred stamps I decided to adopt the practice of QSLing only on receipt of a card". With this policy everyone who has ever radiated from a sought after spot will assuredly agree.

Philosophically, Peter Lennard adds: "I must say how very much pleasure this 4m portable working gives me. And it cuts both ways, for *I* get the pleasure of giving someone a new county or a decent dx contact, but if *they* didn't look out for me it would sure be lonely up on them there hills!"

Someone who *does* look out for the 'VPS portable forays on 4m is G5DF of Reading. John Pinchbeck has collected 70MHz Transmitting Certificate No 93. In the 144MHz Transmitting clip, another Reading member, G8DWT, gets No 261; No 262 goes to G3ZNZ, No 263 to G3UCS, and No 264 to G4AVX (he collected many of the five-plus-30 under his previous callsign G8CXC). To G3PQF goes No 265, G8BPO gets No 266, GW8EQH No 267 and G3XTQ No 268. In the Clements home near Ely, two FMD certificates now hang, for Barbara, G8FDE (Certificate No 269), has now caught up with dad, G8EBI, who secured No 227 last October. And No 270 goes to G8CKY, No 271 to G8DTQ and No 272 to G3PFR, whose five-plus-30 were obtained exclusively on single sideband, an exceptionally interesting claim that included many QSLs from operators who work no other mode, and *one* card verifying 13 Scottish counties (yes, GM8AGU/P of course, during his notable ssb-safari last year).

Operating procedure

Most phone men operating portable announce their locations, to help distant listeners align aerials appropriately. Telegraphists should announce theirs by inserting the RSGB county code letters after each CQ eg, "CQ de G5GB/P diddit diddit (short break) RD". This will disclose he is in Rutland (and may double the number of replies he gets). For list of county codes see January issue, p 41.

* * *

Another point about identification: holders of newer callsigns not taken into the current *RSGB Callbook* will remain unidentified to the outside world for many months after getting the ticket unless they consistently state location both during a CQ and in the course of contacts.

* * *

Laborious tuning of the whole of 2m is unnecessary. Try tuning only that geographical section to which your beam is turned, and state during a CQ that you intend to do so. It is enough simply to say "Tuning Zones A and B only". And if the other fellow does not know where Zones A and B are, your announcement will encourage him to look them up in the *RSGB Callbook*. Incidentally, the 2m and 70cm bandplans are illustrated on a map of the UK on that double sided card called *VHF Bandplans* obtainable from RSGB for 10p.

* * *

Newer comers to vhf who conclude a CQ by saying "K somebody please" simply because they hear other people say it may not know that this is a telegraphy abbreviation for "Go ahead". On telephony it is tautological. "Tuning Zone D" (or low to middle or whatever) is sufficient.

* * *

Do not hesitate to use cw for a CQ on the national calling frequency of 70·26MHz. All 4m men have Class A licences and can (should?) read cw. But move off it when contact has been established.

What they say

"Anyone working G3UMH on vhf recently has been talking to a pirate. The person concerned is being prosecuted. I am very grateful to vhf men for their vigilance: having no vhf gear at the moment I might never have found out. I hope next time G3UMH appears on vhf it will be myself!"—G3UMH of Leeds.

"G3NHE's contest statistics: what was the power level on each mode? Was his mod a bit down on A3? Did he waste too much time swapping from mode to mode?"—G8BQX.

"Thought for the month for 432MHz. Anyone who can't see solar noise should kick his receiver or put up a bigger aerial. If he sleeps through a gale without worrying it's not big enough anyway!"—G3LTF.

"Cumberland a rare county? Often someone is out portable, and always at contest times. All you have to do is to turn your beam north for a change"—G8DLL, Seascale.

"You say (June *FMD*), telegraphists are recognizable by the way they send morse. Their fists are their voices. I believe during the war we were able to identify disguised enemy transmissions simply by the way they signed off, a point covered by the way we trained our own Service operators"—BRS33327 (Alan Melhuish of Dursley, Glos).

Expeditionaries

Directly after VHF NFD, G8DXD/P from Worcester will be radiating from Rutland 4-5 September, Norfolk 6 September and Suffolk 7-8 September, from 1700 to 2000bst and from 2100 until the QSOs run out, lunch times as well when possible. QRG: 145·06 and 145·46.

If you read this before VHF NFD look for French portables on the summit of Mont Blanc 3 September on 145·5 ssb, 432·5 fm, and on 1,296MHz a beacon transmitter F5LS/P sending during the first 15min of each hour.

If you think Mont Blanc to the UK comes into the super-dx bracket, read on. Next month in Austria OE3HJW/3 at almost 4,000ft and OE3WBA/3 well above it will operate 300W p.e.p. stations all day from 1 October to 21 October, ssb on the sideband channel of 2m and A1 at the bottom end. Each will use high gain aerials in an attempt to work long haul 2m paths by tropo.

Here and there

The BBC1 "Young Idea" programme on 6 August included interviews with G8DXS of Doncaster and G8DYJ of Yeovil. The interviewer called them "hams". Shots of their aerials rotating were accompanied by outer space noises dubbed on to the sound track. Both members came through the experience with dignity, and managed in a few sentences to explain what amateur radio was about.

In PA-land on 2m the use of vfo and co-channel working is almost universal. More than 1,000 members of VERON are active on vhf, of whom 40 per cent use ssb, 40 per cent fm, and a few a.m. and cw stations remain, according to PA0EZ.

G3ZPB expresses interest in last month's suggestion here to form an amateur bulk buying group for ICS, and offers to help organize such a group. "As the majority of the items required are physically small, the idea lends itself admirably to a postal service for distribution, which I would be happy to arrange," adds Peter Burton. We guess he will now be swamped by letters, so an sae to him would be courteous if you write him at 20 Thornton Crescent, Old Coulsdon, Surrey CR3 1LH.

A tip from G5PI: standard ½in bore copper pipe used for central heating makes good aerial material, especially booms carrying many elements. The standard T-junction units will secure booms horizontally and accept mast section vertically.

If planning mobile in North Devon, write to G4CG of Barnstaple with date and time in the area and QRG. He will call you on 144·35 and/or 145.

Are you missing a card from DJ7FJ/P for a 2m contact on 7 October last? It went by mistake to G8ECU. Confirm with him the gmt the contact was made and he will post the card to its rightful owner.

25 YEARS BACK

"On August 14th the Working Group submitted to Committee 5 its proposals for frequencies between 31·7 and 10,500Mc/s . . . it became clear that an amateur allocation around 150Mc/s would finally mature. For the European region the band 154–156Mc/s is proposed . . . and a band 40Mc/s wide between 420–460Mc/s" from a report on the Atlantic City telecommunication conference by G6CL (*RSGB Bulletin* September 1947).

MICROWAVES—1,000MHz and up....

by DAIN EVANS, G3RPE*

A 70/23cm tripler

One of the problems of getting on a new band is that it demands the conviction that the time, the money and the nervous energy invested will be justified by the results achieved. One is therefore always on the lookout for designs which are simple and cheap, but which also have sufficient performance to give a fair picture of the potential of the band. G8AZM has supplied the following rather bold design which fits in well with this need.

The unit consists of the tripler unit itself followed by a simple filter to attenuate the other harmonics generated — a filter is necessary as the output at 1,728MHz, for example, is only 16dB below that at 1,296MHz. The tripler stage uses five 1N914 or 1S44 switching diodes which have a step recovery time of less than 90 picoseconds, although their capacitance/voltage ratio is small. Each diode is rated at nominally 200mW dissipation, but this can be greatly increased by using large thermal sinks as in the present design. By this means, up to 6W at 432MHz can be dissipated by the five diodes to produce up to 2W at 1,296MHz, a useful power level for the 23cm band. The maximum power input even for short times is about 9W.

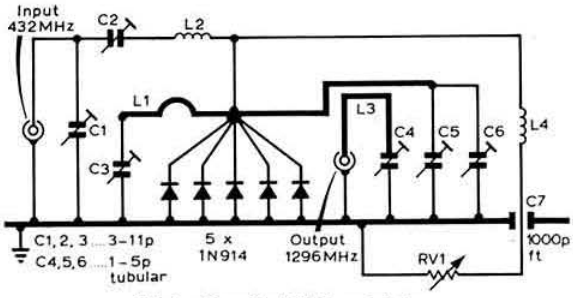


Fig 1. Circuit of 70/23cm tripler

The circuit is shown schematically in Fig 1 and the practical configuration in Fig 2. The five diodes are connected between two 1in × ⅛in plates to form a stack, one side of which is bolted to the chassis and the other to the line L1. The plates, the line and the chassis are made from copper (22swg) which provides high thermal conductivity. Great care must be taken in soldering in the diodes as their lead lengths should be as short as possible. To reduce the risk of damaging the diodes, the leads and the holes in the plates

(Continued on page 613)

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

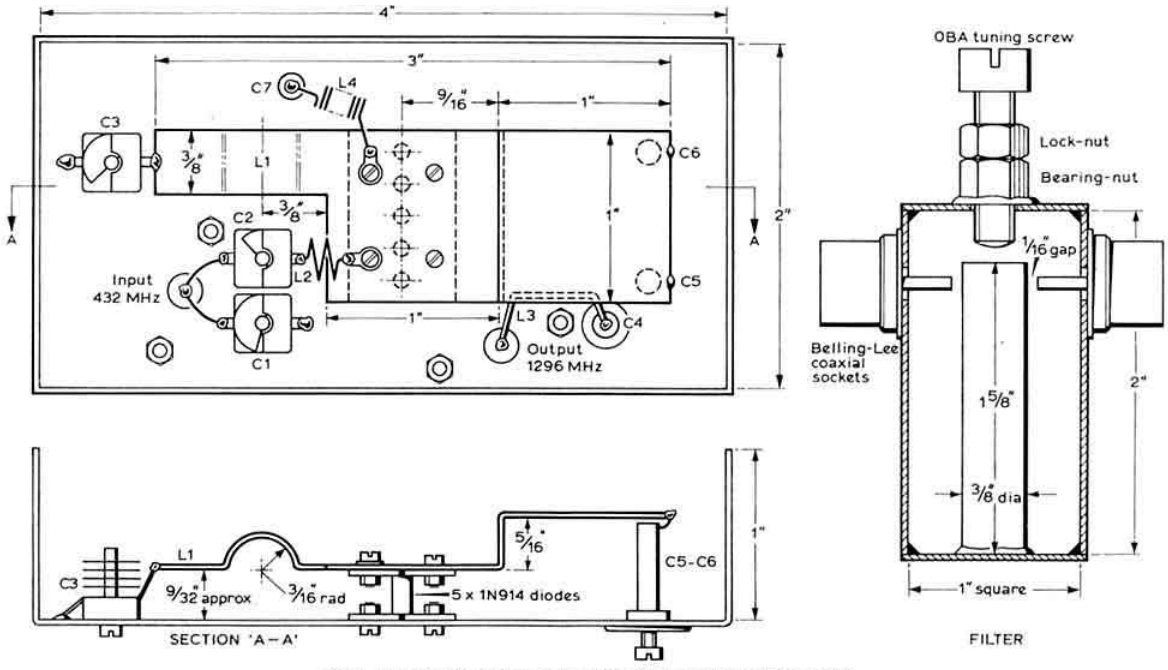


Fig 2. Practical configuration of tripler and 1,296MHz filter

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

READERS will be interested to learn that the recent IARU Region 1 Conference endorsed the previous recommendation that the 3,500-3,510kHz and 3,795-3,800kHz portions of the 3·5MHz band should be reserved for cw and ssb dx working respectively. (3,635-3,650kHz will be used by stations in the USSR for intercontinental working.)

It is also sincerely to be hoped that all users will respect this suggestion as well as continuing to refrain from using phone in the parts of the bands set aside for exclusive cw use by the Region 1 HF Band Plan. For the benefit of newer readers these are as follows:

3,500- 3,600kHz
7,000- 7,040kHz
14,000-14,100kHz
21,000-21,150kHz
28,000-28,200kHz

Phone transmissions should **never** be made in these bands.

DXCC

It is reported that Maria Theresa Reef (FO8M) has been deleted from the ARRL Countries List because there is no proof that it ever existed! Minerva Reef is deleted because it has now been annexed by the Kingdom of Tonga, only contacts made before 15 July 1972 will be credited. All previous Maria Theresa credits will be deleted.

W7RM-28MHz

G3DME has received information from W7RM on a 28MHz e-m-e project. He is aiming to erect a 40-element rotatable/tiltable array and preliminary calculations indicate that European stations with 1kW input and 4/5-element tiltable beams should be able to make contact. A narrow band (200Hz) receiver with a good noise factor would also be needed. Anyone interested should contact Homer Spence, W7EXM, 1508 40th Ave, Seattle, Wash, 98122, USA.

DX news

VQ9FOS will be operating from Mahe, Seychelles, during the period 2-5 October, as part of the island's festival activities. Continuous activity on 14, 21 and 28MHz is anticipated (on other bands by schedule) and special QSL cards will be sent out.

The LX3 prefix has now been discontinued. In future LX1 will be used by Luxembourg nationals, LX2 (or /LX) by reciprocal licence holders, LX9 by club stations, and LX0PTT will be the only legitimate LX0. It is understood that stations on the island of Gozo were due to change their prefix from 9H1 to 9H4 wef 1 August.

There will be a special activity day on 16 September by stations in Woerden (PA0s, BHK, CRA, PIM, VDZ, WW) who may be using a PA6 prefix. Special QSLs will be sent out. This event is being organized by Lions International and members of this organization are especially asked to try to make contact.

C21AA, C21DC and C21DR, are now on the air from Nauru in addition to C21TL (=C29ED).

Nigerian amateurs will again be using the 5N5 prefix during the month of October. This is to celebrate Nigeria's 12th Anniversary of Independence. They also hope to have 5N5BSN on the air during the Boy Scout Jamboree.

The Queen's University ARC (VE3VX) will be using the callsign VA3VX during 1973 to celebrate Kingston's tricentenary. A 100 per cent QSL policy is promised.

The Amateur Radio Malta National Day Award committee is organizing a special activity period for Maltese stations. A special contest and award are being issued in connection with this (see *Awards*).

The new officer in charge of the coastguard station on Kure Is should have received his conditional class licence by now. Tom Christian is at present in New Zealand receiving treatment for a leg injury sustained some months ago, and it seems that VR6TC will not be on the air again for some time yet. VK2BCV is going to Norfolk Is in September and may be heard signing VK2BCV/9.

The Arabian Knights Net now meets on Monday at 1700 on 14,290kHz, on Thursday at 1400 on 21,270kHz, and on Friday at 0400 on 14,290kHz. AP2AD has reported to *West Coast DX Bulletin* that all amateur equipment was confiscated by the Pakistan authorities last November and that any AP calls heard must be pirates.

The special Algerian prefix referred to in August *MOTA* should have been given as 7X7—there are said to be 14 stations using it and activity will cover July-September, commemorating the 10th Anniversary of Algerian Independence. A special certificate will be given to those contacting five different 7X7 stations.

BV2A is said to be crystal controlled on 14,023kHz and to frequently be on the air for a few hours commencing at 1200 on Fridays. K4FOK is en route for Formosa and has hopes of receiving permission to operate, if he is successful his QSL manager will be WB4SPG.

OR4ES was the callsign of a scientific expedition which visited the Dasht-I-Lut desert (in Iran) during July and August. QSL to ON4VL.

Jacky, VQ9SM/VQ8CF/VQ8CFB, should be on the air from Rodriguez Is as 3B9CF by now with his FDTX400 (supplied by QSL manager JA0CUV). The information that YK1AA QSLs should go to K3RLY given in August *MOTA* is now known to apply only to USA stations—all others should apply to JA1KSO.

80m dx

G3LP reports keeping a schedule with ZL4IE daily since 29 August 1971 on 3·5MHz cw. At the end of July this had been successful no less than 313 times—on only *two* occasions had contact not been possible because of conditions.

* 10 Knightlow Road, Birmingham B17 8QB.

Norman feeds 150W into a G5RV aerial and says that he already has 33 states confirmed (including KL7). The times of his ZL schedules have varied from 0420 to 0830. These facts suggest to the writer that the 3,500-3,510kHz part of the band conceals great dx potential even to those with restricted facilities.

Dxpeditions

Three members of the Queen's University ARC of Kingston, Ontario, will be on the air from FP8AP's station from 31 August to 10 September using the callsign FP0VX. One of the operators will be Roger Hart, G3SHM, who is currently VE3BOH.

The rumours of Spratly Is activity may become realities during September according to the *West Coast DX Bulletin* —INDXA is helping to organise an expedition.

Aldo, ET3ZU, and others, are ready to visit the Kamaran Is and only need official permission to land there. September is said to be the best month as far as climatic conditions are concerned.

The amateur who was to have been with the scientific survey party visiting Aves Is (YV0) has been replaced.

Contests

Results of the **1971 CQ WW CW Contest** have been received. UK scores are as follows: (Single operator)

		points			points
G3FXB	**(All band)**	**833,519**	**G3HCT**	**(21MHz)**	**205,989**
G3KWK	,,	522,158	G3RUX	,,	79,390
G2DC	,,	174,492	G3YCT	,,	8,775
GW3SYL	,,	**172,330**	**G3RZI**	**(14MHz)**	**110,510**
G2AJB	,,	77,945	**GW3NJW**	,,	**77,095**
G3JKY	,,	41,664	G3PVA	,,	34,880
G3XTT	,,	34,441	**G3KDB**	**(7MHz)**	**33,600**
G3ZOQ	**(28MHz)**	**24,000**	**GM3CFS**	**(3·5MHz)**	**25,193**
G2BOZ	,,	19,668	**GM3YOR/A**	**(1·8MHz)**	**1,582**
G3CWL	,,	1,508	**G4ANR**	,,	**1,316**

The only multi-operator entries were **G3SSO (794,220)** and G4ALE/A (378,750). GM3YOR/A was world fifth on 1·8MHz, and G3HCT world fifth on 21MHz as well as being top European. G3FXB won the W3AU Operator's Trophy for scoring top European multi-band total. Congratulations to certificate winners (listed in bold type).

The Welsh 80m Contest

October 22—rules will be given next month.

The Scandinavian Activity Contest

1500 16 September to 1800 17 September (cw).
1500 23 September to 1800 24 September (phone).

All bands 3·5 to 28MHz. Non-Scandinavians work Scandinavians and the same station may be worked on each band for credit. Each contact counts one point and the multiplier is the number of Scandinavian countries (LA, JW, JX, OH, OH0, OX, OY, OZ and SK/SL/SM) worked on each band totalled together. Serial numbers consisting of RS/T plus QSO number (starting from 001) should be exchanged. There are single-operator/single-transmitter and multi-operator single- and multi-transmitter sections, and all entries are multi-band. Logs should show date, gmt, station worked, No sent, band, note if new multiplier. Separate sheets for each band are not required but a summary sheet showing totals for each band and the final score should be enclosed; this should also give operating class, callsign, name and address, and a signed declaration that the entrant agrees with the rules, has been working to them and accepts the decision of the committee. Logs should be posted before 15 October to: SSA Contest Manager, Leif Lindberg, SM5CEU, Rydsvagen 120C, S-582 48 Linkoping, Sweden.

Results of the **1972 WAB Contests** are now available and are as follows:

HF phone		HF cw	
SM4DHF	28,105 points	**G8KU**	8,215 points
G3SSO	26,240 ,,	G3VDW	7,700 ,,
GM3DZB	25,970 ,,	OK2BPF	1,620 ,,

Listener section: (phone) **G13503** (17,360 points), BRS32525 (9,120), GM13801 (1,890).

LF phone		LF cw	
G3ZSS	329,630 points	**G3SSO**	68,000 points
G3SWX	219,530 ,,	G3VDW	32,485 ,,
G4ABQ	151,980 ,,	G3ZXZ	25,550 ,,

Listener section: (phone) **BRS32525** (369,510 points), G13503 (272,640), A7120 (242,165). (cw) **A7120** (19,470 points).

Note that the **1973** contests will take place on 11 March (HF phone), 25 March (HF cw), 1 April (LF phone), 8 April (LF cw), and 17 June (VHF phone).

News from overseas

ZC4RS has written to say that the amateur service is again operative in Cyprus and that 5B4 licences are now being issued. Requirements are the same as those required for UK licences and pre-1964 licensees may have their calls re-issued. Roly is leaving the island soon after making nearly 3,000 contacts and will be on the air from Rutland on his return to the UK.

Tony Kathro, who gave many their first contact with the Khmer Republic during his spell on the air from XU1AA, is back home in Cardiff. He offers to QSL direct to those *urgently* in need of his card—an sae should be sent by UK and an sae plus IRCs by other applicants. Tony's address is 10 Erw Wen, Rhiwbina, Cardiff. He can, of course, only QSL XU1AA contacts made when he was operating the station. 9M2IR visits Pnom Penh monthly and will try to activate XU1AA at these times—he has photocopies of logs since 5 March 1972 and can assist with QSLs if three IRCs and an sae are sent to him at Box 262, Johore Bahru, Malaysia.

Eric Lomax, 5N2ABG, NARS (hon sec, QSL manager, certificate manager, and *NARS News* editor) has now returned to Nigeria after leave in the UK. He kindly supplied the picture of 9G1DW, 9G1GG and himself which was taken on board the RMS *Aureol* during their voyage to Europe. 9G1's DW and GG are Doris Murray-Stone and the Rev Angus Murray-Stone who jointly run the Seamen's Mission in Takoradi, Ghana, on behalf of the British Sailors Society. They had the misfortune to lose all their possessions when the mission was destroyed by fire last December, but both hope to be on the air again by now with KW equipment. 9G1GG has previously held the calls ZD2AMS, 5N2AMS, FD8AMS, 5U7AMS, 5N2AMS/TR8, TY2AA, MP4BEF, 5N2AMS/TT8, MP4QBD, MP4TAX, MP4MAP, HZ2AMS, HZ3AMS, 8Z4AMS, 8Z5AMS and HZ2AMS/5B4. 5N2ABH closed down during June and has left Nigeria.

Mike Dransfield, formerly 5N2AAF, but now back in Ipswich and using his G3JKO call, reports that his call has

Eric Lomax, 5N2ABG (left) with 9G1DW and 9G1GG (see "News from overseas")

been pirated since he officially closed down 5N2AAF on 10 December 1970. His call has not been re-issued and any contacts since that date have been with a pirate. Mike confirms the fact that no new 5N2 licences have been issued to individuals for some five years, and that the licences belonging to the Nigerian Polytechnic, Kaduna, (5N2KPT), and the Ahmadu Bello University, Zaria, (5N2AAU), have been withdrawn as there are no longer any licensed amateurs there. Mike can frequently be found these days on the WAB nets relaxing after his surfeit of dx during 14 years in Africa.

Allan Papworth, G3WUW, who has been mentioned earlier in *MOTA*, reports the arrival of his VS5AP call for use from Brunei. He left Labuan on 24 June for Sarawak where he replaced 9M8TJZ (who has returned to the UK) and he now has his TH3 beam up. Many UK contacts have been made and Allan says that he has a regular schedule with G6WA at weekends at 1500 on 21,190 and at 1630 on 14,160kHz. These frequencies may be moved a little either way because of interference, and trouble on 14,160 usually results in a move to 21,190kHz and contact with 9M8WUW should be easy. 9M6BA is now on 14 and 21MHz regularly (and sometimes 7MHz) using FL400/FR400 equipment and a quad and wire aerials. Another new licence holder is 9M6AW (G3EAX) who prefers cw operation. VS5PW is with the Royal Signals in Brunei and uses a KWM2 and long-wire aerial. The callsigns VS5AA and VS5JA were issued to KH6GLU and G3NDY/W2 for use during their expedition to Brunei during June. KH6GLU was also permitted to operate 9M6AB for two days.

9L1GC was scheduled to be in the UK on leave and off the air between 28 July and 19 September. So far he has had over 4,000 contacts and has now commenced QSLing. Ross operated from 9L1ITU on 17 May but due to pressure of business only made 127 contacts. QSLs continue to go via G3DYY. Another UK callsign holder, G4AGF, is now on the air from Malawi as 7Q7NB, and QSLs should be sent to the address in *QTH Corner*.

Awards

The P-75-P Award

This Czechoslovakian award, previously issued for contacting a minimum of 50 different ITU zones, is now available to listeners.

The Malta National Day Award

A special activity period (0001 8 September to 2359 21 September) will provide entrants with the opportunity to contact as many 9H1 stations as possible on any mode. A log copy (certified by two licensed amateurs) showing date, station worked, RS/T received and sent, and serial number of contact (starting from 001) should be sent to Awards Manager, Mr L. Smith, 9H1BB, "Doreen", Francis Buhagair St, Birkirkara, Malta. Separate sheets must be used for each band, and callsign and QTH shown on each. All participants scoring 40 points (each QSO = one point) may apply for the Certificate of Merit by sending 10 IRCs, 50p, or $2 with the logs. Special certificates will be awarded to the contest winners.

Marconi-Kemp 75th Anniversary Award

Further information on this award, mentioned in August, has now been received. It is issued to mark the 75th anniversary of the Bristol Channel tests of May 1897, and to obtain a first-class award it is necessary to work at least one of the three Bristol Channel commemorative stations. Transmitting amateurs and SWLs looking for a first-class award will be interested to learn that two of these stations will be active in September to mark the issue of the Marconi stamp.

GB3BCT will operate from 9 to 16 September from Flatholm Island on all bands from 160m to 10m (ssb and cw) and 2m (fm). The callsign GB3BCT will be included in the hand-stamp used by the PO from Flatholm Island on 13 September, the first day of issue of the stamp.

G2WS/P will operate from Brean Down, Somerset, on the weekends of 9-10 and 16-17 September, and occasionally during the week. The main band will be 2m (a.m. and cw) although 70cm QSOs are possible. The President of the RSGB will be guest of G2WS and will be operating the station with him on 9 September.

Approximately 4,000 amateurs contacted the Bristol Channel commemorative stations in May. Apart from the September revival of these two stations, it is unlikely that they will be active again until May 1973, at the end of the time limit for the award.

Commemorative stations which will be active throughout the time of the award are: G2WS, GW3VKL, G4RS, GB2SM, I4FGM, IP1TTM, I/IJ and HVISJ.

The British Commonwealth Games Award

Issued by NZART to commemorate the 10th Commonwealth Games. Requirements are a contact with Christchurch, plus contacts with each of the four New Zealand districts (ZM1, ZM2, ZM3 and ZM4) and one British Commonwealth station from each of the three world IARU regions—a total of eight. QSLs are not required and a list of contacts certified by two other amateurs should be sent to Award Manager, Box 1733, Christchurch, New Zealand, together with four IRCs. The award will be sent by airmail. QSOs made during the period of use of the ZM prefix (3 June 1972 to 2 February 1974) are valid. (Region 1 Commonwealth countries include G, GC, GD, GI, GM, GW, ZD3, 9G1, ZB1, 5Z4, 7Q7, 9H1, 3B8, 5N, 9L1, 3D6, 5H, 5X and 9J. Region 2 includes VP1, VP2, VE, 6Y5, 9Y4, 8R1, VP5, 8P6, VP9 and ZF. Region 3 contains VK, VS5, 3D2, VS6, VU, 4S7, 9M, 9V1 etc.)

The Cyprus Award

This is a new and different certificate from the previous Cyprus Award—valid contacts must have been made after 1 May 1972, and both 5B4 and ZC4 contacts may be counted. 50 points are required if all contacts were made on one band, 40 if on two bands, and 30 if spread over three bands or more. The points value per contact is as follows:

	Bands (MHz)						
"CQ" Zone	1·8	3·5	7	14	21	28	144
20	4	2	1	1	2	4	16
1, 2, 3, 6, 7 10, 12, 19, 24, 25, 26, 27, 29, 30, 31 and 32	16	8	4	2	4	8	
All others	8	4	2	1	2	4	16
Cyprus amateurs	4	2	1	1	2	4	8

(5B4/ZC4 applicants need 50 points covering five bands)

Applicants should send log details plus QSLs (or a list certified by a national society awards manager) and 10 IRCs or equivalent to Awards Manager, PO Box 216, Famagusta, Cyprus.

The LX Award

Issued by the Luxembourg section of IARU for contacts since 1 January 1951. For the hf award European stations need 30 points (not less than 20 per cent of which must have been gained by 7 and 3·5MHz contacts), and others need 20 points (any bands). Each LX contact counts one point to Europeans, but those on 3·5 and 7MHz count two points to non-Europeans. Reports should not be less than R3/S3. There are no mode restrictions and the same station may be worked once on each band. A station worked in all five bands is worth 10 points (Europeans) or 15 points (others). Send certified lists of QSLs (signed by two licensed amateurs) plus 10 IRCs to LX1AJ, Hausemer Ch. grand-rue 71 Differdange, Luxembourg.

Odds and ends

G3YDQ (Alex McElhinney, 66 Falcon Av, Bedford) reports that his 18 months of activity from the Israeli ship mv *Elat* as G3YDQ/4X/MM ended on 1 July. His callsign has been pirated and the pirate has been breaking ITU regulations besides causing interference to commercial stations outside the amateur bands. Anyone with information or who has worked G3YDQ/4X/MM *since* 1 July is asked to contact the address above. G3YDQ/MM should be on the mv *London Clipper* in mid-August using a Drake 4 line. Alex wishes to thank all those who kept him company when on the *Elat*.

Readers will be sorry to learn that Joe Hiller, W4OPM, died on 1 July. Joe was in his mid-seventies and had been a prominent dxer for many years. He was a WPX specialist and had confirmed nearly 1,200 different prefixes—over 1,000 of these on ssb.

ZL1BNA, aboard the 37ft ocean racing yacht *Tamure* is taking part in a protest against nuclear tests by sailing round Mururoa Atoll. He has an FT101 and will operate on 14,300kHz. Special QSLs will be issued. Amateurs are asked to keep the channel clear when schedules are being worked and to take appropriate action if they hear a distress call (this may be on 14,200kHz).

At present touring western states of the USA is RSGB Area Representative Douglas Byrne, G3KPO, who has been invited to see the "Californian Kilowatts" and examine their 40m quads. He plans to cross the border into Mexico, and to "go mobile" into the Grand Canyon—on the back of a mule!

Those collecting WAB areas will be interested to know that GM4QK will be operating from some of the NS, NW and NX areas during the latter half of August, and from NM briefly in September. He will not be going north of Fort William or anywhere east except in the border country. Skeds will be made (preferably 3·5MHz cw, but 14, 21 or 28MHz or ssb for the benefit of overseas amateurs). There will be no 160m operation. Interested parties can reach John Roscoe at 39 Letham Road, Strathaven, Lanarks, ML10 6DU.

QTH Corner

A2CAY	Private Bag No 10, Serule, Botswana.
FM7WN	via K2KGB, Box 73, Coram, NY, 11727, USA.
FP0AA	WA0KXJ, 5200 Shriver Av, Des Moines, Ill, 50312, USA.
FP0AZ	VE7AZ, P. MacDonald, 7152 Union St, Burnaby 2, BC, Canada.
FP0ZZ	WA2FBI, 6 Howard Drive, Spring Valley, NY, 10977, USA.
HB0XKI, HB0XKJ	ON4QV, P. Van Der Gucht, 362 J Moretuslei, B-2610 Wilrijk, Belgium.
HD8IG	W3ABC, 6903 Rhode Is Av, College Park, Md, 20740, USA.
KA2MI	USCG Loran Stn, Minami Torishima, FPO Seattle, Wash, 98782, USA.
K5QFH/VQ9	via K5QFH, 127 Mink Drive, San Antonio, Tex, 78213, USA.
OR4ES	ON4VL, 22 R de La Tonne, B-4300 Ans, LG, Belgium.
PY0DVG, PY0ZAA	PY1DVG, PO Box 51, ZC-00, Rio de Janeiro, Brazil.
VP2VAU	(see YV0CCA).
XW8EV	K3NAS, 3833 Janbrook Rd, Randallstown, Md, 21133, USA.
YK1AA	JA1KSO, N.Itoh. PO Box 7, Aobadai, Yokohama 227, Japan.
YV0CCA	via W5GJ, 12301 Zavalla St. Houston, Tex, 77045, USA.
3B9CF	JA0CUV, T. Kumagai, PO Box 22, Mitaka, Tokyo, Japan.
5H1LV	K3RLY, Box 125, Simpsonville, Md, 21150, USA.
7X7G	Box 2, Algiers, Algeria.
7X7MD	I0IJ, Tony Privitera, Viale 21 Aprile 34, 00162, Rome, Italy.
7Q7NB	N. H. Baugh, PO Box 5595, Limbe, Malawi.
8P6CSJ/4	PO Box 814E, Bridgetown, Barbados.
9G1YA	via W5EGH, 4868 Sierra Madre Drive, New Orleans, La, 70127, USA.
9M6AW	A. W. G. Weatherly, PO Box 257, Labuan, Sabah, E. Malaysia

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

Band reports

Conditions have deteriorated very rapidly on the hf bands during the period under review and on one occasion the only signal audible on 14MHz at 0700 was one of your scribe's locals!

Many thanks to the following for submitting logs: G2HKU, G3GVV, GM3IAA, G3UKH, G3VBL, G4ALQ, G5JL, G6GH, BRS2098, BRS17567, BRS25901, ORS30694, A7476, A7545, A7768 and A7951.

Stations listed in italics were on cw, the others on ssb.

1·8MHz. 0000 *EP2BQ* (is ZL4JA/G3KWM/VS5JA and will be active from EP until late 1973), *HB9CM, W1BB, ZP9AY, 4U1ITU.*

3·5MHz. 0400 *LX1BW.* **0500** *ZL4IE.* **2200** C31FG, OY7JD, ZS1MH. **2300** *VP2AAA,* ZS2MI, 8P6CSJ (Caribbean Scout Jamboree). **2400** C31FG, *F0AHY/FC, KP4DLW,* KV4FZ, LU8AJG, PJ2CW, PY2DL, *UH8CS.*

7MHz. 0500 OA4OS, *TG4SR,* ZLs. **0600** VKs, YVs, WA9TCH/P/TF (QSL to WA9PZU). **0700** *XE1DE.* **2100** *G6ZY/CN/M, OH2BMF/OH0.* **2200** CT2BG, *VP2AAA, 3A0GA.* **2300** C31FG, CX1AA.

14MHz. 0000 CE3EX, ZL4CO. **0300** CP1JJ. **0500** *JT1AA,* KJ6CW, YJ8DE, *ZK1AA.* **0600** FO0JS, JR8AG, *VK9JW* (Mellish Reef). **0700** *FO8s AP, BV, KH6IJ, KL7ABT,*

VK9KE, WA6QPL/M/R3 (NASA ship *Vanguard* near Pitcairn Is), XP1AA, 9G1WW. **0800** FB8XX. **1100** JW7FD. **1200** C21TL. **1400** FP0WE, YB3AAY. **1500** VR4BS, YA1KY. **1600** 4S7LM, 9M8WUW. **1700** A2CAY, *FP8CZ* (BP 16, St Pierre). **1800** HZ1SH, ZD7BB, 4W1AF. **2000** FY7AE, ST2AC, XV5AC, YJ8BD, ZD3D, *ZL5AAI*. **2100** KX6EB, LA4C (Ferking Reef, QSL to LA7GJ), VR4EE, *9X5GJ*, 9Y4VV. **2200** FM7AD/FS7, JT0AE, *JY9GR* (QSL to DK4PP), JW8IL (RS59 using 10W of a.m.), VP1EZ. VP2VAM, *5T5CJ* (BP 202, Nouakchott, Mauritania).

21MHz. 0300 8P6CSJ/4. **0500** JT0AE. **0600** *KH6CHC*. **0800** *KS6DY*, *W3JAK/M/R3* (near KH6). **0900** *JT0AE*, VK9RY, VR4EE, *3D6AX*, 9M2DQ. **1000** KS6DY, VK9AC, VK9JW, 9N1MM. **1100** VR4EE, 5H1LV (Zanzibar), 5W1AL. **1200** JY6BM, VK9RY. **1300** 3B8DG. **1400** MP4s MBB, TDM, ZS2MI. **1500** HS5AFJ, JR6ES, VP8MM, 9M8WUW. **1600** *F0AHY/FC*, K9QFH/VQ9 (Chagos), YB0JC/6 (Sumatra), 3D6AJ, 9M2CW. **1700** CE3FU, TR8AF, VS9MB, 7X7G, 9L1VW. **1800** CR3KD, *FY7AE*, KC4USP, VQ9MC, VUs, 9Y4CR. **1900** *CR5AJ*, *MP4BHM*, 4W3BS. **2000** *TA1MB*, *TY5ABK*, *VP9BK* (QSL via VE2DCY), 5U7AN. **2100** *FP0ZZ*, HK0BKX, *OA6BB*. **2200** HM1GD, VK9JW. **2300** FP0AA, *HD8IG*.

28MHz. 1800 PZ1CU. Much short skip.

Very many thanks to all correspondents and especially to the following for items taken from their publications: The **EX-G Radio Club Bulletin** (*W3HQO*), **DX'press** (*PA0INA/PA0TO*), **DX News Sheet** (*Geoff Watts*), the **29 DX Club Newsletter** (*VK6JR*), **QUAX** (*G3DME*), the **DXers Magazine** (*W4BPD*), **NARS Newsletter** (*5N2ABG*), **Long Skip** (*Nick Sawchuk*), **CARS Newsletter** (*ZC4RS*), and the **West Coast DX Bulletin** (*WA6AUD*).

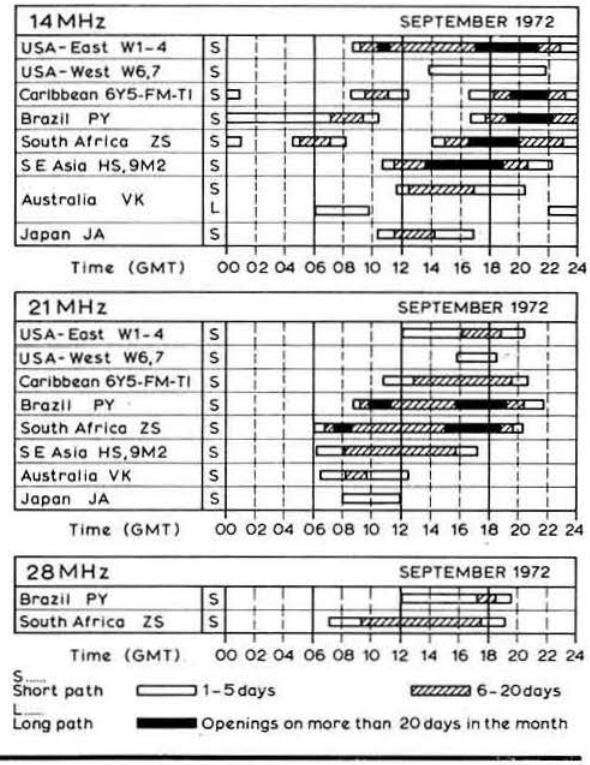
Please send all items for the **October** issue to reach G3FKM by **8 September,** for **November** by **5 October,** and for **December** by **8 November.**

Propagation Predictions

During September the seasonal rise in F2 layer critical frequencies will commence and the poor summer conditions on the **21** and **28MHz** bands will steadily improve. The peak of conditions will be reached in October/November.

On **28MHz** no worthwhile improvement can be expected before the end of the month. The path to Central America, SE Asia and Australia on **21MHz** will improve gradually during the month. With the longer autumn nights the dx possibilities on **14MHz** will be best during the second half of the night. The **7MHz** band will also be suitable for dx working during the same period. Both **7MHz** and **3·5MHz** will carry dx traffic but will be subject to the dead zone during part of the hours of darkness, this effect will be greatest on **3·5MHz.** The longer autumn nights and the temporary decline in the static level will improve dx possibilities on both **7** and **3·5MHz** but communication on the latter band will suffer some disturbance during the second half of the night.

The provisional sunspot number for July 1972 from the Swiss Federal Observatory was 78·6 with solar activity reaching a peak during the last week of the month. The predicted smoothed sunspot numbers for November and December 1972 and January 1973 are 51, 49 and 47 respectively.



MICROWAVES—1,000MHz and up

(Continued from page 608)

should be pre-tinned and a *hot* soldering iron used for the minimum time necessary to make each joint. The top and bottom surfaces of the stack should then be made flat by filing, and then with emery paper on a flat hard surface such as glass. The corresponding parts of the chassis and L1 should also be carefully flattened to ensure good thermal contact. The output loop is of 18swg wire running for $\frac{1}{2}$in as near to L1 as possible, one end being connected to the output socket and the other to C4. The filter consists of a box 1in square and 2in long fabricated from 16 or 18swg brass or copper sheet, containing a single resonant element.

Alignment can be done without elaborate test equipment, although this should obviously be used if available. The filter should first be tuned by connecting it to a receiver input and peaking preferably a weak distant signal: its insertion loss should be less than 1dB and therefore barely detectable. The tuning screw should then be locked and the filter connected between the tripler and a load (perhaps an aerial feed fed by a long length of lossy coaxial cable) together with some sort of power indicator (for example, a field strength meter or a diode connected in the aerial line). With the bias resistor set at about 5kΩ, about 5W of power at 432MHz should be applied to the input, and C1, C2 and C3 adjusted for maximum reading from a voltmeter connected across the bias resistor: about 20V should be measured. C4, C5 and C6 should then be adjusted for maximum 1,296MHz output. The bias resistor and all the tuning capacitors should then be re-adjusted to maximize the output.

45th Annual General Meeting

Minutes of the 45th Annual General Meeting of the Radio Society of Great Britain held at the Royal Society of Arts, John Adam Street, Adelphi, London WC2, on Friday 3 December 1971 at 6.45pm.

Present: *The President (Mr F. C. Ward) in the Chair, The Executive Vice President (Mr R. J. Hughes), Mr A. C. Morris (Honorary Treasurer), Messrs E. G. Ingram, G. R. Jessop, W. F. McGonigle, L. E. Newnham, W. A. Scarr, R. F. Stevens, G. M. C. Stone, E. W. Yeomanson (members of Council), Mr J. O. Brown, Mr D. A. Findlay (secretary), Mr A. W. Hutchinson (editor), and 93 corporate members of the Society.*

An apology for absence had been received from Dr J. A. Saxton, Immediate Past President, who was abroad on business.

Notice convening the meeting
The secretary read the notice convening the meeting.

Minutes
Mr R. Glaisher proposed and Mr W. H. Allen seconded and it was resolved that the minutes of the 44th Annual General Meeting as published in the May 1971 issue of *Radio Communication* be taken as read, confirmed and signed as a correct record.

Annual report
The President moved that the Annual Report of the Council for the year ended 30 June 1971 as published in the November 1971 issue of *Radio Communication* be adopted.

Mr J. H. Ellis commented on the lack of information concerning the TVI Committee and asked about the activities of this committee during the year. Mr J. W. Swinnerton explained that the committee had been reformed during 1971 and had held its first meeting only on 24 June.

Mr G. Shirville asked how many times the Exhibition Committee had met during the year. Mr Newnham explained that there had only been two meetings of the committee.

There being no further questions, it was resolved that the report be received and adopted.

Report of the Honorary Treasurer and audited accounts for the year ending 30 June 1971
The Honorary Treasurer, Mr A. C. Morris, read the report of the auditors.

Mr Morris presented his report and the audited accounts for the year ending 30 June 1971. He explained that the deficit shown in the accounts was higher than the forecast made at the time of the Extra-ordinary General Meeting in August 1970. Subscription rates were increased from 1 January 1971, but the full benefit of an increase was not felt immediately. The benefit would be evident when the accounts for the following year were presented.

Inflation had increased expenses and in the early months of 1971 there had been the postal dispute which had distorted the pattern of subscription income.

The President, in moving the adoption of the report of the Honorary Treasurer and the audited accounts of the Society for the year ended 30 June 1971, said that the Honorary Treasurer would deal with further questions in due course. Mr Corsham seconded the motion.

Mr Rix commented that the costs of producing *Radio Communication* had increased from £16,000 per annum to £28,000 over the last six years. Advertising revenue had, however, not increased correspondingly. It was explained that the increase in costs was due largely to the several rises in the cost of paper and printing that had taken place over the past years. Advertising rates had not, however, been increased until July 1970.

Mr Bluff asked for information on the item of creditors shown in the Balance Sheet at £29,994 having increased from £12,281 in 1970. It was explained that part of the increase was due to deliveries of publications just before 30 June 1971 and these had not been paid for until the following month.

There being no further questions, the motion was put to the meeting and carried unanimously.

Council 1972
The President announced that it gave him great pleasure to report that in accordance with Article 10 of the Articles of Association, the Council had appointed Mr R. J. Hughes, G3GVV, to the office of President for 1972.

The President read a letter dated 26 November 1971 from the scrutineers of the ballot held for the election of two Council members for 1972.

The result of the ballot was as follows:

G. R. Jessop, G6JP,	1,566 votes
G. M. C. Stone, G3FZL,	1,433 votes
Dr J. A. Saxton, BRS23361,	1,260 votes

He then declared Messrs Jessop and Stone elected and thanked the unsuccessful candidate for taking part in the election.

The President announced that the vacancy arising on 31 December 1971 for a Council member elected on a zonal basis for Zone A was to be filled by Mr J. R. Petty, G4JW, who had been returned unopposed. He then formally declared Mr J. R. Petty elected.

The President also announced that the vacancy arising on 31 December 1971 for a Council member elected on a zonal basis for Zone B was to be filled by Mr John Bazley, G3HCT, who had been returned unopposed. He then formally declared Mr John Bazley elected and took the opportunity of introducing him to the meeting.

The President explained that, because of an administrative oversight, the vacancy arising at 31 December 1971 in Zone C due to the appointment of Mr R. J. Hughes as President for 1972 had not been notified to the members. Council at the first meeting in 1972 would consider this matter and extend an invitation to a qualified member to act as Zone C member for 1972.

Mr Ellis suggested that possibly Dr J. A. Saxton could be invited to serve as Zone C member. The President explained that he had received a letter from Dr Saxton and this would be considered at the next Council meeting.

The President said that he had been advised that Mr A. C. Morris did not wish to continue as Honorary Treasurer and that Mr Morris had therefore tendered his resignation as a Council member and as Honorary Treasurer.

The President expressed his regret at the resignation of Mr Morris and said that he was sure that all members of Council would join with him in thanking Mr Morris for his efforts on behalf of the Society. It was hoped that Mr Morris would continue to serve on the Finance and Staff Committee.

The President announced that Mr J. O. Brown, G3DVV, who had acted as financial advisor to the Society and who was also a director of Lambda Investment Co Ltd, had been appointed by Council to the office of Honorary Treasurer from 1 January 1972.

Auditors
It was announced that the auditors, Edward Moore & Sons, had indicated their willingness to continue in office.

Amendments to Articles of Association
The President explained that it had become apparent over a period of years that there was a need for amendments to certain of the Articles of Association. Some of the amendments were for reasons of economy and others were to bring the Articles into line with the wishes of members.

Mr Brown pointed out that very long and careful consideration had been given to the amendments. The amendments had been divided into three categories: those which would substantially alter the Articles of Association; those which were of a minor nature; and those which only updated references to the Companies Act or which are only renumbered.

Before submitting the special resolution to the meeting Mr Brown agreed to deal with any questions.

Mr Corsham said that he felt that the conditions of life membership were not altogether satisfactory as they tended to favour the

younger members who could apply for life membership after five years. In many cases, older members had been paying full subscriptions for many years.

Mr R. Walker reminded the meeting that Council had power to approve any application for life membership.

Mr J. E. Ellis commented on Article 88 which specified the period after which any notice sent by post was deemed to be served. Mr Ellis felt that possibly five days was more appropriate.

Mr Powell commented on the family membership provisions. It was explained that Council had considered this matter and had decided that a family membership subscription of £3 should be paid by second or subsequent family members. Mr Powell said that he thought a subscription of £2 would be more appropriate.

Mr Brown explained that under the amended Articles it would not be necessary to hold 12 Council meetings each year. It was for consideration whether the expense of additional Council meetings was justified. Mr Shirville suggested that the Council was trying to economize by cutting down meetings.

There being no further question, the President proposed, Mr C. E. Newton seconded, that the Articles of Association of the Society be amended in the manner set out in the schedule of amendments.

The resolution which was submitted as a special resolution was carried unanimously.

J. Fraser Shepherd Prize Trust Fund—investment

The President explained that under the terms of the will of the late J. Fraser Shepherd, a holding of the 6% Debenture Stock of Lambda Investment Co Ltd had been left to the Society. It was necessary to have formal approval for the Society to hold this investment.

It was proposed by Mr J. C. Graham and seconded by Mr E. W. Yeomanson that approval be given accordingly. The motion was carried unanimously.

Other business

The President read the supplementary report of Council covering the period 1 July 1971 to early December 1971.

The formal business of the Annual General Meeting terminated at 7.43pm.

PRESENTATION BY HEATH (GLOUCESTER) LIMITED

The President said that he had received from Mr S. Boakes, representing Heath (Gloucester) Ltd, a request that the Society should accept a Heathkit HW101 transceiver and power supply.

On behalf of the Society, he was delighted to accept this most generous gift which would be incorporated in a headquarters station as soon as possible.

The President asked Mr Boakes to convey to the directors of Heath (Gloucester) Ltd the appreciation of the Council and all members on this occasion.

PRESENTATION OF AWARDS

Presentation of the Society awards was made by the President.

At the conclusion the President thanked Mr Peter Carey, Society Trophies Manager, for his assistance in organizing the collection, engraving and distribution of the trophies.

INFORMAL DISCUSSION

The President opened the meeting for an informal discussion on any matters that the members wished to bring up.

Subscription reminders

Mr Shirville pointed out that he had been advised that a member had not received a reminder that his subscription was due. The matter had been raised with the Council. The President requested Mr Shirville to send details of the complaint so that it could be dealt with immediately.

HF contests

Mr J. E. Ellis asked for an explanation as to the procedure for the receipt and checking of logs for HF contests.

Mr Bazley explained that there had been delay in acknowledging contest entries and there had been occasions when there had been postal delays.

Mr Graham, chairman of the HF Contests Committee, explained the system of checking logs, and Mr Glaisher pointed out that if there was a large number of entries for a contest it was not always possible to open these and acknowledge the contents in less than one week.

VHF contests

Mr Rees asked whether it was correct that a leading station in VHF/UHF Field Day 1971 had been disqualified.

Mr Stone confirmed that there had been a disqualification in the 1971 VHF/UHF NFD based on complaints from entrants. He pointed out that only written evidence in support of complaints was accepted and every effort was made to cross check any complaint before action was taken.

Mr Stone went on to point out that any contest committee acts only in good faith and on the basis of the committee report the Council would also act only in good faith.

Mr Hearsey asked whether the VHF Manager would give an undertaking that entrants will not be disqualified under similar circumstances in future.

Mr Stone pointed out that there was no engineering definition of poor quality signals and that it was, therefore, not possible to verify that a signal conformed to good engineering practice. Instead adjudication was left to the experienced judgement of the VHF Committee.

Finance

Mr Bluff asked whether the Society was still running at a deficit in spite of the increased subscriptions. Mr Brown said that it was too early in the financial year to forecast the result for 1971-72 but it seemed likely that the deficit would be reduced very considerably.

70cm band

Mr Gurton asked whether there had been any decision by MPT as to the future allocations of frequencies in the 70cm band. Mr Stevens pointed out that there had been a premature announcement on this matter which had not yet been settled and there had been no public announcement of changes.

Procedure

Mr Holloway asked whether points raised at informal discussions were noted by the relevant committees, and what the correct procedure was for raising matters officially at an Annual General Meeting.

The President explained the action taken and the procedure for raising a matter at the Annual General Meeting.

Inauguration of President—Dinner Club—Entertaining

Mr Wilberforce reminded members that the RSGB was held in high esteem by other national societies and was regarded as second-to-none as a national society. There were, however, difficulties as it was not always possible to entertain visitors from overseas, many of whom visited Society headquarters. Although the visitors' book was not complete there were numerous visitors in the course of a year.

The Dinner Club had been very successful as an occasion for entertaining visitors and the Presidential Inauguration was looked upon as a most enjoyable social evening. It should, however, be considered whether a charge should be made to members attending the Presidential Inauguration to help defray the expense involved.

The President thanked Mr Wilberforce for his kind remarks and said that the question of a charge had been discussed.

Family membership

Mr Powell asked what was the basis of a charge of £3 for family membership. Mr Morris pointed out that he was not in favour of this form of membership and that the cost of administering this system to a small number of people was not economical. Family membership had, however, been requested by members and Council had agreed to this class of membership. Mr Powell said he would take this matter up with the Membership and Representation Committee.

Mr Thomas mentioned that the subscription rate generally was too low as it did not take into account the amount of work that was done free of charge for the benefit of members.

Publications

Mr Newton pointed out that the costs of membership are subsidized by the profit on sale of publications and this fact should be brought to the notice of members. Mr Brown agreed with this view and felt that it should be brought to the notice of the Membership and Representation Committee.

The informal discussion terminated at 9pm.

YOUR OPINION

The Editor
Radio Communication

Sir—In recent issues of *Radio Communication* there has been a certain amount of written comment and reference to the subject of a.m. versus ssb radiotelephony.

This constant argument over recent years has finally prompted me to write and, I hope, enlighten some of our not so well informed members with respect to some facts.

By reference to the Radio Regulations, Additional Radio Regulations Resolutions and Recommendations (Edition 1968) published by the General Secretariat of the International Telecommunication Union, Geneva, the following is submitted:

1. Resolution No Aer 3 recognises "that single sideband radiotelephony has demonstrated advantages over double sideband radiotelephony in many radio services in terms of radio communication, particularly under adverse atmospheric and propagation conditions."
2. Section VI. Fixed Service. General. Para 465 states: "Administrations are urged to discontinue, in the fixed service, the use of double sideband radiotelephone transmissions in the bands below 30MHz, if possible as from 1 January 1970."
3. Resolution No Mar 5. Relating to the use of single sideband technique in the radiotelephone maritime mobile service bands between 1,600kHz and 4,000kHz resolves: that as from 1 January 1973 any new installations of double sideband equipment in ship stations shall not be permitted except in certain specified cases, however, administrations shall endeavour to discontinue the installation of double sideband equipment at the earliest possible date after 1 April 1969.

   Coast stations shall be capable of single sideband operation at the earliest possible date; furthermore, they shall discontinue double sideband emissions as early as possible, and in any case not later than 1 January 1975.
4. Resolution No Mar 6. Relating to the use of single sideband technique in the radiotelephone maritime mobile service bands between 4,000kHz and 23,000kHz resolves: that as from 1 January 1972, any new installation of double sideband equipment in ship stations shall not be permitted. However, administrations shall endeavour to discontinue the installation of double sideband equipment at the earliest possible date after 1 April 1969.

   As from 1 January 1972, coast stations shall cease all double sideband emissions.,

   As from 1 January 1978 Class A3A and A3J emissions only shall be authorized.

I will close with the suggestion that "A" licence holders re-read section 2 of their licence and endeavour to obtain a copy of the ITU Radio Regulations and acquaint themselves with the relevant sections which apply to operation of a radio transmitting station. The local library may be able to obtain a copy.

Yours faithfully,
E. Briggs, MIE, MISM, RTechEng, G3IJU

The Editor
Radio Communication

Sir—I was very interested in your article in the July 72 issue of *Radio Communication* on the turnstile aerial. I have for nearly a year been operating a turnstile from my QTH with quite good results. I first used it at 18ft, and the results were good. Later at 40ft the results were even better.

I would be interested to have contact with other turnstile users to compare notes. I am on the 2m band late at night and during the weekend in the mornings. May I add I am looking out for any Continental contacts.

Yours faithfully,
R. A. Griffiths, G8BFU

The Editor
Radio Communication

A Hobby for the Millionaire?

Sir— In your "Wanted" column I read—"Student amateur requires cheap . . ."; in your "New Equipment" review I read—"The cost is not out of the reach of the amateur. . . prices range between £200 and £300. . .". Although I believe the latter statement to be far from the truth, the financial span of amateur radio is almost infinite.

Contemplating an attempt on the Radio Amateur Examination and subsequently setting up a station, the young radio enthusiast is inevitably faced with the question "What will it cost and can I afford it?" Unfortunately the answer to the first part of this question is far from obvious, and perhaps for this very reason many who are attracted to the hobby of amateur radio subsequently decide to abandon it in favour of perhaps simpler and apparently cheaper pursuits.

The Council of the Society is ever-mindful of the importance of attracting young recruits to the hobby—for the future of our Society and indeed of amateur radio itself depends on them. Radio clubs, exhibitions, rallies, etc all help to "put over" the hobby and to show how it may be pursued. Nevertheless, there is an ever-growing impression these days that a pre-requisite of establishing an amateur station is the purchase of several pieces of expensive and sophisticated equipment and the purpose of this letter is to assure the would-be transmitting amateur that this is entirely untrue.

Certainly there is a section of the transmitting fraternity who think that the sole purpose and pleasure of the hobby is to shout with the loudest possible voice at similar "broadcasters" in remote parts of the world. Some of these people will cheerfully spend many hundreds of pounds to ensure success, but those who subscribe to this limited view of amateur radio are fortunately in the minority.

Most licence holders take a pride in building and designing their own equipment and enjoy the real thrill of good results obtained with simpler gear.

Unfortunately as one turns the advertisement pages of our magazine it is easy to realise how the newcomer gains the impression that an outlay of several hundred pounds is necessary before he can get on the air. The writer has the opportunity of meeting numerous amateurs and of seeing their shacks and can confidently say that very few of these people possess any piece of equipment worth anything like £100 and, apart from a modest commercial receiver, their gear is often entirely home-made. It may surprise some young readers to know that even in these days, a complete transmitting station capable of worthwhile and satisfying results can be assembled for £100 or less, including the aerial.

While amateur radio handbooks give numerous designs for the construction of simple equipment, it is certainly true that a need exists today for a great deal more information in this field. Designs in *Radio Communication* tend to become more and more "professional" and both difficult and expensive for the less-experienced amateur to copy. Those amateurs who devise simple and efficient pieces of apparatus for themselves are reluctant to submit them for publication as they fear that they will not match up to the required technical standards.

Finally, a word to the newcomer—remember that the older hand was once a beginner too and had to face most of the problems associated with getting on the air. Ask his help, see how he has designed his station and do not hesitate to discuss with him the financial side—he will not fail you.

Yours faithfully,
W. A. Scarr, G2WS

The Editor
Radio Communication

Sir—As the time for elections approaches, may I remind all members of a few facts?

Ordinary members of Council are elected by a majority vote of all members of the RSGB. In practice, this means a majority vote of those who bother to make a return, Last year there were 2,223 voting papers from about 16,500 members. Does it matter that Council is only the elected representative of 15 per cent of the members?

Less than 15 per cent of licensed amateurs hold pre-war callsigns, but half the elected members of Council have been licensed so long that they did not have to take RAE. To be fair, over the whole Council only 44 per cent have such early callsigns, but the most recent of their licences was issued 20 years ago. Fifty per cent of amateurs have been licenced within about the last 11 years. Is this representative.?

The average length of service of the elected members of Council is more than 10 years. Three of them have done 14 years or more. It has been said that if they do not stand, no one else would. Is there anyone more recently licensed who is willing to stand for election?

Some Council members have done and still do much for the good of amateur radio. But it is hardly surprising that for some the enthusiasm has run out. What begins as a challenge can wear away to a familiar habit. For the RSGB in 1973, is this good enough?

This Society needs every member either to stand for election, make a nomination, or simply use a vote to make our Council truly representative.

Yours faithfully,
Kay Priestley, G3XIW

Nominations for election to the 1973 RSGB Council

The Articles of Association (as amended at 1 January 1972) require that not later than 10 September in each year the Council will send to each member entitled to vote a list of those Council members who retire by rotation or for any other reason on the succeeding 31 December. The list must indicate those members who are willing to accept nomination for re-election and the list must also indicate whether the vacancies are to be filled by election of an ordinary member or on a zonal basis.

The following members retire by rotation at the end of this year:

Ordinary members
Dr E. J. Allaway, G3FKM, who will accept nomination for re-election.
Mr L. E. Newnham, G6NZ, who will accept nomination for re-election.
Mr E. W. Yeomanson, G3IIR, who wishes to retire from Council and does not seek re-election.

Zonal members
Mr W. A. Scarr, G2WS, retires as Zone D member by rotation and will accept nomination for re-election.
Mr W. J. Green, G3FBA, retires in accordance with Article 28 of the Articles of Association as he was appointed to fill a casual vacancy in Zone C, but will accept nomination for re-election.

Not later than 10 October next any 10 corporate members may nominate any qualified member, by delivering in one closed envelope to the secretary of RSGB, their respective nominations in writing together with the written consent of such member to accept office if elected, but each such nominator shall be entitled to nominate only one member for election at the subsequent Annual General Meeting.

In the event of insufficient nominations being received to fill all vacancies arising, Council has power to fill any remaining vacancies and all nominations properly made shall thereafter be declared elected unopposed.

Members nominated for election to the Council on a zonal basis must be resident within the zone for which they are nominated and the nominators must be Corporate Members resident in that zone.

MOBILE RALLY NEWS

Thanet RS Mobile Rally, 10 September
Organized by the Thanet Radio Society, this rally will take place at the King George VI Park, on the East Cliff at Ramsgate. The site is well situated, overlooking the sea.

Upton Mobile Rally
There was a total attendance of about 2,000 people at this rally. A count at 1530 showed 430 vehicles on site, and it is estimated that 580 vehicles were present at one time.

One of the visitors was Bill Browne, ZS6FE, of Pretoria, while others travelled from West Wales, SE England and the Midlands. The furthest travelled on the day was Tony Emery, G3YWG, accompanied by Jim, G4BEI, from Weymouth.

The best mobile installation was judged to be Jack Gwynne, G2CLN, from Bromsgrove. Best /M QSOs with the talk-in stations were: G3TLD/M at Lydney, Glos, with G8JC/A on 160m, and G3LTZ/M with G3GJL/A on 2m.

Many people went away laden with strawberries from an adjoining farm, and evidently they also took their rubbish as the Worcester and District ARC committee reports there was almost none left on the field.

OBITUARIES

Captain George Courtney Price, TD, GW2OP

The death occurred on 19 July of George Courtney Price, GW2OP, senior Vice-President of the Society, at the age of 80. He was active on all bands down to 2m until two days before his death. His passing severs another of the all too few links with the golden days of amateur radio, when amateurs were demonstrating that the then professionally despised high frequencies were capable of long-distance communication on a scale previously considered impossible. He led a group who concentrated on aerial development, and was very proud of the fact that he was one of the original Empire Link stations. First licensed in 1920, when living in Cheltenham, he was a District Representative of the Society covering a very extensive area. He became a Vice-President of the Society in 1938, and was at one time a Council member.

He was born in Pembrokeshire and was a banker by profession. In his youth a member of the Territorial Army, he served throughout the First World War, attaining the rank of captain, and was awarded the Territorial Decoration. Between the wars he held a commission in the Royal Naval Reserve. During the Second World War he held a commission in the Royal Air Force Volunteer Reserve (Training Branch). He was then living in Pembroke and was based on the RAF Station, Pembroke Dock, from which unit he managed to accumulate a large number of flying hours on Sunderland flying boats. He was thus one of the few who have seen commissioned service in all three branches of the fighting service.

His interest in the public affairs of Pembrokeshire led him to serve for a number of years on the Pembrokeshire County Council, specializing in planning. He represented that body on the Court of the University of Wales. These are items taken at random from a very long list of public appointments. He was also a long-time member of the Masonic order, in which he held high rank. The annual GW2OP Bucket and Spade Party at Saundersfoot was an event of great local popularity; he also founded the Pembroke and District Radio Society, of which he was president. In this he was assisted by his son, GW3LXI.

All members of the Society, and in particular those who were privileged to know him personally, will join in offering deepest sympathy to his wife Hilda and to his three sons and their families. It is some consolation to know that the memory of GW2OP will be perpetuated in Society history through the medium of the Courtney Price Trophy, which he presented in 1933.

The funeral took place at St Mary's Church, Burton Ferry, nr Neyland on Saturday 22 July. The Society was represented by the Council member for S. Wales, Cyril Parsons, GW8NP, and among the amateurs present were GW5VX, GW3ACF, GW3RPR, GW3EMZ, GW3PZM, GW3OSV, GW4AKO and GW8BOQ.

Mr J. Curnow, G6CW
John Curnow of Nottingham, died on 13 July at the age of 70. He had been on vhf from its early days, and was a key figure on 2m sideband activities.

Mr K. A. Kerton, GW3CJR
Mr Kerton died on 30 July, after a short illness. A founder member of the Blackwood ARS, his enthusiastic help with RAE advice and cw practice helped many individuals gain their licences.

Mr G. Moore, G3WFY
George Moore, a founder member and present chairman of the Thornton Cleveleys ARS, died on 19 July 1972. He was a member of the RSGB slow morse team, and his "eyes down and look in" style will be sadly missed by all on the Fylde coast.

Mr F. Palmer, G2HMG
Frank Palmer of Thetford, Norfolk, died on 20 July 1972, at the age of 54. A holder of DXCC, he was an active dx operator until recently when ill health intervened.

We are also advised of the deaths of the following EI amateurs:

Mr Shane McNamee, EI2A, of Co Meath

Mr T. J. McDonald, EI2R, Waterford

Dr M. E. Folan, EI6W, Galway

Woburn Mobile Rally, 1972

As the rain poured down on the Woburn Rally on 6 August, so the visitors poured in, to break last year's top attendance figures. The trade show, which was the largest ever held at this event, was housed in a 240ft marquee, so despite the very heavy rain everyone stayed dry.

As popular as ever was the Bring and Buy stall organised by the team from Derby and District ARS headed by Fred Ward, G2CVV, which was over-worked for the best part of the day.

Raynet was represented by mobile signals caravans from Manchester, Kent and Essex; the Manchester and Kent teams providing the talk-in facilities on 2m and 4m.

RTTY fans had plenty of eyeball QSOs around the BARTG stand, while visitors were able to watch an rtty demonstration.

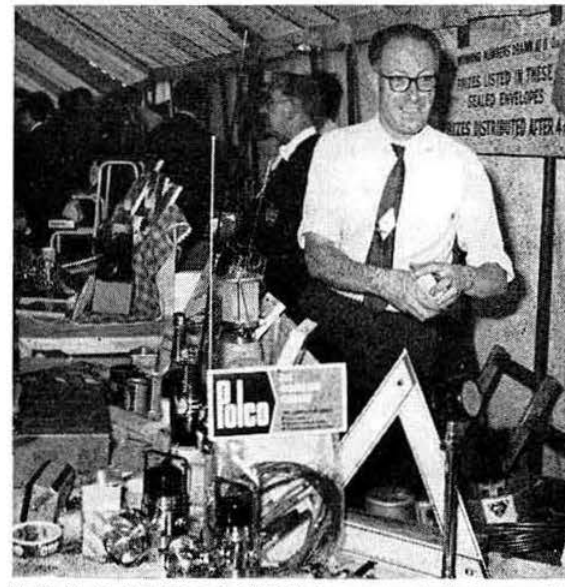
Attending for the first time, the UK (London) FM Group set up a test bench to carry out tests on fm tranceivers.

The Mobile & Exhibition Committee would like to thank all those people who gave such valuable assistance in making the rally such a success.

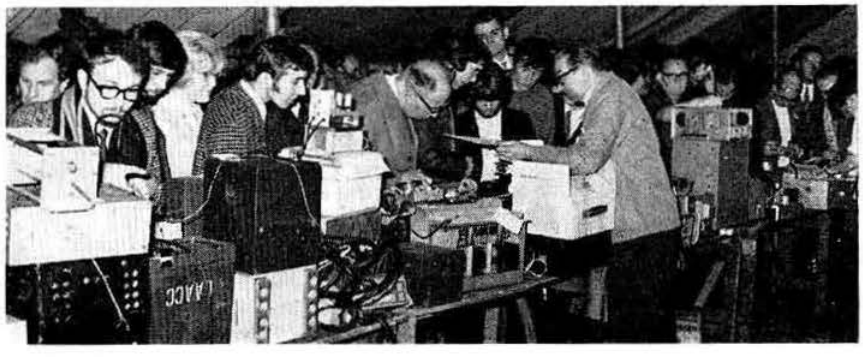
Finally, a date for your diary; the 1973 Diamond Jubilee Rally will be held at Woburn Abbey on Sunday 5 August.

The J-Beam vehicle and mast, and the Kent Raynet control van on location. Photo: *G3GJW*

Mr R. J. Hughes, G3CVV, President of RSGB, among others at one of the trade stands



Mr M. A. C. MacBrayne, G3KGU, keeps a watchful eye on the raffle prizes. The winners of the raffle were: 1st ticket No. 196 — unclaimed, will the holder please claim if he has not yet done so; 2nd, A. Jackson, hon sec of Peterborough R & ES; 3rd, G3EBG



Bring and Buy stand organized by Derby and D ARC

Lower photos by Paul Fletcher

NFD 1972 RESULTS

THIS year shows a significant drop in the number of entries when compared with 1971. Double-station entries have fallen from 26 to 19 and single-station 98 to 80. Bad weather may have had something to do with this, although conditions were unexpectedly very good which led to much higher scores all round. There were quite a number of groups which took part but who did not send in entries.

The changes in the rules were generally welcomed, particularly the bonus points for 1·8MHz and allowing single-station entrants to use any or all of the six bands. While on the subject of the rules it is interesting to note that at the IARU Region 1 Conference in May the subject of NFD rules was discussed by a committee set up to produce a common set of rules for NFD within Region 1. After considerable discussion the committee decided to recommend the 1972 RSGB rules, 10W and all, to be the standard for all countries in future. This recommendation was accepted by the conference as a whole, so in future European countries should be using these rules.

NFD Trophy
SRCC/Croydon RSGB Group — 2,674 points

Gravesend Trophy
Oxford & DARC — 2,615 points

Bristol Trophy
Racal ARC — 1,877 points

Frank Hoosen (G3YF) Memorial Trophy
Oxford & DARC — 928 points

Scottish NFD Trophy
Glenrothes & DARC — 2,202 points

Leading scores on individual bands

1·8MHz	Sutton & Cheam RS "B" G2DMR	512 points
3·5MHz	Aquila RC G3BRK	535 points
7·0MHz	Salisbury G3OBW	689 points
14MHz	Oxford & DARC G8IB	928 points
21MHz	Moray Firth ARS GM3JGS	372 points
28MHz	SRCC/Croydon G6LX	186 points

Overseas station giving most points to NFD entrants
29DX Club Perth W.A. VK6II/P — 396 points

The results

The overall winner was once again Surrey Radio Contact Club/Croydon RSGB Group with a corrected score of 2,674 points. The two stations, G3BFP/P and G6LX/P, were operated by G3BFP, G3EUE, G3IAS, G3JLB, G3MXJ and G6LX. G3BFP/P used a mixer-vfo transmitter with a 2E26 pa and SB301, a half-wave end-fed on 160m, a full-wave loop and an inverted-V on 40m, and a quad on 15m. G6LX/P had a 301 receiver and a 401 with a 2E26 pa used in transceive mode. On 80m a full-wave N-S; on 20m there was an 8-element all-driven array on USA, a quad and a 265ft long wire, while a quad was used on 10m. A very fine win especially as their generator was out of action for quite a while with water in the diesel intake.

Runner-up in the double-station section was the Oxford & DARC with a score of 2,615 points. The stations were G2DU/P and G8IB/P, and with G8IB/P having the highest 20m score the club also wins the Frank Hoosen (G3YF) Memorial Trophy. Operators were G2DU, G3JLE, G3KLH, G3UJI, G3WMM and G4AZN.

G2DU/P used a home-brew transmitter and a Racal receiver. Aerials were: on 160m a half-wave dipole; on 40m the 160m dipole with open wire feeders and an inverted-V dipole, and on 15m a quad. G8IB/P used a home-brew transmitter with a 2E26 pa and a home-brew receiver. On 80m the aerial was an inverted-V dipole, with a quad on 20m and a V-beam on 10m.

In third place was Anglo-American RS/University of East Anglia Radio & Electronics Club with 2,344 points. The stations were G3YIR/P and G3IOR/P. The Bristol Trophy for the highest scoring single-station entry goes to Racal ARC which scored 1,877 points. The operators were G3CYL, G3NCN, G3NKR, G3PSV and G3RBP. The equipment used was an SB101 with a 2E26 pa, a 160m dipole, an 80m dipole, a 40m inverted-V, a 20m quad, and on 15m the 40m inverted-V was used. Second place in the single-station section goes to the Ariel Radio Group G3GDT/P operated by G3POI and G3KKQ; equipment was a KW2000 with 2E26 pa and a cw filter.

The Scottish NFD Trophy was won by Glenrothes & D ARC GM3FXM/P and GM3PFQ/P with a score of 2,202 points. The stations were keyed by GM3FXM, GM3LWS, GM3OLK, GM3PFQ and GM3YOR. GM3FXM/P used a KW Vespa 2E26 pa and a FRDX500 receiver, while GM3PFQ/P used an SB102-2E26 pa transceiver. Aerials were 160m dipole, 80m dipole, 40m dipole (also used on 15m), while on 20 and 10m a TH3 was used.

The second Scottish station was Moray Firth ARS with a score of 2,105 points. The stations, GM3JGS/P and GM3TKV/P, were operated by GM3DZB, GM3JGS, GM3RFH, GM3UAG and GM3UKG. Equipment used at each station was a Trio 599 transceiver with the transceiver output driving a 2E26 pa. Aerials were inverted-Vs for 160, 80, 40 and 15m, with a 3-element beam for 20 and 10m. The 15m score of 372 points makes them band leaders.

Once again we must congratulate the Scottish clubs for their fine efforts by putting in five entries out of 19 in the double-station section with their top two in overall fifth and sixth places. Glasgow + W Scotland ARS, GM3CSM/P, came overall fifth in the single-station section.

1·8MHz

A welcome change here—lots of stations on—helped no doubt by the new bonus points for this band and the free use of all bands by the single-station entries—which made the competition very keen indeed. While there was quite a lot of activity very little of it was outside the UK so conditions were probably only average.

Top scorer for this band was Sutton & Cheam RC "B" Group, G2DMR/P, with a checked score of 512 points. Operators were G3DCZ, G3HSK, G3LCH, G3ZPP, G4AAW and G4ADM. A KW 2000-2E26 pa gave transmit and receive facilities with a three-quarter wavelength Marconi aerial with counterpoise. A total of 138 contacts was made by this single-band entry.

In second place is another single-band entry, Mansfield ARS, G3GQC/P, which had 132 contacts for 504 points. Operators: G3EQF, G3DBF, G3DBZ, G3VDF and G3XWZ. Equipment: KW160, 840C and two half-wave dipoles.

The University College of N Wales ARS, GW3UCB/P, with 498 points from 135 contacts are in third place—using a KW2000-2E26 pa, a dipole and a top-loaded vertical—once again a single-band effort.

3·5MHz

Quite good conditions with lots of activity from the Continent as well as some dx made for some high scores. At the top is the Aquila RC with a single-band entry making 535 points from 206 contacts. The station, G3BRK/P, was operated by G3GRK, G3IZP and G3JKY. The transmitter and receiver were all transistorized and the aerial was a dipole slung between two trees and fed with 75Ω twin lead.

Another single-band entry came second, Maidenhead & D ARC, G3WKX/P, with 506 points from 200 contacts. A home-brew transmitter, an FR100 receiver, with a dipole and a 42ft vertical aerial was the equipment operated by G3RQI, G3UKS, G3ZPK and G4ALG.

Salisbury, G3FKF/P, is in third place with 499 points. Two stations were run but G3FKF/P operated on 3·5MHz only.

7MHz

There were lots of stations on and with conditions generally good the going was fast and furious all the time. The star dx on this band was surely VK6HD/P who contacted GM3CSM/P for his only UK NFD contact.

Top scorer on this band is Salisbury, G3OBW/P, with a score of 689 points. The station operated on this band only and the men at the key were G2FIX, G3OBW, G3YHG, G3YHU, G3YIN and G3ZNH. Equipment used was a G2DAF with 2E26 pa, a G2DAF receiver, and two inverted-V dipoles at right angles. This station was the top scorer on the band in 1971 and once again worked a few N American stations as well as 8P6.

The UCNW ARS team; G4AJW, G8BWO, G3WKH, GW4AQR, G4BEG and G3WXS

Runner-up with a score of 645 is the Oxford & D ARS, G2DU/P, with operators G3JLE, G3KLH, G3UJI, G3WMM and G4AZN using a home-brew transmitter, a Racal receiver, an inverted-V dipole and a 160m dipole with open-wire feeders. Their contacts included N America, EL2 and VP8KF/P.

In third place was Edgware & DRS G2ASR/P with 632 points, a simple station on this band only mainly for the benefit of the less experienced operators.

14MHz

Conditions were generally quite good and there were lots of dx stations worked as well as vast numbers of short-skip EUs.

Band leader and winner of the Frank Hoosen (G3YF) Memorial Trophy is Oxford & D ARC with a checked score of 928 points. The operators were G2DU, G3KLH, G3UJI, G3WMM and G4AZN. Equipment was all home-made and the aerial was a 2-element quad. Lots of Ws and VEs as well as VP9/P and VK6II/P and an XE made up their dx. In fact N America was workable throughout the contest.

Very close runner-up is Glenrothes & D ARC, GM3PFQ/P, with a checked score of 922 points. But for rather a lot of errors in the log this club would have been the band leader. Again lots of N Americans plus VK6, ZD8, TI2, ZL, VP9/P, and a massive list of EUs made the score very high. The short-skip probably helped Scotland on this band. The equipment was an SB102 transceiver (2E26) and a TH3 at 30ft—they could not get it any higher! The operators were GM3FXM, GM3OLK, GM3PFQ and GM3YOR.

In third place is the NFD Trophy winner, Surrey RCC/Croydon RSGB Group, with 850 points. The aerials used were an 8-element all driven array on USA, a 2-element quad and a 265ft long wire with main lobe NE-SW.

As aerials are what really matter apart from operators, it is worthy of note that quads are still the most popular. Commercial beams were used by the runner-up (the only one in the first seven) and 16 other entrants; many of these were in the bottom half of the score. V-beams did quite well and one club used a 7-element inverted delta-loop fixed on USA with a quad as a back up.

TVARTS "A" station. Larry Seaman, G3ATF, operating; Peter Matthews, G3BPM, second operator

21MHz

Plenty of short-skip activity set the scene for 15m this year, and although the band did open up to N America for a while most of the contacts were with European portables. A number of 12-pointers helped to swell the totals, including VK6II/P, VP8KF/P, VP9BY/P, ZS6BMS/ZE/P (Arnold Mynett, G3HBW), 9J4LA/P and 9J4ND/P.

It is pleasing to see a Scottish station as band leader with Moray Firth ARS, GM3JGS/P, operators GM3JGS, GM3RFH and GM3UAG keying 372 points from 118 contacts. Their transmitter was a Trio 599 driving an outboard 2E26 pa, the receiver was a JR599, and the aerial an inverted-V at 40ft.

Runner-up was Guildford & D ARS, G3KMO/P, with 364 points using a 2-element quad.

There were two commercial beams in the first 10 places, ie at fourth and seventh places, and a total of 19 non-wire beams altogether out of 58 entries.

Torbay ARS at Newton Abbott. Mr D. Webber, G3LHJ, operating; Mr A. Endacott, G3TLK, logging; Mr L. H. (Pop) Webber, G3GDW, and Mr D. Place, G3MEP, looking on

28MHz

This was the big surprise, lots of short-skip Europeans all day Sunday as well as the south path dx; as a result many more logs and much higher scores than for a long time. Once again band leader is Surrey RCC/Croydon with a score of 186 points from 57 contacts. Operators were G6LX, G3IAS and G3MXJ—strange they only worked one of the 12-pointers that were on—ZS6BM/ZE/P, 9J4LA/P, 9J4ND/P and VP8KF/P. SRCC used a quad, as did the runner-up Addiscombe ARC, G4ALE/P, which made 164 points from 48 contacts.

A total of 32 entrants out of which 11 used commercial beams and only four of these were in the top half of the listings.

Overseas check logs

It was a pleasure to get check logs from four Commonwealth portables, and congratulations to the 29 DX Club of Perth, W Australia, VK6II/P and VK6HD/P, the most distant of them, for coming out top with a checked score of 396 points. Only one G portable was worked on 7MHz and that was GM3CSM/P. VK6HD/P was on 7MHz while VK6II/P was on 14, 21 and 28MHz with 150W

SINGLE-STATION ENTRIES

Posn	Group	Callsign	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	*Racal ARC	G3RAC	326	344	443	672	92	—	1,877
2	*Ariel Radio Group	G3GDT	254	148	456	635	112	—	1,605
3	East Barnet ARCC	G6KQ	342	413	329	322	123	38	1,567
4	Bristol ARC	G3TAD	320	359	454	186	118	45	1,482
5	Glasgow & W Scotland ARS	GM3CSM	—	284	555	606	—	—	1,445
6	Chelmsford ARS	G3KRZ	352	269	399	229	151	26	1,426
7	*Maidstone (YMCA) ARS	G3TRF	300	289	425	342	59	—	1,415
8	*Stockport RS	G6UQ	278	298	369	248	130	8	1,331
9	Gloucester	G3MA	388	187	305	290	126	4	1,300
10	*Cannock Chase ARS	G3VCC	216	261	392	237	117	68	1,291
11	*Verulam ARC	G3VER	206	310	249	241	147	96	1,249
12	Cornish Radio Amateur Club	G3OHB	174	147	155	195	345	130	1,146
13	Torbay ARS	G3NJA	298	160	222	283	117	57	1,137
14	Chippenham & DARC	G3VRE	172	255	325	105	210	35	1,102
15	Harrow RS	G3EFX	262	181	218	141	167	126	1,095
16	Stevenage & DARS	G3SAD	362	382	207	139	—	—	1,090
17	Cheltenham ARS	G5BK	314	357	335	75	—	—	1,081
18	Cheltenham	G3CGD	352	380	331	—	—	—	1,063
19	Leicester RS	G3LRS	358	366	288	24	—	—	1,036
20	East Notts	G3TBK	278	274	266	133	82	—	1,033
21	Chiltern ARC	G3CAR	242	358	80	139	72	127	1,018
22	E Kent RS & UKC RS	G3LTY	392	172	282	103	56	4	1,009
23	N Bucks ARS	G4AFN	237	459	301	—	—	—	997
24	Hull Group	G3LIQ	—	244	340	240	147	16	987
25	Bury & Rossendale RS	G3BRS	18	128	511	245	72	—	974
26	*City & County Bristol RSGB	G6YB	—	322	203	257	163	6	951
	*Reigate ATS	G3REI	38	230	375	268	40	—	951
28	Fareham & DARC	G3VEF	322	383	224	—	—	—	929
29	Blackpool & Fylde	G8GG	158	137	148	375	77	—	895
30	Barnsley & DARC	G5IV	—	276	483	132	—	—	891
31	Conway Valley ARC	GW3CW	340	118	218	161	44	—	881
32	Scarborough ARS	G4BP	—	299	377	169	28	—	873
33	Ilford	G3XRT	356	338	136	37	—	—	867
34	Bangor & DARS	GI3XRQ	—	75	228	345	218	—	866
35	Derby & DARS	G3ERD	46	329	378	65	—	—	818
36	Worcester & DARS	G3GJL	—	241	254	170	93	26	784
37	Southgate RC	G3SFG	—	297	318	134	29	—	778
38	Garendon School RC	G3MKX	—	225	304	233	—	—	762
39	Edgware	G3VW	54	345	—	257	103	—	759
40	Reading ARC	G3LFM	238	144	211	92	42	8	735
41	Aberdeen ARS	GM3BSQ	—	195	213	228	89	—	725
42	Sunderland ARS	G3RDI	124	187	273	133	4	—	721
43	Ainsdale RC	G2CUZ	236	103	99	159	54	50	701
44	Greenock & DARC	GM3ZRC	—	51	109	281	256	—	697
45	Havering & DARC	G3TTB	240	302	148	—	—	—	690
46	NW Kent	G4CW	—	270	124	287	—	—	681
47	Bedford & DARC	G3WTP	170	172	312	—	—	—	654
48	Weston-super-Mare ARS	G5DV	—	315	290	42	—	—	647
49	Edgware & DARC	G3ASR	—	—	632	—	—	—	632
50	Clifton ARS	G3GHN	334	141	151	2	—	—	628
51	Shefford & DARC	G3FJE	118	297	210	—	—	—	625
52	Caithness ARS	GM3VCM	40	25	63	201	290	0	619
53	Harlow & DARS	G6UT	—	264	145	184	—	—	593
	Nailsworth & DARC	G4AAN	—	194	80	198	121	—	593
55	Bradford RS	G3NN	226	214	146	—	—	—	586
56	*Purley & DRC	G4AKG	—	202	227	138	—	—	567
57	ARC Nottingham	G3EKW	200	163	111	88	3	—	565
58	Clacton & DRC	G3CRC	—	316	191	54	—	—	561
	Rugby ATS	G4APD	156	240	165	—	—	—	561
60	*Kingston & DARS	G3KIN	182	157	185	20	—	—	544
61	Bromsgrove & DARC	G3VGG	304	229	6	—	—	—	539
62	Aquila RC	G3BRK	—	535	—	—	—	—	535
63	Sutton & Cheam RS "B" Group	G2DMR	512	—	—	—	—	—	512
64	Maidenhead & DARC	G3WKX	—	506	—	—	—	—	506
65	Mansfield ARS	G3GQC	504	—	—	—	—	—	504
66	Wheatsheaf ARS (Grimsby)	G3PDL	—	—	503	—	—	—	503
	Easington AR & EC	G4APN	212	180	—	111	—	—	503
68	Eccles & DRC	G3GXI	—	—	499	—	—	—	499
69	UC of N Wales ARS	GW3UCB	498	—	—	—	—	—	498
70	Loughton & DRS	G8AB	470	25	—	—	—	—	495
	Kingsway Tech ARC (Dundee)	GM4AAF	—	117	44	334	—	—	495
72	Worthing & DARC	G3WOR	114	230	125	22	3	—	494
73	Coventry ARS	G2ASF	488	—	—	—	—	—	488
74	Swindon & DARC	G3FEC	174	170	141	—	—	—	485
75	Ariel Radio Group (BBC TV)	G3NTS	460	—	—	—	—	—	460
76	Standard RC	G3NIS	—	191	98	156	—	—	445
77	*Newbury & DARS	G3WOI	154	175	103	9	—	—	441
78	Grimsby ARS	G3HTI	—	411	—	—	—	—	411
79	Southdown ARS	G3WQK	—	346	—	—	—	—	346
80	*Woodmansterne	G3KTA	12	219	26	—	—	—	257
81	Newark ARCS	G3YWS	72	131	—	—	35	—	238

TWO-STATION ENTRIES

Position	Group	"A" Station callsign	"B" Station callsign	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	*SRCC/Croydon RSGB Group	G3BFP	G6LX	368	352	562	850	356	186	2,674
2	*Oxford & DARS	G2DU	G8IB	326	292	645	928	331	93	2,615
3	Anglo-American RS/Univ E Anglia REC	G3YIR	G3IOR	280	419	574	644	309	118	2,344
4	*Guildford & DARS	G3KMO	G3IAF	356	399	583	500	364	126	2,328
5	Glenrothes & DARC	GM3FXM	GM3PFQ	356	229	394	922	277	24	2,202
6	Moray Firth ARS	GM3JGS	GM3TKV	260	311	476	588	372	98	2,105
7	*Addiscombe ARC	G3SJX	G4ALE	402	250	404	435	343	164	1,998
8	*Crawley ARC	G2DP	G3TR	214	312	515	478	205	101	1,825
9	Leyland Hundred ARG	G3XII	G3GGS	300	348	515	399	169	76	1,807
10	*RN & RM Portsmouth	G3BZU	G3KSB	318	213	419	327	265	28	1,570
11	W Scotland ARS B & C Group	GM3AXX	GM3SSB	208	227	300	499	239	16	1,489
12	TVARTS	G8SM	G6GB	380	308	283	176	290	51	1,488
13	*Horsham ARC	G3VPO	G3TNO	408	278	341	217	168	67	1,479
14	Wirral ARS	G3NWR	G2AMV	246	413	315	355	137	—	1,466
15	Sutton & Cheam ARS "A" Group	G2XP	G8DF	—	359	544	322	142	—	1,367
16	Salisbury	G3FKF	G3OBW	—	490	689	—	—	—	1,170
17	N.E. Essex Tech (Colchester)	G5YK	G3CO	48	327	353	330	35	—	1,093
18	Ayrshire ARG	GM5KF	GM3NYG	226	133	275	262	72	—	968
19	Dundee	GM4HR	GM3KYI	168	—	—†	446	222	—	837

* *Inspection carried out.*
† *Points claimed for but no logs received.*

Entries disallowed

Chingford	G8JM (1)	(1) General rule 8f
Crystal Palace	G3VCP (2)	(2) General rule 5b(ii)
Echelford	G3UES (2)	(3) General rule 11b.
Southampton RSGB	G3SOU (2)	(4) General rule 8b.
North Riding ARG	G2KK (3)	
Preston	G3KUE (4)	
Tyneside	G3ZQM (4)	

Overseas check logs

Position	Callsign	Group	Points to G stations
1	VK6II/P	29 DX Club (Perth WA)	396
2	9J4LA/P	Lusaka (Zambia) Region	360
3	VP8KF/P	Falkland Islands	228
4	ZS6BMS/ZE/P	(G3HBW)	108
5	SM2ALU	L. Engstrom	68
6	ZE3JO	Mal Geddes	36

Check logs were received from G6CJ, G3TZM, GM4QK, 8P6DR, G3XQX.

and a quad at 65ft. Operators were VK6EU (G3VEU), VK6IZ, VK6NK (G3NKX), VK6PG (G3PHG) and VK6RV (G3FRV) at VK6II/P, while, of course, VK6HD (G3HDX) keyed VK6HD/P.

The saga from VP8KF/P operating in the depths of winter makes our NFD weather sound glorious. A wonderful effort put on by VP8KF, VP8KV, VP8FL and VP8LR.

Quotes from groups

"Water, water everywhere"—G6LX and almost everyone else.
"We couldn't believe our ears when we heard the opening on 10m co-incident with NFD"—G3IOR.
"First rain for six years"—G3OHB, Cornwall.
"At last we got out!"—G8IB, Oxford.
"We didn't need the 'fridge this year, beer cold enough as it was"—G6LX, SRCC.
"A muddy good time was had by all"—G2DMR, Sutton & Cheam.
"SWR here was a function of the tide level"—GW3UCB, Bangor.
"Band multiplier on 160 excellent decision—please retain"—G3TTY, East Kent.

Bury & Rossendale ARS, G3BRS. Seated: Mr D. Bennett, G4ATK, and Mr F. S. C. Burnett, G3RSM. Standing: Mr K. Rothwell, G8EAP; Mr T. Platt, G2GA; Mr K. Taylor, swl. Photo: *Bury Times*

"Do away with 160 for single stations—it favours the London area"—G3OHB, Cornwall (*Radio Communication*, August).
"Publish WAB numbers of each entry in results"—G3ION, Norfolk.

There were lots of comments from entrants for which the HF Contests Committee are very grateful. All suggestions will of course be considered seriously but there is little likelihood of any rule changes due to IARU Region 1 adopting the RSGB rules for future NFDs in Europe.

Comments from the HF Contests Committee

The overwhelming majority of entrants want the rules left as they are, far more comments on this than ever before.

Quite a number of clubs failed to apply the multiplier for 160m. Adjustments have been made so those clubs will get a pleasant surprise by finding their scores upped by one or two hundred points.

Commercial beams were used to quite a large extent and do not seem to have produced scores higher than the wire aerials. In fact, most of those using such beams seem to have quite low scores.

No reports of any caravans being used but one club operated from a leaky horse box.

The committee is asked, "Why apply for entry if there are to be no check lists provided?" The answer is that it needs to know the site for possible station inspection.

Although NFD may have originated as a sort of emergency exercise before the second world war it is now a low-power, portable multi-operator, club cw contest, which is the only one in the calendar and is much enjoyed by all who take part. Raynet looks after the emergency angle, and in any case vhf in mobiles would do a much better job than cw from tents.

Regarding operators' callsigns against contacts, this is insisted upon because we often get an operator who is not very good and, for example, sends 7 when he means 8. In the ordinary way the copying of a 7 in the receiving stations log would lose the recipient points. Where it can be seen that the error occurs in lots of logs when a particular operator is sending we do not penalize the recipient.

Still too many duplicate contacts for which points are claimed—no disqualifications for this but, in future, duplicate contacts for which points have been claimed are likely to be heavily penalized.

Finally, our thanks to all competitors and to those who sent in check logs.

CONTEST NEWS

June 70MHz Contest 1972 results

The June 70MHz Contest was supported by 18 fixed stations, 21 portable stations and two entries for the Listener Championship. From the few comments received it seems that many of the competitors found it a colourless event with few highlights to relieve the tedium of the closing hours. Even the catalogue of equipment used by most of the stations lacked originality and inspiration, and nearly 40 per cent of those sending in logs make no concessions at all to the solid-state era.

Most contestants appeared to be reasonably content with the rules and conduct of the event, and the three or four complaints recorded failed through their diversity to focus upon any common cause for discontent.

Scoring was very close, especially among the upper bracket, and points were lost through indifferent operating procedures. In the variety of 427 cover sheets sent in, some must surely date back to prehistoric times, and while no penalties have been imposed for incorrect or incomplete declarations, it would be appreciated if the photo-copy fanatics would take the trouble to duplicate the current (A4 size) style of 427 and log sheet.

The overall winner, to whom the VHF Manager's Trophy will be awarded, was the Golden Valley VHF Contest Group whose station, GW4ABR/P, was operated by G3SNN, G4BEZ and G8DTA. The runner-up, G3FDW/P, shares the honours of second place with his fellow operator, G3JYP. Certificates of merit go to the leading station and runner-up in each section.

C. S.

FIXED STATIONS

Posn	Callsign	Score	QSOs	Cnty	Best dx	km	Pwr
1	G3OHH	401	79	SD	G3DAH	295	50W
2	G3RLE	268	40	YS	G3JHM/A	330	50W
3	G3NEO	229	44	YS	G3KSU/P	290	40W
4	G3DOV	209	31	NK	G3TDM/P	325	25W
5	G5DF	206	46		G3FDW/P	385	20W
6	G6HD	169	54	KT	GW3NWR/P	290	34W
7	G5UM	158	36	LR	G3FDW/P	232	20W
8	G3WXI/A	114	32	YS	G4ARD/P	192	30W
9	G3OJE	105	47		GW3UCB/P	283	
10	G3YQW	82	35	SX	G3OHH	270	18W
11	G3ZYR	71	40	SX	G3OBD/P	142	15W
12	G3PGN	69	19	EX	G3RLE	270	50W
13	G3OHC	61	16	WK	G3TDM/P	195	10W
14	G3HBG	43	11	SY	GW3UCB/P	300	30W
15	G3ZKE	32	22	LD	G3VPK	80	25W
16	G4AGO	25	9	YS	G3FDW/P	141	18W
17	G4ARO	21	18	SY	G3WOS/P	85	6W out
18	G3YPN	18	14		G4ARD/P	80	11W

PORTABLE STATIONS

Posn	Callsign	Score	QSOs	Cnty	Best dx	km	Pwr
1	GW4ABR/P	495	79	RN	G3DAH	323	40W
2	G3FDW/P	493	59	WD	G3JHM/A	445	22W
3	GW3UCB/P	492	82	DB	G3DAH	340	50W
4	G3TDM/P	472	72	ST	G3FDW/P	400	15W
5	G3WOS/P	373	97	BD	G3FDW/P	332	11W out
6	GW3ITZ/P	330	66	DB			25W
7	G3VCV/P	329	72	HN	G3FDW/P	305	50W
8	G4ARD/P	327	83	BD	G3FDW/P	338	50W
9	GW3NWR/P	297	67		G3KSU/P	295	
10	G3KSU/P	242	60	HE	GW3NWR/P	290	10W
11	GW3OXD/P	233	43	RN	G3DAH	308	12W
12	G3PXP/P	182	48		G3TOM/P		12W
13	G3ZLQ/P	166	40	WE	G3FDW/P	362	3W out
14	G3JFO/P	162	30	YS	G3TDM/P	348	30W
15	G3KUE/P	151	43	LE	G3TDM/P	360	20W
16	G3RCQ/P	144	51	BD	GW3UCB/P	220	10W
17	G3VPF/P	137	29	DT	GW3NWR/P	270	25W
18	G3ZKR/P	105	48		G3VCV/P	157	15W
19	G3LVP/P	79	23		G3OHH	280	7W out
20	G3RWW/P	48	20	LE	G3FDW/P	150	8W
21	G3KIN/P	26	16	SY	G3KSU/P	80	8W

LISTENER CHAMPIONSHIP

Station	Score	QSOs	Cnty	Best dx	km
BRS 31152	153	47	SX	G3OHH	320
BRS 15822	103	38	LD	GW3NWR/P	300

Check log acknowledged from G8LY

June Microwave Contest results

A 50 per cent increase in contacts made during this 24-25 June contest over last year's shows how popular microwave activity is becoming. Forty-six stations were active on 23cm and no less than 12 on 3cm making the latter the second most popular microwave band. For the first time all bands up to 15mm were in use.

The overall winner and runner-up were, as last year, the Mid-Essex Group, G3LTF/A, and G3RPE/P respectively. This year Peter's group operated from a site close to Chelmsford, amassing a very large score on 23cm.

The best dx recorded was over 200km between G5PI/P and G8ACE/P. This is somewhat greater than last year but conditions could not be described as "assisting".

The 1N23 mixer and 2C39 pa seemed to form the bases for most 23cm stations, but the leading stations also used preamplifiers: G3LTF had a parametric, G3RPE a fet, and G5PI a TA7486.

Activity on 3cm seems to have come on apace with the use of Gunn diodes in both transmitter and receiver now common. Klystrons and travelling wave tubes were also used, and several stations were known to be crystal controlled. The notable score of G3ZGO/P was achieved using all-solid-state gear.

G3WDG used a 1N26 doubler to give him microwatt power on 15mm, allowing a link to be established over 5km. G3EEZ used varactors on 9cm and 6cm with 1N23 front ends.

Most stations used parabolic dishes of various sizes and constructions for their main aerials, but it was noted that several successful Yagi designs have now appeared for use on 23cm.

Certificates go to G3LTF/A and G3RPE/P.

W. J. M.

Posn	Station	Total score	23cm score	23cm QSO	13cm score	13cm QSO	3cm score	3cm QSO	Cnty	ASL
1	G3LTF/A*	4157	3524	21(5)	633	3			EX	350
2	G3RPE/P	2917	1586	10(5)	561	2(3)	770	3	OX	650
3	G3THQ/A	2373	1200	9(2)	543	3	630	3	OX	600
4	G5PI/P	2172	2172	8(5)					ST	1000
5	G3EEZ/P *†	1990	694	2(2)	216	1	360	1	SE	1530
6	G5FK	1682	680	8(3)	562	2(3)	440	2	MX	160
7	G4ARD/P	1535	994	11(3)	539	3(2)			BD	800
8	G3WDG/P*††	1512	956	6	291	3	440	3	HE	820
9	G3TTV/P	1414	1414	14(2)					BS	850
10	G8ARM	1277	1277	17(3)					LD	150
11	G3ZEZ/P	1108	754	7(4)	354	2(2)			HF	470
12	G3ZGO/P	1015					1015	4	BE	960
13	G8CIT	612	612	8(1)					MX	53
14	G8AZM	594	594	7(2)					KT	150
15	G8AFA/P	566	566	5					WE	755
16	G3NHZ	330					330	2	LD	220
17	G8ATD/P	274	274	5(1)					BD	640
18	G2WS	196	196	3					ST	300
19	G8CYG	155	155	3(3)					HF	220
20	G3VPF/P	110					110	1	DT	500
	G3RZG/P	110					110	1	DT	180

* Band leaders. ( ) indicate one way QSOs.
† G3EEZ/P also scored 360 points for one QSO on 9cm, and 360 points for one QSO on 6cm.
†† G3WDG/P also scored 25 points for one QSO on 15mm.
Check logs were received from G8BYV and G8DKK/P.

70MHz Cumulative Contest rules

From 1000 to 1200 clocktime on the following dates: 15 and 29 October, 12 and 26 November, 10 December 1972, 14 and 28 January 1973.

All entries and check logs should be sent to the adjudicator addressed to: VHF Contests Committee, 59 Harewood Road, Chelmsford, Essex. CM1 3DH.

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

Chelmsford DF Qualifying Event results

Twenty-two competing parties assembled on Danbury Common to take part in the third qualifying round of the year. Good signals were received at the start from both transmitters. Station "A" was located in a small clump of undergrowth on the sea-wall, a short distance east of Goldhanger and approximately eight and a half miles from the start, while station "B" was in thick undergrowth in Lingwood Common about one mile from the start, although the signal strength from this station had been carefully reduced to conceal its proximity.

One or two competitors, who had inaccurate bearings, found themselves on the wrong side of the River Blackwater, and Trevor Gage was fortunate to hitch a lift across the river from a friendly yachtsman. Only 10 competitors located both stations, and four teams did not find either. As B. Mahony who finished second had already qualified; subject to confirmation, both G. W. Anderson and P. J. Tyler, who tied for third place, go forward to the Final.

Posn	Name	Club	Time of arrival Station "A"	Station "B"
1	R. Pearce Boby	Oxford	1536½	1457
2	B. Mahony	Rugby	1537	1453
3	G. W. Anderson	Dartford Heath	1600	1450
	P. J. Tyler	Oxford	1456	1600
5	J. R. Vickers	Stratford	1455½	1601
6	D. Beattie	Chelmsford	1456½	1601½
	D. Newman	Rugby	1601½	1453
8	E. L. Mollart	Oxford	1458½	1602
	W. J. North	Chiltern	1602	1453½
10	M. G. Easterbrook	Dartford Heath	1507½	1614
11	G. Whenham	Coventry	—	1449
12	T. C. Gage	Oxford	—	1454
13	T. Dix	Chelmsford	—	1458
14	A. Adams[1]	Southend	1520	—
15	P. G. Wells	Dartford Heath	1531½	—
16	D. Holland	South Manchester	1606	—
17	F. Piper	Chelmsford	1615½	—
18	G. L. Mills	Chelmsford	—	1616

High Wycombe DF Qualifying Event results

The Chiltern Qualifying Event was held on 7 May when 18 teams gathered in an isolated position on the towpath of the Thames for the start.

Both stations were heard at good strength, and most competitors were somewhat surprised to get an identical bearing on both stations. Transmitter G3KLT/P was well hidden among the tangled roots at the bottom of a gorge in Maidenhead Thicket, and many competitors, including M. Hawkins, spent over half an hour within 50ft of the transmitter before actually finding it. Transmitter G3XSO/P was in a somewhat similar position about a mile further away hidden in dense undergrowth; the transmitter used a very long wire aerial and proved almost as difficult to find as the first one.

Subject to confirmation, B. Bristow and J. R. Vickers qualify for the Final.

Posn	Name	Club	Time of arrival Station "A"	Station "B"
1	B. Bristow	Chiltern	1458	1415
2	J. R. Vickers	Stratford	1507	1431
3	T. Gage	Oxford	1509	1415½
	D. Newman	Rugby	1511	1449
5	I. R. Butson	Chelmsford	1512	1425
	P. Tyler	Oxford	1512	1450
7	M. Hawkins	Chelmsford	1524	1452
8	G. Whenham	Coventry	1444	1529
9	R. Pearce Boby	Oxford	1445	1531
	E. L. Mollart	Oxford	1531	1422
11	P. Wells	Dartford Heath	1531½	1501
12	M. Easterbrook	Dartford Heath	1449	1540
13	G. Taylor	Rugby	1544	1447
14	A. Butcher	Chelmsford	1459	1546
15	A. Simmons	Oxford	1629	1458
16	P. Lisle	Oxford	—	1447
17	G. T. Peck	Chiltern	—	1544
18	N. Hadley	Chiltern	—	—

Salisbury DF Qualifying Event result

The Salisbury DF Qualifying Event took place on Sunday 16 July in perfect weather. Nineteen teams assembled at Bemerton Heath, a built-up area on the west side of the city. The "A" station, G3OBW/P, was located on the slopes of the Old Sarum earthworks about 1½ miles north-east of the starting point. The "B" station, G3FKF/P, was located in dense undergrowth above the entrance to a tunnel on the disused Salisbury-Bournemouth railway about six miles south-east of the starting point.

Eleven teams went for the "A" station first. A few, misled by the strong signals, wasted several minutes searching bushes and undergrowth on waste ground near the starting point. Not all the competitors used the motorable track to the "B" station; some, following the disused railway into a deep cutting (as they were intended to) decided that the quickest way in was to climb the steep, loose chalk face above the tunnel entrance. One competitor a least lost foot and hand hold and slid to the bottom, but repeated his climb with a borrowed receiver, his own not having survived the descent as well as he had.

Posn	Name	Club	Time of arrival Station "A"	Station "B"
1	M. Hawkins	Colchester	1415	1449
2	W. J. North	High Wycombe	1414	1513
3	C. Pearce Boby	Oxford	1436	1514
4	A. Simmons	Oxford	1435½	1515
5	D. E. Newman	Rugby	1414½	1520
6	P. Tyler	Oxford	1424½	1521
7	D. Holland	South Manchester	1435	1523
8	R. Vickers	Stratford	1531	1448
	T. Gage	Oxford	1531	1448
10	G. Whenham	Coventry	1531½	1447
11	E. L. Mollart	Oxford	1416½	1533
12	I. Butson	Colchester	1536	1448
13	R. Worby	Dartford Heath	1414½	1545
14	G. Marsh	Dartford Heath	1425	1551
15	A. W. Butcher	Chelmsford	1553	1522
16	P. H. Lisle	Oxford	1555½	1523
17	P. Homer	Dartford Heath	1456	1554
18	M. Easterbrook	Dartford Heath	1603	1509
19	D. Nasey	Newport, Mon.	1604½	1501

W. J. North and C. Pearce Boby qualified for the Final.

South Manchester DF Qualifying Event results

Thirteen teams assembled at the start near "The Romper" public house on 25 June. The weather was rather dull, but the rain held off until after the end of the contest. Good signals were received from both stations, and about half the teams went in search of Station "A", while the remainder chose Station "B".

Station "A", G3FVA/P was located about 1½ miles from the start in Styal Woods, the transmitter being situated under a large thorn bush at the top of a very wet and slippery nettle-covered slope. The wet weather over the last few weeks had added the final touch. The station was manned by G3WFT and G3ZKO, who were wondering where the competitors were when no-one had appeared by 1500. About two minutes later, Eric Mollart was seen negotiating a nearby electric fence, and at 1505 was the first in. A further 10 minutes passed, then suddenly about six muddy and weary teams were all trying to climb the slippery slope.

Station "B", G3UHF/P, operated by G3MXV and G3SMT was, like "A", situated a good walk from the nearest road and was about seven miles from the start. The transmitter was hidden in thick bushes near a muddy brook. The first competitor to arrive was B. Mahony at 1417 followed by E. Mollart at 1430. One competitor stood about a foot away from the transmitter for sometime but wandered off in the wrong direction.

Posn	Name	Club	Time of Arrival Station "A"	Station "B"
1	E. L. Mollart	Oxford	1505	1430
2	B. J. Mahony	Rugby	1515	1417
3	R. J. Slatter	South Manchester	1618	1433
4	P. Simmonds	Slade	1516	1628
5	J. R. Vickers	Stratford	—	1450
6	D. E. Newman	Rugby	1517½	—
7	D. Kennedy		1518	—
8	K. Brown	Coventry	1519	—
9	W. J. North	Chiltern	1521	—
10	P. M. Williams	Slade	1547	—
11	G. Clark	South Manchester		Failed to locate either transmitter
	D. Nasey	Newport		
	R. P. Smith	South Manchester		

E. L. Mollart and R. J. Slatter qualified for the Final.

Colchester ARC VHF & UHF Contest rules

Date: 14–15 October 1972.
Time: 0001gmt Saturday to 2400gmt Sunday.
Mode: AM, fm, ssb, cw.
Bands: 2m, 70cm, 23cm.
Entrants: All amateur radio operators and SWLs.
Logs: Separate log for each band, as per RSGB.
Certificates will be awarded for the highest points in each band, also prizes for the best dx stations in each band.
Scoring system: RSGB (B) contacts will be scored at one point per kilometre.

Grafton 2m Contest rules

The president of Grafton Radio Society, Mr Bert Wennell, G2CJN, has donated a cup, for a members section, for a vhf /uhf contest to complement the Grafton G2AAN Top Band Contest. The first contest will be on 2m and will have an open section, the rules being as follows:

1. **Saturday 16 September 1972**—2100–2400gmt.
2. **Individuals only**—club entries not accepted.
3. **Scoring**—as RSGB 1972 rules.

Km	*Pts*	*Km*	*Pts*
0–50	1	200–250	9
50–100	3	250–300	11
100–150	5	and pro rata.	
150–200	7		

Contacts on border rigs count low.

4. **Exchange** RS or RST followed by serial number, QRA locator and QTH.
5. **Logs**, showing date and time (gmt); callsign of station worked; report and serial no. sent; report and serial no. received; QRA locator, QTH, and points claimed, to be postmarked not later than 30 September 1972 and sent to: C. E. Heywood, G3KEB, 23 Richmond House, East St, London SE17, from whom copies of the rules and log sheets may be obtained (SAE, please).
6. **Certificates** will be awarded to the winner and runner-up, with a special certificate to the highest placed station first licensed in the six months prior to the contest. Qualifiers to give date of licence.

Contests calendar

9–10 September—WAE Phone
10 September—80m Field Day (Rules in August issue)
16 September—Grafton 2m
16–17 September—SAC (cw)
16-24 September—BARTG VHF RTTY Contest (Rules in August issue)
17 September—DF Final Round—Oxford
23–24 September—SAC (phone)
7–8 October—21/28MHz (Rules in May issue)
7–8 October—IARU UHF (Rules in April issue)
7–8 October—VK/ZL/Oceania DX (phone)
14–15 October—VK/ZL/Oceania DX (cw)
14–15 October—Colchester ARC VHF/UHF
21–22 October—7MHz CW (Rules in June issue)
28–29 October—CQ WW DX Phone
4–5 November—7MHz Phone (Rules in June issue)
5 November—144/432MHz CW (Rules in August issue)
11–12 November—Second 1·8MHz
12 November—Czechoslovakian
25–26 November—CQ WW DX CW
November-December—70MHz Cumulative

SPECIAL EVENT STATIONS

University of Manchester Institute of Science & Technology, 2-30 September
A special event station, GB3MAN, will be operated by the University Amateur Radio & Electronics Society, to coincide with the intake of new students. Operation will be on 160-10m cw/ssb, 2m ssb/a.m. and 70cm a.m./fm. Prospective students are invited to get in touch with the hon sec, P. Bacon, G3ZSS.

Staffordshire County Fair, 9-10 September
GB3SCF will be active on Saturday and Sunday, from the County Showground, Weaton Road, Stafford. All bands from 160 upwards, including 2m. Talk-in facilities available, free car parking, entrance—adults 30p, children 15p. Visitors welcome. Main attractions include falconry, clay pigeon shooting, fairground, brass bands, etc. Details from G3UMI, QTHR, tel 0785 850 636.

Oulton Park, Cheshire, 22, 23, 24 September
G3CVW will be operated during the Ranger Guide and Venture Scout Cheshire Gathering, at Oulton Park. It is hoped to be active on 3·5, 14, and 21MHz bands, calls from Scout stations especially welcome.

RAYNET

by S. W. LAW, G3PAZ*

As these words are of necessity written before the date, we can only wish all our members well for the Woburn Rally, and trust that those who made the trip were well satisfied with the day. Our thanks to the members and friends who attended and a special thank you to those who assisted in any way to help out the hard-working organisers. More about the Raynet angle next month. Do not hesitate to write if you have any criticism or suggestions to the Raynet Committee c/o the address in the panel below. All letters will be read out at the next committee meeting at RSGB HQ on 9 September and note taken of the contents.

Flood problems
While our sympathy goes out to the many countries of the world in the times of disastrous flooding, we are by no means immune in the UK, as events of recent months have shown. Many local authorities are now taking steps to deal with the matter on a high level of priority and perhaps none more so than the area from London to the Thames estuary and the Medway environs. Hence we are pleased to report the very praiseworthy combined exercise held on Sunday 30 July, by no less than five groups comprising NW Kent, Mid-Kent, SE London, Essex and Chingford (Essex). The "call-out" was initiated by SE London from G3IIR by the announcement of "Raynet exercise 'Canute', condition Yellow" and when all groups had called in, the exercise changed to "condition Red" and things got really under way.

SE London had previously called Surrey, Sussex and other adjacent groups inviting controllers to come and observe at the various controls and sub-controls. G3HVE, controller Surrey, was in evidence early-on, travelling and reporting /M en route from Camberley to the main control situated at Shooters Hill in the GLC area. It did not take long for G3HVE to be co-opted as assistant at the famous striped waggon of G8DPW/P, the central 2m link connecting all sub-controls. These, we understand, comprised G8ALM/P (Chingford) somewhere in Epping, G3GNQ (Essex) well down river, G3FZL operating from Forest Hill (SE London controller), G3GYZ (NW Kent controller) and G3YCN/P at Bean (between Gravesend and Dartford). G3IIR/M was holding the fort on Erith Marshes near Belvedere SE2, while G3OOU/M was having a little trouble in the difficult area between London Bridge and the dockland district.

According to G3GJW (Kent controller) the day was even more exciting than anticipated owing to actual high water conditions causing trouble at Tower Bridge, the capsizing of a certain well-known craft and some rather serious flooding in Kent which involved official rescue services in some trouble and a large number of citizens in considerable discomfort if not worse. In fact on the following day G3GJW was asked to call a stand-by in Kent, but no call-out resulted as the authorities were able to contain the situation.

Exercise "Canute" was a busy and useful day, more than 60 messages being passed on each of the 2m control circuits between the "Red" start at 1015 and the close at 1510bst.

Around and about
There are a number of changes in three or four areas in connection with the control of existing groups which have yet to be ratified by the committee. These we hope to report later. Meanwhile we hear that further groups are forming in Leicestershire, Teesside and Mid-Warwickshire. More details when these are to hand.

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

* 130 Alexandra Road, Croydon, Surrey CRO 6EW

CLUB NEWS

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

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

REGION 1 — RR B. O'Brien, G2AMV

Special Events

North West Amateur Radio Convention—23-24 September, in Lancaster. Talk-in stations on 1,876kHz (G3ZBY) and 144·5MHz (G8DOU).

Ainsdale (ARC)—Members should contact N. Horrocks, G2CUZ, for details of meetings.
Blackburn (ELARC)—1st Thursday each month. 7.30pm Edinburgh House, Shearbank Road, Blackburn. Secretary, W. E. Baxendale, G8FDG, "Juverna", Westland Avenue, Darwen, Lancs.
Blackpool (B & DARS)—Mondays 8pm, Pontins Holiday Camp, Squires Gate. Morse tuition 7.30pm.
Bolton (B & DARS)—1st & 3rd Wednesdays, Bolton Recreation Club, Kensington Place. Morse tuition at every meeting. Further details from G3XUM.
Bury (B & RRS)—2nd Tuesday each month at 8pm, George Hotel, Market Street, Bury. Secretary, G3RSM, 13 Rhiwlas Drive, Bury BL9 9DD. Tuesday 12 September—Another look at amateur tv this month, but this time it's the conventional 70cm type. G3SXC will be coming from Blackburn to give us a talk and demonstration. The club newsletter is in full swing, the latest issue containing an article on Top-Band vertical aerials by G3JAG. Club net times have been amended, now taking place on 145·8MHz on Sunday mornings at 1130am. 9 October ("TVI & bci oddities", by G2BTO).
Carlisle (C & DARS)—Mondays 7.30pm, Currock House, Lediard Avenue, Currock. Secretary, A. R. Harper, 23 Roman Way, Stanwix.
Cheshire (Mid Cheshire ARC)—Wednesdays 7pm, Technical Activities Centre, Winsford Verdin Comprehensive School, Grange Lane, Winsford. 6 September (Discussion on NFD and final examination of the 2m project transmitters), 20 September (AGM), 27 September (Talk and demonstration on chart recording by Ian Campbell). Monday net on 160m from 7pm, Tuesday on 2m at same time. Details from G3JWK.
Chester (C & DARS)—Tuesdays 8pm except 1st Tuesday in month which is net night. YMCA, Chester. Details from G8AYW.
Douglas IOM (D & DARS)—Secretary, GD3YUM, will be pleased to hear from any member who intends to visit the island.
Eccles (E & DRC)—Tuesdays 8pm, Bridgewater School, Worsley, Manchester. Club 2m net 11am Sundays on 145·65MHz. We will be holding our AGM on 12 September. All visitors and prospective members welcome. Secretary, G4AEQ, QTHR.
Lancaster University (UOLARS)—Prospective members should write to Phil Jones, Department of Environmental Sciences. The society's vhf station, G8DOU, is operational on 144MHz rtty and would welcome enquiries about skeds.
Leyland Hundred Amateur Radio Group—2nd Monday each month, 7.30pm, Rose & Crown, Ulnes Walton, Leyland. Net night Saturdays, 1900bst on 145·8MHz. Details from F. Harrison, 78 Lancaster Lane, Leyland, Lancs.
Liverpool (L & DARS)—Tuesdays 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary, G3WCS.
Liverpool (NLRC)—Tuesdays 8.30pm. Informal meeting at the Nags Head, Thornton, Crosby, Liverpool 23. Visitors welcome. Secretary, G3XMG.
Liverpool University (ARS)—During the summer vacation, "lid net" will be held on 80m so that the members can keep in contact. Listen for G3YSH, G4AUF, G4BBP, G3WZR and G4AXA. Liverpool University ARS would be interested in hearing from any amateurs or SWLs who will be entering the university in October. Please contact the secretary, N. Pope, G4AXA, 234 Derby Road, Chesterfield, Derbyshire S40 ZEP, or visit the club stall during fresher's week. Members of the society will be active on 80m during the vacation.
Manchester (M & DARS)—Wednesdays 7.30pm. All meetings include morse classes. Secretary, G3IOA.
Manchester (SMRC)—The club meets on Fridays at 8pm at the Sale Moor Community Centre, Norris Road, Sale, Cheshire. The vhf section meets on Mondays, 8pm at the club shack, "Greeba", Shady Lane, Manchester 23. The club df event is on 10 September (non-members welcome). The start is near The Romper Public House, NGR 808 848, OS map 101, starting at 1.20pm (please inform G3WFT if you are coming). This is a triple df event. September programme: 8 September ("Printed circuit boards—their design and production", by D. Holland, G3WFT), 15 September ("Capacitors", by D. Hyde), 22 September (Contests review), 29 September (Surplus equipment sale). Visitors are welcome on both Mondays and Fridays. Hon sec, G3WFT.
Manchester University (ARS)—G3VUM is active on all hf bands. The society continues with its programme of lectures, visits and tuition for the RAE and morse test. Details from G8BVF, G3ZNS or GM3YOK at the University Union, Oxford Road, Manchester.
Preston (PARS)—14 & 28 September, 7.30pm, Windsor Castle (private room), St Paul's Square, Preston. Secretary, G. Earnshaw, G3ZXC. Morse practice 7.30pm, main feature 8pm.
Stockport (SRS)—2nd Wednesday each month is a discussion night, 4th Wednesday is a lecture night. 8pm, Blossoms Hotel, Buxton Road, Stockport. Secretary, G8BCG.
Thornton Cleveleys (ARS)—1st & 3rd Wednesdays, 8pm, St John Ambulance Brigade HQ, Fleetwood Road North (behind the police station), Thornton. Construction group meets Mondays 7.15pm at Rossall School. Book through G4APP.
Warrington (W & DARS)—1st & 3rd Tuesdays, 8pm, Thames Board Mills Social Club, Alford Hall, Manchester Road, Warrington. 5 September (rf stages of club tx by Mr T. Leeming and Mr W. Neill), Saturday 16 September (Demonstration station at Woolston Show, Warrington, operation 160 and 10m G3ZRN/A, 2m G8FVP/P), Tuesday 19 September (Visit from RSGB Region 1 Representative Mr B. O'Brien, G2AMV).
Westmorland (WRA)—1st Monday each month at the New Allen Technical College. Acting secretary is N. Stanley, G3UEC, 9 Castle View, Sedgwick, Westmorland.
Wirral (WARS)—1st & 3rd Wednesdays each month 7.45pm Sports & Recreation Centre (Old Drill Hall), Grange Road West, Claughton, Birkenhead, secretary G3WSD.
Wirral (Wirral DX Association)—Last Thursday each month at members' homes. Secretary M. Davidson, G3YSM, 43 Stuart Avenue, Moreton, Wirral. Visitors welcome, please inform secretary beforehand.

Local RSGB members in **Crewe** meet at the home of R. Owen, 10 Circle Avenue, Willaston, Nantwich, from whom further details may be obtained; and **Merseyside** RSGB members hold luncheon meetings at HMS *Landfall* on first Monday of each month, contact G3VQT or G2AMV.

REGION 2 — RR J. E. Agar, G8AZA

Barnsley (B & DRC)—AGM on 8 September, 7.30pm. 22 September (to be announced), King George Hotel, Peel Street, Barnsley. AR, Peter Ackley, G3LRP, QTHR.
Bradford (BRS)—12 September, (1st meeting of new session), 7.30pm, HQ, 10 Southbrook Terrace, Great Morton Road, Bradford 7. Hon sec, R. Harker, A7585, 65 Whitby Road, Bradford BD8 9JN. Tel Bradford 43971.
Fulford (FARS)—Meets Tuesdays 7.30pm, Scout HQ, 31 George Street, York. Hon sec, G5KC, QTHR.
Halifax (NHARS)—13 September (Flea market — type of junk sale), 27 September (Film Show). Hon sec, G3MDW, QTHR.
Harrogate & Knaresborough (H & KARS)—Meets 2nd and 3rd Mondays each month, details from hon sec, R. Troughton, G8CRH, QTHR.
Hull (H & DARS)—1 September ("Microwaves"—G8EAH), 8 September ("Quad Aerials"—G3LIQ), 15 September ("Semiconductors"—G3SSA), 22 September (Visit to Applied Physics Dept, Hull University), 29 September ("Building in earlier days"—G2ABR), 20

October (Open night). Hon sec, Mary Longson, 4 Chester Road, Hull.

North Riding (NRARG)—Meets at Alma Inn, Scarborough, and White House Hotel, Whitby, on alternate fortnights. Hon sec, J. E. Agar, G8AZA, QTHR.

Northumberland (Morpeth) (NRS)—Northumbria Radio Club meets at 3 Wheatsheaf Yard, Morpeth. Details G3XAI, QTHR.

Otley (ORS)—ORS is holding an open construction competition. Details from hon sec, D. G. Mott, G8BZY, 17 Newall Carr Road, Otley.

Scarborough (SCARS)—Summer recess at normal meeting room, meetings arranged elsewhere. Details from hon sec, G3VAN, QTHR or AR, G8SKU QTHR.

South Shields (SS & DARC)—Fridays 8pm, Trinity House Social Centre, Laygate, South Shields.

Spen Valley (SVARS)—HQ Grammar School, High Street, Heckmondwike. 7.30pm, hon sec, G8DSB, QTHR.

Sunderland (SARS)—19 September, first meeting after summer recess, Sunderland Polytechnic. Details, G3XID, QTHR.

Tyneside (TARS)—Offers RAE classes and lectures on many varied subjects and extends a welcome to anyone interested in Amateur Radio. The club newsletter is titled "Source and Drain". Meetings at Community Centre, Vine Street, Wallsend. Details, hon sec, George Lowden, 21, Winefred Gardens, Wallsend NE28 6EF, tel Wallsend 627878.

Wakefield (WRS)—Meets alternate Tuesdays, 7.30pm, Youth Centre, Ings Road, Wakefield. Details G3XVU, QTHR.

York (YARS)—Thursdays 7.30pm. British Legion HQ, 61 Micklegate, York. Hon sec, J. Rainbow, 14 Temple Road, Bishopthorpe, York.

REGION 3 — RR R. W. Fisher, G3PWJ

Special event

GB3SCF—160 to 2m, Staffordshire County Fair, The Showground, Stafford. *G3UMI.*

Birmingham (MARS)—No information for September, 17 October (AGM), 7.30pm, The Birmingham & Midland Institute, Margaret Street, Birmingham 2. *G8BHE.*

(Slade)—8 September ("Basic principles of ssb transceivers", by Mr J. L. Tiptaft, G3MVT), 22 September ("Hi-Fi equipment", by Mr Evans of Heathkit), this meeting by ticket only, free ticket from Mr Smart, 110 Woolmore Road, Erdington. 8pm, The Church House, High Street, Erdington, Birmingham. *G8EYL.*

(South)—6 September ("Toys", by G3XGP), 8pm, Hampstead House, Fairfax Road, West Heath.

Bromsgrove (B & DARC)—8 September ("VR2 Land", by G3HZG), Royal Oak, Barley Mow Lane, Catshill.

Coventry (CARS)—8 September (Night on the air), 15 September (Stan's quiz night), 22 September (Beginners night), 29 September (To be arranged), 8pm, The City of Coventry Scout HQ, 121 St Nicholas Street, Radford Road, Coventry.

Dudley (DARC)—5 and 19 September, 8pm, Central Library, St James's Street, Dudley. *G3PWJ.*

Hereford (HARS)—First and third Friday of each month, 7.30pm, Civil Defence HQ, Gaol Street, Hereford.

Leamington Spa (MWARS)—Every Monday, 8pm, 28 Hamilton Terrace.

Rugby (R & DAR & EC)—Last Tuesday of each month, Lawrence Sheriff Public House, Rugby. *G3YQC.*

Solihull (SARS)—19 September (Licence regulations by MPT), 7.30pm, Manor House, High Street; 3 October (Informal), 9pm, Malt Shovel, High Street. *G3XPY.*

Stourbridge (STARS)—5 September (Informal), 8pm, Shrubbery Cottage, 13 September (Social evening at G3OXD clubroom), 18 September ("Microwaves", by G8CZO), 8pm, Longlands School, 25 September (Visit to Droitwich).

Telford (WARS)—6 September (Films, Walker Tech meeting), 8pm, 13 September (Discussion and committee meeting), 20 September (Proposed Water Board visit), 27 September (Practical television). 8pm, Ketley Bank. *G3UKV.*

Worcester (W & DARC)—4 September, 16 September (AGM), 2 October, Crown Hotel, Broad Street. As part of an experimental weekend, the club was recently invited to give a demonstration of amateur radio to a group of young people. Also the club has had a successful mobile rally, and taken part in a hobbies exhibition at Worcester City Show. *G8ASO* (Worcester 29208).

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—6 September ("Surplus Sale"), 13 September (Film show inc Aerials Part II), 20 September (DF practice night), 27 September ("Voltage stabilizers", by Dr T. Beamond—talk and dem), 4 October (Surplus sale). All Meetings are held at the clubroom, 119 Green Lane, Derby, at 7.30pm. Visitors are always welcome. Monday night is activity night in the clubroom and helpers would be appreciated.

Grimsby (GARS)—14 September (Talk on marine radio), 28 September (Open evening). Meetings at 8pm, at the Red Cross Rooms, Rowston Street, Cleethorpes. *G8EDK.*

Melton Mowbray (MMARS)—The next meeting will be the AGM on 15 September at 7.30pm, in the St John Ambulance Hall, Ashfordby Hill, Melton Mowbray. *G3FDF.*

Nottingham (ARCON)—7 September (Forum), 14 September (Talk on either basic teletype or digital frequency control), 21 September (Activity night on the air), 28 September (Talk—the alternative of the talk given on 14 September). All meetings start at 7.30pm prompt at the Sherwood Community Centre, Mansfield Road, Nottingham. The club station, G3EKW, shoud be on the air more frequently in the future, as we now have a TA33Jnr aerial erected. There is also a six-over-six skeleton slot for 2m. The 2m station is not yet operational but should be shortly. *G4AFJ.*

REGION 5 — RR P. J. Simpson, G3GGK

Bedford (B & DARC)—7 September ("Night in the club shack"—G3WTP), 14 September ("Transmission lines"—G2CLP), 21 September ("Power supplies"—G3SME), 24 September ("DF contest"—G3FWA/P), 28 September ("Two metres"—tape lecture—G2UJ). Meetings 7.30pm, The Dolphin, Broadway, Bedford. Hon sec, John Bennett, G3FWA, 47 Ibbett Close, Kempston, Beds.

Cambridge (C & DARC)—8 September (Informal), 15 September (Film night), 22 September (Informal), 29 September (To be arranged). Meetings 7.30pm at Corporation Yard, Victoria Road, Cambridge. Hon sec, J. Hern, G3NAC, 5 Acheson Road, Brampton, Hants.

Cambridge University (CUWS)—Meetings fortnightly commencing 10 October at 8.15pm, King's College. Prospective members should contact hon sec, M. J. Atherton, G3ZAY, at Emmanuel College or R. C. Wainwright, G3YMH, at Selwyn College. Speakers already booked are "Dud" Charman, G6CJ, and Bill Lowe, of Lowe Electronics. Full programme later.

Dunstable Downs (DDRC)—8 September ("Cause and effect"—Ron Ham BRS15744 and Terry Cooper BRS28005), 10 September (DF hunt, 2m), 15 September (Between week), 22 September (Constructors' contest), 29 September (Between week). Meetings 8pm, Chews House, 77 High Street South, Dunstable. Hon sec, C. G. Powell, G8BPK, 1 Wenwell Close, Buckland Wharf, Aston Clinton, Aylesbury, Bucks.

Ely (EARS)—Meetings 7.30pm, alternate Thursdays, at Ely Adult Education Centre, St Mary's Street, Ely.

March (M & DARS)—Tuesdays 7.30pm, 88B High Street, March. Hon sec, R. E. Ludman, 7 Elwyndene, March, Cambs.

Peterborough (PR & ES)—Meetings will commence Friday 6 October, at Peterborough Technical College. Contact hon sec, A. H. Jackson, 57, Peterborough Road, Castor, Peterborough. Tel Castor 353.

Shefford (S & DRS)—7 September ("Quiz"—G3VMI), 14 September ("Setting up a station"—G3VMI), 21 September ("Working mobile"—G8AKT), 28 September ("The Radio Amateurs licence"—G3VMI). Meetings at Church Hall, Ampthill Road, Shefford, Beds. Hon sec, A. Sullivan, G2DGF, 12 Glebe Road, Letchworth, Herts.

Stevenage (S & DARS)—Meetings first and third Thursdays each month. 7.30pm in Senior Staff Canteen, Hawker Siddeley Dynamics Ltd, Gunnels Wood Road, Stevenage, Herts.

NB Will all club secretaries please forward details if they wish to be included in future club notes.

REGION 6 — RR L. W. Lewis, G8ML

Cheltenham (RSGB Group)—First Thursday of each month, 8pm, Royal Crescent Hotel, Clarence Street, Cheltenham. *G2FWA.*

REGION 7 — RR R. S. Hewes, G3TDR

Acton, Brentford & Chiswick (ABCRC)—19 September (Reports on members' holiday radio activities—G3CCD as F0UT in France), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick. Hon sec, W. G. Dyer, G3GEH, QTHR.

Ashford, Middlesex (Echelford ARS)—11 September (Being arranged), 28 September (Being arranged), 7.30pm for 8pm, St Martins Court, Kingston Crescent, Ashford, Middlesex. All visitors welcome, hon sec, Vic Higgs, G3WVJ, QTHR.

Barking (BR & ES)—14 September (No details received), 7.45pm, Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking, Essex. All visitors welcome, hon sec H. Davidson, G3FZP, QTHR. 9 November (2nd G3XBF constructor's award).

Bexley Heath (North Kent RS)—14 September (Tape & Slide lecture—Expedition to St Pierre & Miquelon Islands), 28 September (Natter nite). Doors open 7.30pm, Congregational Church Hall, Chapel Road, Bexley Heath. Hon sec, Maurice Lee, G4BAL, QTHR.

Burnham Beeches (BBARC)—7 September ("Printed circuit board production"—G8COT), 21 September ("RAEN"—G3NGK). 8pm, Hedgerley Scout Hut, Hedgerley, Nr Slough. Hon sec, Nina Appleby, G8ENX, QTHR.

Cheshunt (CDRC)—1 September (No details received). 8pm, Methodist Church Hall, opposite Theobald's Station, Cheshunt. Hon sec, Richard Ludwell, G3ZZQ, QTHR.

Chingford (Silverthorn RC)—Every Friday, 7.30pm, Friday Hill House, Simmonds Lane, Chingford E4. Hon sec, K. S. Arnold, G3XNP, QTHR.

Cray Valley (CVRS)—7 September ("Cray Valley and its members"—D. R. Baker, G3XMD), 21 September (Natter nite). 8pm Congregational Church Hall, Court Road, Eltham SE9. Hon sec, P. F. Vella, G3WVP, QTHR.

Croydon (Surrey Radio Contact Club)—19 September (Sale of members surplus gear, auctioneer G8DWM), 7.30pm, Swan & Sugarloaf, 1 Brighton Road, South Croydon. Hon sec, Sid Morley, G3FWR, QTHR.

Crystal Palace (CP & DRC)—16 September ("Microphones and their use" —Eric Yeomanson, G3IIR), 8pm, Emmanuel Church Hall, Barry Road, SE22. Hon sec, Geoff Stone, G3FZL, QTHR.

Dartford Heath (DF Club)—10 September (DHD/FC "Geoff's Grand Do"), 17 September (RSGB National Final—Oxford). Hon sec, Maureen Worbey, G3XVC, QTHR.

Dorking (DR & DRS)—12, 26 September (No details received). 8pm, Surrey Yeoman, Dorking. Hon sec, P. B. Gilbey, 6, Hawkwood Rise, Great Bookham, Surrey.

Ealing (E & DRS)—Every Tuesday, 7.30pm, Northfield Community Centre, Northcroft Road, Ealing W13. Details from hon sec, J. E. Alban, G3JEA, QTHR.

East London RSGB Group—Meets at Wanstead House, The Green, Wanstead E11. Chairman, Ron Ledgerton, G2ABC, QTHR.

Edgware (E & DRS)—14 September ("Interference"—Mr J. R. Turner of the Post Office), 28 September (Informal), 8pm, Watling Community Association, 145 Orange Hill Road, Edgware. Hon sec, Alan Masson, G3PSP, QTHR.

Gravesend (RSGB Group)—Mondays at 7.30pm, Windmill Tavern, Shrubbery Road, Gravesend. Area rep, P. F. Jobson, G3HLF, QTHR.

Greenford (GARS)—8, 22 September (No details received). 8pm, Greenford Community Centre, Old Field Lane, Greenford. Hon sec, John Hedges, G3MMQ, QTHR.

Guildford (G & DRS)—8, 22 September (No details received). 8pm, Model Engineering HQ, Stoke Park, Guildford, Surrey. Hon sec, Peter Hopwood, G8CQM, QTHR.

Hampton Court (Thames Valley ARTS)—6 September (Talk on uhf and microwaves), 8pm, The Three Pigeons, Portsmouth Road, Long Ditton, Surrey. PRO, Rob Muir, G3LHN, QTHR.

Harlow (DRS)—Every Tuesday, 8pm, Mark Hall Barn, First Avenue, Harlow. Club station operative on 80–10m ssb/cw. Club net Sunday mornings at 10.30 on 28·8MHz. Members use frequency most nights at 2100gmt. Hon sec, V. Heard, 106 Vicarage Road, Harlow, Essex.

Harrow (RSH)—15 September (Practical night), 22 September (To be arranged), 29 September ("Radio controlled models"—G8EDL). 8pm, Harrow County School for Boys, Sheepcote Road, Harrow. Hon sec, Les Light, G3KDC, QTHR.

Havering (H & DARC)—6 September ("VXO, hf, cw rigs"—G3TTB), 20 September ("VHF working"—G3WSN). 8pm, British Legion House, Western Road, Romford. Hon sec, S. J. Hobday, G3SKV, QTHR.

Holloway (Grafton RS)—Mondays (RAE), Fridays (Morse and club night). 7.30pm, Archway School Annexe, Whittington School, Highgate Hill, N19. Hon sec, Tom Coleman, G8EEI, QTHR.

Ilford (ARS)—Every Thursday 8pm, 50 Mortlake Road (off Ilford Lane), Ilford. Further details from F. G. Jarvis, G3HIW, QTHR.

Kingston (K & DARS)—13 September (No details received). Penguin Lounge, 37 Brighton Road, Kingston. Hon sec, R. S. Babbs, G3GVU, QTHR.

Loughton (L & DRS)—1 September ("Radio location"—G3OPA), 15 September (Informal), 29 September ("Diodes & transistors"—G3TUC). 8pm, Loughton Hall, near Debden Station. Hon sec, David Bowers, 12 Theydon Park Road, Theydon Bois, Essex.

Newton Cross (Clifton ARS)—Meetings every Friday, 8pm, 225 New Cross Road, London SE14. Hon sec, R. A. Hinton, 38 Camilla Road, Bermondsey, SE18.

Northolt (BEAARS)—First Wednesday in the month, 8pm, BEA Trident Club, Western Avenue, Northolt, Middlesex. (This club is open to non-BEA employees by invitation. Contact David Evans, G3OUF, Amersham 3257, for details.)

Paddington (P & DRS)—Meetings every Wednesday, 8pm, Beachamp Lodge, 2 Warwick Crescent, W2. Further details from hon sec, Mike Pawley, G8AWV, QTHR.

Purley (P & DRS)—12 September (Natter nite), 26 September (Constructional contest), 8pm, Lansdowne Hall, Lansdowne Road, Purley. Hon sec, Alan Frost, G3FTQ, QTHR.

Reigate (RATS)—6 September (Club night), 8pm, Nutley Hall, Nutley Lane, Reigate. 20 September (Ragchew), 8pm, Marquis of Granby, Hooley Lane, Redhill. Hon sec, F. Munday, G3XSX, QTHR.

Scouts (Baden Powell House ARG)—21 September (No details received), 7.30pm, Baden Powell House, Queensgate, South Kensington SW7. Hon sec, A. H. Watts, G3FXC, QTHR.

Southgate (SRC)—14 September (2nd junk sale of the year), 8pm, Civil Defence Hut, Bowes Road, London N11 (opposite Arnos Grove underground station). All visitors welcome. PRO, Steve White, G3ZVW, QTHR.

St Albans (Verulam ARC)—20 September (Mr D. R. Collins, G2FCB, talking on recent Transarctic Expedition in which he, Squadron Leader Church, and other British amateurs, were involved. The talk will be illustrated by slides taken during the journey). 7.30 for 8pm, The Town Hall, St Albans. All visitors welcome. Hon sec, Hugh Young, G3YHY, QTHR.

Sutton & Cheam (SCRS)—19 August (No details received), 8pm, The Harrow Inn, Cheam, Surrey. Hon sec, Jack Korndorffer, G2DMR, QTHR.

UK FM Group (London)—Tuesday 19 September (Post mortem on VHF NFD, and colour slides of the mobile picnic and treasure hunt in June). 7.30 for 8pm, Scout Hut, Hayes Road, Southall, Middlesex. Talk-in on 144·48MHz. PRO, Mike Tooley, G8CKT, QTHR.

Welwyn (Mid-Herts ARS)—14 September (VHF NFD post mortem and natter nite). 8pm, Welwyn Civic Centre, Welwyn. Hon sec, Peter Wilcocks, G8AIE, QTHR.

Wembley (GECARS)—Thursdays, 7pm, Sports Club, Preston Road, North Wembley. (This club is open to non-GEC employees by invitation. Tel Dain Evans, G3RPE, at 01-904 1262, during business hours, for details.)

Wimbledon (W & DRS)—7 & 22 September (No details), 8pm, St John Ambulance HQ, 124 Kingston Road, Wimbledon, SW19. Hon sec, F. W. Hill, G3WDO, QTHR.

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

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

Canterbury (EKRS)—21 September ("Projects for the beginner"). Further details of meetings from G3MDO, QTHR.

Mid-Sussex (M-SARS)—7 September ("Post mechanization"—Jack Brooker, G3JMB), 21 September (Visit to Brighton Post Office to see equipment in operation). Hon Sec, G3RXJ.

Eastbourne (SARS)—4 September (Talk by John Longman of Jermyn Industries). Meetings held first Monday in the month at Victoria Hotel, Latimer Road, Eastbourne. PRO, G3JFM.

Worthing (W & DARC)—19 September (Junk Sale). Meetings held every Tuesday at Rose Wilmot Youth Centre, Littlehampton Road, Worthing.

Tunbridge Wells (WKARS)—8 September ("Contest operating"), 22 September (Visiting speaker). Meetings held at Art Centre, Monson Road, Tunbridge Wells. Details from H. Richards, 17 Reynolds Road, Tunbridge Wells, or PRO, G3YOU.

Crawley (CARC)—Monthly meetings held at Trinity Congregational Church Hall, Ifield, Crawley.

Horsham (HARC)—8 September ("Transistors and diodes") at Guide HQ, Denne Road, Horsham. 19 September (Informal) at the Star, Roffey. A net is active every Thursday on 3,650kHz at 2000hrs.

Maidstone (M YMCA ARS)—All meetings at "Y" Sports Centre, first and third Fridays devoted primarily to the beginners.

Brighton (BTCARC)—Details of future events from hon sec, G2CMH, 35 Willington Way, Brighton.

REGION 9 — RR H. W. Leonard, G4UZM

Bristol (City & County RSGB Group)—25 September (General Business Meeting), 7.30pm, Becket Hall, St Thomas Street, Bristol 1. *G3ULJ.*
Bristol (BARC)—Every Tuesday, 7.45pm, 24 Bright Street, Barton Hill, Bristol 5. *G8BIR.*
Bristol (University ARS)—Saturdays during term time, 2.30pm, Royal Fort, Tyndalls Park Road, Bristol 8. New officers— president G3WDG, hon sec G8CVS, treasurer G3XEF. For further details please contact G3WDG or G8CVS, both QTHR, before or at the beginning of next term. Our thanks to G8ADP for his past work as sec—Clive has now graduated. *G8CVS.*
Burnham on Sea (BoSRC)—Contact J. Robertson, G3ZOR, for details. Tel BoS 2333.
Cornish (CRAC)—First Thursday in month, 7 September ("Radio & major disasters" by G3FWG), 7.30pm, SWEB Social Centre, Poole, Camborne. Visitors and holidaymakers very welcome. *G3UCQ.*
Newquay Group (CRAC)—Fortnightly, 7.30pm, Treviglas School, Newquay. Dates from G3THT. For further details of Cornish and Newquay Group, contact G3NKE, QTHR or Camborne 2419.
Exeter (EARS)—Every Tuesday. 12 September (Talk) 7.30pm, Community Centre, St Davids Hill, Exeter. Details from A. W. Bawden, 232, Exwick Road, Exeter EX4 2BA.
North Devon (NDRC)—Second and fourth Wednesday of month. 13 September (Lecture), 27 September (Ragchew) 7.30pm. "Grinnis", High Wall, Sticklepath, Barnstaple. RAE Session at 7pm each meeting. *G4CG.*
Plymouth (PRC)—First and third Tuesdays of month. 7.30pm, Virginia House, Bretonside, Plymouth. Hon sec, S. E. Martin, 32 East Park Avenue, Plymouth PL4 6PF.
Saltash (S & DARC)—First and third Fridays of month. 7.30pm. Burraton Toc H, Saltash. Hon sec, G4AJU, 302 St Peters Road, Plymouth PL5 3DU.
South Dorset (SDRS)—First Friday of month, 7.30pm, Alma Road Section of Weymouth Tech College. 23 September (Visit to Winfrith AEE), 6 October ("Digital Instruments"—G3VPF). *G3VPF.*
Taunton (T & DARS)—Fridays, 7.30pm, Jelalabad Barracks, The Mount, Taunton.
Torbay (TARS)—Every Tuesday and last Friday and Saturday of month. 30 September (TARS Slides and Films), 7.30pm, rear of 94 Belgrave Road, Torquay. Visitors most welcome. *G3NQD.*
Weston-Super-Mare (WsMRS)—Second Friday of Month. Contact G8FNL at WsM 29327 for details. Visitors always welcome. *G3GNS.*
Yeovil (YARS)—Every Thursday, 7.30pm, Youth Centre, 31 The Park, Yeovil. 28 September (RSGB Tape Lecture). *G3NOF.*

REGION 10 — RR D. M. Thomas, GW3RWX

Blackwood (ARC)—Fridays 7.30pm during school terms at Oakdale Community Centre, Oakdale, Mon. Further details of summer meetings from GW3TUG. Following on the recent sad loss of Frank Mudford, G6BK, news is to hand that another founder member of the club, Ken Kerton, GW3CJR, passed away recently. Sympathy of all members in Region 10 is extended to his family and the club.
Barry College of Further Education (ARS)—As reported in the August issue, 9 to 16 September will see the final operations from Flatholm Island signifying the termination of the Marconi-Kemp Commemoration year. Callsign will be GB3BCT, and all bands will be in use. PO officials will be in attendance on the island to frank the special first-day covers for which there has already been a great demand. Further details will be found elsewhere in this issue, and first-day cover applications should be made to Mr Dan Adams at the college, Colcot Road, Barry, Glam.
Cardiff (RSGB Group)—Monday 11 September, 7.30pm, BBC Club, Llandaff, nr Cardiff. *GW3GHC.*
Glamorgan Raynet Group—Details from GW3ZFG. Tel Cardiff 62411.
Haverfordwest (ARS)—Tuesdays 7.30pm, HQ Rosemary Lane, Haverfordwest, Pembs. *GW3YBB.*
Hoover (ARC)—Mondays 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, nr Merthyr, Glam. Mr F. E. Tribe, c/o Hoover Works.
Pembroke & District (RSGB Group)—Last Friday of each month, 7.30pm, Defensible Barracks, Pembroke Dock. *GW3LXI.* As reported elsewhere in this issue, this group has suffered a sad loss in the death of George Courtney Price, TD, GW2OP, who was its distinguished president and founder. Such an outstanding personality is not easily replaced, and the sympathy of all Region 10 members is extended. *GW3LXI.*
Port Talbot (ARC)—Meets second Tuesday of each month at 7.30pm. Please note new meeting place: the Rail and Transport Club, Station Road, Port Talbot. *GW5VX.*
Sully & District Short-wave Club—Tuesdays, 7pm at the Annexe, Sully Bowls & Social Club, 59 South Rd, Sully, Glam. *GW3ZSV.*
Rhondda (ARS)—Meetings at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. *GW3PHH.*
Swansea Radio Society—Meets on first and third Tuesday of each month at the Palace Bar, High Street, Swansea. It also holds an RAE course on the second and fourth Tuesday of the month, when morse practice is also available. 12 September (Transmitters), 26 September (Propagation & Antennas (1)). Further details from Mr M. D. E. Connor, 54, Talley Road, Penlan, Swansea SA5 7EU.
University College, Cardiff (ARS)—Interested students entering college for the new session are asked to contact Mr Simon Northeast c/o Students Union, Dumfries Place, Cardiff.
University College of Wales, Aberystwyth Radio & Electronics Society—All enquiries to the secretary, c/o Students Union, University College of Wales, Aberystwyth. Club callsign, GW4BGG.

REGION 11 — RR P. Hudson, GW3IEQ

Bangor (UCNWARS)—Meetings alternate Thursdays at 1715 in the small lecture theatre of the Engineering Dept, Dean Street, Bangor.
Rhyl (R & DARS)—Programme for 1972/3 session is now at hand. 12 September ("Receivers"—Dr J. D. Last, GW3MZY), 10 October (Junk Sale), 14 November ("Constructional techniques"—A. Antley, GW3UTG), 12 December (Film Show).

REGION 12 — RR A. J. Oliphant, GM3SFH

Aberdeen (AARS)—Fridays, 7.30pm, 8 Blenheim Lane, Aberdeen. *GM3HGA*, tel Aberdeen 33838.
Dundee (Kingsway Technical College ARC)—Wednesdays, 7pm prompt, Kingsway Technical College, Old Glams Road, Dundee.
Inverness (IRS)—Fortnightly on Fridays at 7.30pm. Next meeting 8 September. Cameron Highlander's Memorial Youth Club, Planefield Road, Inverness. Mr L. Bell, 114 Glenurquhart Road, Inverness.
Lerwick (LRS)—Every Tuesday at 7pm, Clubrooms, Abbsbrae House, Lerwick. *GM4BBL*, tel Lerwick 1238.
Lhanbryde (MFARS)—Wednesdays, 7.45pm, St Andrews School, nr Lhanbryde, Elgin, Morayshire. *GM3UKG*, tel Clochan 225.
Queen's Own Cameron Highlander's Memorial Youth Club Radio Section—Tuesdays, 7.30pm, Planefield Road, Inverness, section caters for all young people from 13 years interested in learning, and obtaining practice in, the elements of radio technique. Mr Bill Begg, 68 Tomnahurich Street, Inverness.
Thurso (CARS)—Second Tuesday in each month, 7.30pm, Scapa House, Thurso. *GM3JUD.*

REGION 13 — RR V. W. Stewart, GM3OWU

Berwick (BARS)—Next meeting 27 August, 3pm, Tweed View Hotel. Further details from C. H. Crook, G3YOG, 19 Hatters Lane, Berwick on Tweed or from the AR, G. Shankie, GM3WIG, 8 Ettrick Terrace, Hawick, Roxburghshire.
Dunfermline (DRS)—Second Wednesday in each month, 7.30pm, Abbot House, Dunfermline. Further details from G. Martin, GM3NVQ, 42 Rose Street, Dunfermline.
Edinburgh (LRS)—Second and fourth Thursdays, 7.30pm, 66 Hanover Street, Edinburgh. Further details from R. Manners, GM3VZL, 165 Mayfield Road, Edinburgh.

Glenrothes (GDARC)—First Sunday in each month, 7.30pm, Old Nursery Buildings, Leslie, Fife. Further details from K. Home, GM3YBQ, 14 Liss Way, Kirkcaldy.

REGION 14 **RR M. A. Comrie, GM3YRK**

West of Scotland (ARS)—1, 8, 15, 22, 29 September, 8pm, 81 Virginia Street, Glasgow.

REGION 15 **RR J. Thompson, GI3ILV**

Belfast (B & D RSGB Group)—The AGM will take place on 20 September at 8pm at 90 Belmont Road, Belfast 5.

REGION 16 **RR D. F. Beattie, G3OZF**

Chelmsford (CARS)—First Tuesday of the month, 7.30pm, at Marconi College, Arbour Lane, Springfield, Chelmsford. Details from G3VPK.
Colchester (NEETCARS)—Wednesdays, 7.30pm, North-East Essex Technical College, Sheepen Road, Colchester. Details from E. T. Jacobs, 26 Pondfield Road, Colchester.
Gt Yarmouth (GYRC)—Last Tuesday of the month, 7.30pm, at the Central Library, Gt Yarmouth. Details from A. D. Besford, 49 Blake Road, Gt Yarmouth.
Ipswich (IRC)—Where possible, two meetings each month. 13 September (Film show), 27 September (Informal). Meetings at Handforth House, corner of Ranelagh Road and the main London Road (A12), and not as previously stated. Details from G3YWM.
Norfolk (NARC)—Every Wednesday, 7.45pm, at Crome Community Centre, Telegraph Lane East, Norwich. Details from G8BLD, The Rectory, Framingham Pigot, Norwich, Norfolk NOR 45W.

Southend (S & DRS)—Every other Thursday, 7.30pm, at The Flarepath Canteen, Southend Airport. Next meetings 7 and 21 September. Details from G3AXN.

REGION 17 **RR L. Hawkyard, G3ZKR**

Swindon (SDARC)—6 September, (First meeting of winter session), 20 September (Informal meeting). Meetings at Penhill Junior School at 7.30pm. *G3YKC*.
Basingstoke (BARC)—Meetings first & third Saturday each month. 2–3 September VHF/NFD at Farleigh Hill, three miles south of Basingstoke, 16 September (Eleventh AGM), at the clubroom, Chineham House, Popley, 7.30pm. *G3CBU*.
Maidenhead (MARDC)—4 September (Informal meeting), 19 September (Visit of Regional Representative). *G3VMR*.
Harwell (AERE ARC)—Meetings on the third Tuesday of each month, also informal gatherings & junk sales every Friday lunch time. Social Club, AERE, Harwell, Berks. *G3NNG*.
Southampton (RSGB Group)—9 September at Lanchester Building, Southampton University. Every Wednesday evening at the clubroom, Kent Road, 7.30pm. *G3ZKR*, tel 73378.

Looking ahead

23-24 September—NW Amateur Radio Convention; University of Lancaster.

29 September—RSGB Dinner Club, Kingsley Hotel, London.

1 October—Scottish VHF Convention and Region 14 ORM.

1 December—RSGB AGM, Royal Society of Arts, John Adam St, London WC2.

MEMBERS' ADS

These low-cost flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the last page of each issue of *Radio Communication*, or on a postcard similarly laid out. Each must be accompanied by a recent *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 25p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No other correspondence concerning this service can be entered into.

The closing date for each issue is the 4th of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale.

Members are advised to enclose a stamped addressed envelope when replying to advertisements.

See the current order form on the last page for further details.

FOR SALE

AR88D S-mtr hndbk £35. Hallicrafter S36 28–144MHz £15. Advance sig gntr type E 100kHz–100MHz £15. Leak point-one amp £10. Advance Q-mtr £15. Imhof cab 4ft by 19in with doors, on wheels, £5. G3UFZ QTHR. Bishops Stortford 723088.

KW Vespa mk II, ac psu, new 6LQ6 pa, alc, just serviced by KW, with hndbk and ccts, good cond, £90. Will del 25 miles. G4ALQ, P. F. Saxby, 30a Crossways, South Croydon, Surrey, CR2 8JL, tel 01-657 6251.

KW Vanguard tx, 160-10m, needs slight attention, £20. GW3NUO, QTHR, tel Swansea 74012.

Pye a.m. 2m base stn £35; Cambridge a.m. 2m £25; Dual 300V 250mA stab psu £5. Buyers coll. Oddments also for callers, weekends only. G8ATA, QTHR, tel Poynton 4521.

156-174MHz fm 10W base stn 220/40 ac, 6 channels remotely switched from desk control unit, hndbk, £22. Will del free via Securicor up to 150 miles. G3JMJ, QTHR, tel (073) 271 3467.

Hi-Band single channel Pye Cambridge (dash mount) 8W out, a.m., less xtals, £25. G3VFO, QTHR, tel Brighton 684659.

2m Storno fm /M tx/rx 10W o/p, 12V dc supply, modern hybrid cnstrctn, £15. Buyer coll, tel Mortimer (Berks) 332582.

Eddystone EA12, mint cond with maker's manual, £130. Pref buyer coll. G8CNP, QTHR, tel 0273 503980.

30ft Duralumin tower, self supporting, non rust, very light, will support tri-band Quad, bolt cnstrctn, buyer coll, £35. G3RWQ QTHR.

Trio JR310 with SP5D, absol mint cond, £50, buyer coll. S. Aoki, 120a Highlands Heath, Putney, London SW15, tel 01-789 7851.

TW communicator 2m tx/rx, also mains psu, £30. Marwood, 25 Keynsham Road, Cheltenham, tel Chelt 52889.

Trio 9R59DE with matching spkr & voltage stab, as new & in orig carton, £37. Tel 01-455 6075.

Masts, light-weight tub steel, each 3-section, 44ft x 2½in £3.50, 18ft 8in x 2in £1.75, good cond, buyer coll. G3ADK, QTHR, tel Luton 27595.

Tx/rx Sommerkamp FT747, exactly same as Yaesu FT560; 500W ssb/cw, plus spare PAs, Shure 444 mic, Katsumi EK-9X electr keyer, £150 ono the lot or will split. GW3SYL, QTHR, tel Newton Llantwit 3270 (Glamorgan).

24hr ships clock, 8 day, wall mntng, black bakelite case, £7.50; ten xtals 12166.66 to 13833.33 spaced 333.33, ten xtals 6033.33 to 6333.33 spaced 33.33, temp comp boxes, all twenty £5.50. Newland, 23 George Ave, Marton, Blackpool.

DX100 & SB10 exc cond, del rsnbl dist, £45; ridge tent suitable expeditions, field day, 5ft 6in high x 10ft x 6ft, blue, sewn-in grnd sheet, £15; two 866As £1. G3YPS, QTHR.

Two BCC69D 4m tx/rxs compl, exch sim units High Band type, a.m./fm, must be working. Consider straight sale £15 ea ono. Also J-Beam 4-el 10m beam £12. G3VJG, QTHR, tel 01-624 4206.

VCR97A 50p; Antex 15W iron £1; xtal mic £1; 500-0-500, 200mA trnsfrmr £1; three 8H Woden chokes 250mA 50p ea; 2in dia 15in joining sleeve 50p; 15W 2m tx £10 ono. G8CRP, QTHR, tel 01-654 1761.

Viceroy mk IV tx, 10–80m, gd order, fltr fitted by KW, £70. G3TYD, QTHR, tel Selsey 2806.

VHF aircraft band monitor, Park Air 10SS prof rx, /p or fixed, solid state, exc cond, 115-137MHz (would conv for 2m), fully tunable, with squelch, gen sale, £50 ono. G3XLL, 29 Coppice Ave, Hellesdon, Norwich, NOR 49M, tel Norwich 48685.

KW2000B, 6146Bs in final, mint cond, £170; Shure 201 mic £3; 3-el Yagi beam for 10m, lightweight, folded dipole radiator, 75Ω, 8dB gain, £7; hdphns, 2 prs, £1 per pr. G3VIE, QTHR, tel West Forest 4048 (Berks).

Class D wvmtr £4; RF26, RF27, 50p ea; Admir osc unit W6283A 50p; variometer max 160μH No 19, aerial modded, 50p, buyer coll. F. Griffiths, 172 Robin Hood Lane, Birmingham B28 0LD, tel 021-777 5374.

CW tx, prof built, based on Princess, 10-80m, 120W, G2DAF pa, integral psu, incomplete but all parts available, fully documented, parts cost over £40, buyer coll £10; Marconi brass key £2, tel 01-648 5895.

2m rx solid state 6¼ x 4 x 8ins mosfet cnvrtr, 28-30MHz i.f., £20; ic squeeze key £6. G3WXS, QTHR, tel Andoversford 439.

Eddystone EA12, mint cond, serviced by Eddystone 1971 £140; Joystick and tuner, £5; Ekco car radio, sep tuner amp, £12. Pembrook, Twin Pines, Kingsdown Hill, Kingsdown, Deal, tel Deal 3538.

FRDX 500 rx in mint cond with SSM 2m cnvrtr plus 160m and cw filter just o/hauled by distributor, £100. G8CYY, QTHR, tel Shipley 52096.

Going vhf, selling KW2000B with ac psu, unmarked cond, £165 cash; pr 813s with bases and top caps £3.50. SAE for list of junk. G3VFO, QTHR, tel Brighton 684 659.

Viceroy mk II £40; AR22 rotator £15; cowlgill motor, indicator and trnsfrmr, £6; S640 £5; various trnsfrmrs and chokes, mainly Woden. G3IOE, QTHR.

KW Vespa mk I tx, as new, £55; Trio JR500SE rx, as new, £35; Bendix RA1B rx £7. **Wanted** manual for Cossor 1035 scope. G3JDN, QTHR, tel Reigate 40646 after 6 pm.

HROMX, exc cond, 5 coils 0·9 to 14, plus 80m bndsprd, all new valves and comps, with psu, spkr and set spare valves, £25. Del rsnble distance. G3TAM, QTHR.

AR22 rotator with approx 15 yds control cable, £16, carr paid. G3GVV, QTHR.

Heathkit 5in O-12-U scope little used £30 plus carr; Pyramid linear 800W built-in psu, £35 plus carr. G3OIB, QTHR, tel Leconfield 482 after 6pm.

Canadian 52 rx, 21/28 xtal cnvrtr, Hamgear PH11 preselector (new), Marconi AD7092A rx 17 valves xtal etc, circ, 400V/6·3V mains trnsfrmr, the lot £20. Coll or will del Lancs/Cheshire. G3JIC, QTHR.

Heathkit SB301 rx, recent works o'haul, vgc, a.m./cw, fltrs fitted, £90. G3XRU, QTHR, tel Shelsley Beauchamp 208.

Sobell 8-waveband /P model 334, new June 1972, list price over £40. Exch for mint Hacker/Grundig Mariner or Yacht Boy, Beolit 600 or other good make. All letters answered. L. D. Ireland, Carnhell, Camborne, Cornwall, tel Praze 236.

Scope OS2, exc cond, exch for CR100 sim cond or sell. G3SSJ, QTHR.

Mosley V-4-6 B2 rx and psu, 21MHz HRO bndsprd coil and 80m coil, 70·26MHz Reporter rx, tunable. Part exch any for R209 or sim. Woods, 1 Baker Avenue, RAF Benson, Oxon.

Eddystone EB36 rx, immac cond, fitted bfo, noise limiter, agc on/off, and rf gain cntrl. Battery and mains psu in makers orig packing with manual, offers? G3XLL, 29 Coppice Ave, Hellesdon, Norwich NOR 49M, tel Norwich 48685.

Atlanta ac psu, sep vfo and vox, exc all-round stn, KW maintained, £135, or exch suitable /M rig plus separate rx and tx for stn use. Cash adjustment or why? G3SGH, QTHR, tel Ashford 21158.

CW tx 80, 40, 20, 15, 807s pa homebrew, weighs about 1 cwt with psu, £5. G3KAA, QTHR, tel Luton 58370.

KW Vanguard tx 10–80m, a.m./cw, £20; R206 rx 0·55-30MHz mod with product detector, £12. Pavely, 25 Whitmore Road, Beckenham, Kent, tel 01-650 3163.

Akai tape rcrdr series 910, 3¾ or 7½ ips, 7in reel, exc for amateur use, £35, buyer coll. Grundig TK141 tape rcrdr 6 months old, as new comp with mic etc, 5in 3¾ips, £45 ono. Buyer coll. A. Levy, c/o 53 Tamworth Ave, Whitefield, Lancs, M25 5UH, tel 061-773 2074.

Pye Cambridge hi-band, also Pye base stn, exc cond, £25 ea ono; Pye Ranger cnvrtd for 2m, offers? **Wanted** KW E-zee match and swr bridge. G3OYI, QTHR, tel Huddersfield 62824.

Table top tx a.m./cw 160–10m (100W out on 10) exhibited by RSGB, £30 ono, G3HRO, QHTR, tel 01-460 7660.

AR88D, £25; Kokusai MF-455-15CK ssb mech fltr, £7; Hi-band transistor Ranger cnvrtd for 2m, £7; 500/1000V 1A psu £2; Ferguson tape recorder model 3200, £9, pref buyer coll (York). G3UUT, QTHR, tel York 71211.

Garex 2m convrtr, 28–30MHz, £5; 4MH 2m tx, homebrew mod and mains psu £10.Weekends only. G8DKA, S. P. Westlake, 29 Redlands Way, Streetly, Sutton Coldfield,Warks, tel 021-353 5901.

Zeners 400mW unmarked, similar to BZY88, 100 untested for 50p, 20 tested for 25p, p & p 5p any order. G8GPO/G4BAY, PO Amateur Radio Club, 200 Marton Road, Middlesbrough, Teeside.

Heathkit RA1, int spkr, vgc, £27.50; Joystick and Joymatch £5; ex-army /p tx/rx £2; *World Callbooks* 1969, £2. M. Pelham, Tresco House, Ogbourne St Andrew, Marlborough,Wilts, tel Ogbourne St George 220.

KW77 rx exc cond, £65; Sphinx ssb tx with Delta cont unit, £45; Cossor scope type 1035 Mk3, £15 ono. G3TWJ, QTHR, tel 689 1441 (office).

Lafayette HA600 solid-state rx realigned, with orig packing, £35; Minimitter 150W 80–10m a.m./cw tx, gd cond, £15; valve 10m tuner i.f. 3MHz, works well, £3; two Radiospares "Hygrade" 7W o/p, trnsfmrs £1 ea. G3YMH, QTHR, tel Staines 53765.

Ten Tec PM3A tx/rx, 5W 20/40m with matching atu £20, new cond. G13SH1, QTHR.

KW Viceroy with home-brew psu, £55; HA350 with Top Band, £45. GW3XHJ, QTHR, tel Aberkenfig 389.

Swan model 260 ssb tx/rx, /M or shack use, no mods, mint cond, £135. Del up to 150 miles. GM8AT, QTHR.

Pair Wight traps, £1 each, pstge extra. G6UI, QTHR, tel Wolverhampton 35556.

CR100 with S-meter, NL £12; 2m fet cnvtr, i.f. 15–17MHz £4; 2m mosfet cnvtr, i.f. 6·5-8·5MHz, £5; Tad110 £1.15; LP1175 70p; MR38P S-meter unused, £1.50; xtal 72·875MHz HC18U £1.20. Lothians Radio Society, c/o GM3ZVL, QTHR, tel 031-667 3366.

Marconi terminal unit, model HU11, gd cond with tech handbk, £40; Mosley 10m ground plane aerial, model DI10, new in maker's box, £14, or in part exch for 18AVT/WB aerial. N. G. Boyd, 4 King's Avenue, Eastbourne, Sussex, tel Eastbourne 31844.

National hro psu and spkr, fb cond, 6 gen cov coils plus bndsprd 160, 80, 40, 20, 10m, £35 ono. G3OXZ, QTHR, tel 021-453 4748.

SSB trnsvtr/cnvtr JXK 14MHz, £8; Grundig tape rcrdr fb, £8; Joystick de luxe with 4RF tuner £7; TW 144/146 SS rx £10; 680X rack mounting brackets £50. G3AOS, QTHR, tel 061-980 2415.

KW E-zee match £8; Z-match universal coupler £5; TTC swr/pwr mtr C3005 £15; Waters speech com preamp model 359 £7. All practically unused, carr paid. Hy-gain 2-el quad, offers? G3PRJ, QTHR, tel Leominster 2048.

Heathkit HW-17A and homebrew dc psu, £60, tx has been modified giving much improved modulation. Pref buyer inspect and coll. G4AWA, Flat 8, Bevere House, Bevere, Worcester, WR3 7RG, tel 0905 51575.

Labgear LG300 £10; 1,700V 300mA psu cnstrctd from Woden comps £3; 500V 250mA-100V psu £3; HA600 £30; AT5 and psu control unit £20; 3·5MHz xtals 50p; various mtrs 50p; buyer coll. G3RFG, QTHR.

Taylor sig gnrtr model 67A, 100kHz to 240MHz, £10 ono; Elizabethan tape recorder, amp ok, deck needs mech attntn, £20 ono; R1132A with built-in psu and o/p stage £3. Carr extra. G3NPF, QTHR, tel Horsham 66290.

R106 comp with 234A psu and 9 coils 50kHz to 30MHz, wkg order, ccts supplied, £40; R209A 1MHz to 20MHz, £15; scope type 13A, comp wkg order, £30. Buyer coll. Lester James Devaney, 36 Avenue Gardens, London W3, tel 01-402 5474.

Heath DX40 and vfo, gd cond, Cossor 3339 scope, wkg, any offers? G3PQR, QTHR.

Radio Communication 1960, 6 copies, 1961–63 complete, 68–69 bound, *Short Wave Magazine, Radio Constructor, Practical Wireless*, 1971 complete. 5p per copy or £4 lot. Buyer coll or plus p & p. G. Thompson, 49 Widney Avenue, Selly Oak, Birmingham 29, tel 01-472 4678.

DX-100U, exc cond, £40, buyer to coll. G3ZAG, QHTR, tel 01-205 5601.

Hammarlund HQ170A with clock, £75; KW Vanguard, £25. Both units stored during past four years, exc cond. G3BWY, QTHR, tel 01-777 6645.

KW Atlanta, 16 months old, sep vfo, vox, built-in fan, £160 or will split. G3ZLN, QTHR, tel Ipswich 55200.

HRO S-meter. Calrad DM16HL dynamic mic, high and low imped. New SR700A rx. Offers? HA350 rx, calbtr manual, £49, no offers. G2UZ, QTHR.

Trio 9R59D, i.f. af mods, spkr, £40; Pye Cambridge AM10D, on 174MHz, £50 ono; stereo record player, £20; various ws sets, wkg. **Wanted,** KW 160m tx and psu, Codar AT5 tx, or any ssb 160m tx with psu. P. Jenkins, 30, Gainsborough Road, North Finchley, London, N12 8AG, tel 01-445 8722.

19 set, mains psu; 2X38 set; 2X58 set; CR45B, valves and other junk. Would appreciate if someone bought for a nominal price. Write or phone, Mr M. R. B. Wivell, "Greycote", Eleventrees, Keswick, Cumberland. tel Keswick 72400.

Pye Ranger high pwr /M with cntrl box, mic, hndbk etc, exch for KW E-zee match digital clock, linear, or why? GW3VVC, QTHR.

4m Pye 703 base station, tunable rx xtal, controlled tx with xtals, QQV0320 final, 25W, vgc, £25. G3ZKD, QTHR, tel Penketh 5611.

Murphy marine ship tx 1·5–16MHz, master oscillator type M1-1940 7A, 1–10MHz, RF26 unit. Mains trnsfmr, 1000V at 300mA. "Gold bag" type aerial mast, 6in long-persistance crt. Offers? P. Wait, 87 West Park Drive (East), Leeds, LS8 2EE, tel Leeds 665831.

Eddystone EC10, £40; comp wkg Pye mkIV industrial camera chain incl monitor spg camera lens cct, £85 ono. G3ZUL, B. Kennedy, 10 Pilgrim Road, Droitwich, Worcestershire, tel Droitwich 4510.

J-Beam type automatic rotator, never used (with cable), £20 ono; 5in vmtr O-150V, O-30V, mirror scale, 400Hz, £2. J. Owen, 76 The Glade, Shirley, Croydon, Surrey, tel 01-654 5741.

P/pack, two Thordarson 700-0-700, one 2·5V, 10A, two 866A, two 1500V dc 10μF, two h/duty chokes, G3BR, QTHR.

Eddystone 940 mint cond no mods, £100; HRO MX 9 coils psu, £17. Buyer coll. Would exch for HW101 tx/rx with cash adj. E. Taylor, 4 Brownsea Ave, Corfe Mullen, Wimborne, Dorset, tel Broadstone 2631.

New QQV03-10 50p each. Back numbers *Short Wave Magazine, RSGB Bulletin* 2p per copy. Callers only. Advance Electronics interval timer IT42, as new, £5. G3YRB, QTHR, tel 684 3974.

Cossor dbl beam scope 1035, £17.50; J-Beam 70cm 14-el Sky Beam £2.50; **Wanted** AKAI 4000D tape rcrdr must be gd cond. M. Baker, Cornerstones, Green Close, Bicester, Oxon OX6 7QU, tel Bicester 2574.

Honda ED250 /P petrol gnrtr 6, 12 and 24V brand new only 10 hrs use list price £89, will sell for £60. Arrange del. SAE with enquiries. G3YTU, QTHR.

Low band Ranger (dash) with manual £8; 0·68in ferrite toroids 3p; ferrite beads Fx1115 ½p; FX 1898 1p; 10·7MHz block fltrs £2; uhf power trnsstr PT41760 12W, PT4166D 7W, PT2125 3W, £2; details for sae. 2½in CRTs CV9311 £1. Mr A. Clampitt, 136 Osborne Road, London E7.

DX-100U, SB-10U, B40 rx, cables etc, comp stn, all good wkg order. Any rsnble offer for all or part. G3YSO, QTHR, tel 0643 3306.

RX A/B-H/B, £10; sig gnrtr TF144F/H, £10; vhf Q-meter 170A, £10; test mtr 20 k/V E772, £10; 2m and 4m tx/rx desktop type, £12 and £10; voltage stabilizer BMVR-1725, £12; 50Hz m/c meter £2. G3WMQ, QTHR, tel 01-903 4363.

Trio 9R59DE, mods, £25; class D wvmtr £3; 2m cnvrtrs, mosfet £6; nuvistor £5; Codar PR30X, preselector £3; 25ft vertical aerial GVI, £2; other goodies sae. Buyer coll or plus carriage. G3FHF, QTHR.

Labgear 160m twin, £8. **Wanted:** pair of synchro motors. Dick Gibson, Dungannon, Co Tyrone, N Ireland.

HRO with ac psu and spkr, no mods, full set of coils including 7MHz bndsprd, hndbk, £19; Vespa II (6LQ6 220W p.e.p. input) £99, together £109. Del rsnble dist. G3LXD, QTHR, tel Fleet 6405.

Pye 8-band chassis £1, ancient (1930?) radio £1, 1968–69 *WW*s (24) 60p. PO 3000 6C/O 6K coil screened (17)+ (5), McMurdo plugs, £1 the lot, buyer coll. B. R. Makowski, 66 Manor Ave, SE4 ITE.

RTTY gear Teletype 14 strip printer tx/rx, £13; teletype 15 page printer tx/rx with tape punch, £15; Teletype 14 tape reader £8; KW2000A with ac psu £135, Codar AT5 £11, carr extra. G3TTV, Toll House, Wilburton Road, Stretham, Cambs.

Vibroplex orig bug key, gd cond, £7 ono. G3KDB, QTHR, tel Lichfield 53398.

KW500 linear amp with spare 813, gd cond, buyer coll, £30. G3FXB, QTHR, tel Brighton 593382.

Preparing for retirement and moving. Shackful of gear for scrapping. Some gd stuff but not modern. Will give away (club preferred) in return for help in clearing. Phone evenings, Amersham 6014.

RSGB Bulletin July 1943 to Dec 1970 incl (Feb 1947 Aug 1959 missing) 328 in all, highest bidder coll. **Wanted** good wvmtr, cheap. G2HP, QTHR.

Heath sig gnrtr RF-1U mint, £10; monitor scope HO-10, perfect, £20. G5NN, tel Winslow 2498.

FT DX 100 Yaesu Musen absolutely perfect, cond as new, little used, plus homemade miniature vfo for mobile remote control, £160 ono. 120W p.e.p. out on all bands. G3KLF, QTHR, tel 078-089 512....

AM/tx Geloso vfo, 807, 813, Eddystone 640, wks but needs attention, £10 the lot. G6WA, QTHR, tel St Ives 63088.

Two vols *Transistor bias tables* by E. Wolfendale:—(1) Germanium (Cost £1.05) (2) Silicon (Cost £1.25), as new. Offers? Also all spares from dismantled wireless set 19. Mr A. Thornborough (A6185), 30 St John's Estate, South Broomhill, Morpeth, Northumberland.

Codar CR70A comm rx ideal for swl, vgc, £14. Buyer coll or carr extra. D. J. Lawley, 14 Hillingdon Road, Gravesend, Kent DA11 7LG.

B2 spy rx needs attention 50p. Fantavox aircraft band cnvrtr, new £2.50 + 15p p. & p. Ian L. Bishop, 27 Stratton Way, Biggleswade, Beds, tel 312609.

Trio 9R59DS + SP5D spkr + manual, mint cond, £45. Mr P. M. Cleaver, 86 Main Rd, Dovercourt, Harwich, Essex, tel Harwich 2195.

KW2000A ac psu, KW match, KW fltr, xtal mic £150. Buyer coll. KW E-Zee match thrown in. Lafayette HA600 eight wks old £35. G4AJZ, QTHR, tel 051-709 3750.

Heathkit RA1 £27; HW30 £12.50; 160m tx + psu £12.50; Pye Ranger 30w/m £30. Del by arrgt. Vlvs ancient & modern 20p ea. Open PO with requirements, returned if not available. G8DXD, QTHR.

Trio JR500SE brand new £50. G3JPS, QTHR.

Trio JR500SE 160–10m, spkr, hdphns, atu, xtal marker; EMSAC 2m cnvrtr psu, SE700 psu 3/6/9/12V dc; S870 rx, fet 2m cnvrtr nonworking; 8-el Yagi, £50. Buyer coll. J. R. Martin, 3 Albion Rd, Fairmile, Christchurch, Hants BH23 2JG.

160–10m mobile/home stn; Multi-Elmac tx, 11 by 7 by 9, 40W a.m. cw, nbfm Rx 7 by 5 by 12 bfo, inc broadcast band, 12V psu, hndbks inc, £50 ono. G3UMI, QTHR, tel (0785) 850636.

AR88LF + hndbk and spares £35 ono, buyer coll. J. Dillon, 72, Inchmurrin Drive, Wardneuk, Kilmarnock, Ayrshire.

KW/m psu 12V pos or neg earth, for KW2000A, little used, £25; Halson /m whip coils for all bands £10, buyer coll or carr extra. G6SU, QTHR, tel Ryton on Tyne 2627.

18AVT/WB 6 months old, £25 ono; CR100 £10; Federal sig gen £15. G3MBK, QTHR, tel Brookwood (Surrey) 5906.

CR100, no case, gd cond, some new vlves, o/hauled, suit swl, bfo £10 ono. Pref buyer coll or arr coll. J. O'Connor, 20 Chevallier Street, Ipswich, Suffolk.

Xtals QCC B7G base, three 459kHz, three 461kHz, one 458·6kHz, one 461·4kHz as for G2DAF rx filter. G3KNA, QTHR, tel 097-62 3122.

DX100U, exc example, buyer coll, consider exch deal on EC10, Mohican rotator, 2m preamp, or WHY? G4ACK, QTHR, tel Burnham-on-Sea 5264 after 7pm.

LM372 a.m., i.f. strips, TO5 can, £2. G8CPS, 63 Daventry Road, Coventry, tel Cov 24777.

G2DAF tx mkII, lf, v good, £40; Lafayette HA350 rx 160-10, mint £55; **Wanted** FT101 W1D 160 fitted, loan of TA33 or sim req for SJOTA (Oct 21/22). G3WEF, QTHR.

Codar CR70A, six months old, mint cond £16. Rob Fisher, 110 South Mossley Hill Road, Liverpool, tel 051-428 1086.

Property of late G3FX: Marconi CR150/2 rx; RCA osc type PX No 1, 1·4-6·7MHz; hv pa, pr 872A vlves, 2000-0-2000V trnsfrmr; psu type 234A; panel inc hf prslctr; wooden console plus eqpt rack 6ft × 4ft 4in × 15in, inc aerial direction indctr, plus switch panel; large selection radio chassis. T. Clegg, Half Acre, Sheriff Lane, Eldwick, Nr Bingley, Yorkshire, tel Bingley 2643.

Trio 9R59DE rx, SP5D spkr, £38; Heathkit Twoer £20; Electroniques transistor Hambands coilpack, 1·6MHz i.f., new unused £15, buyer coll or carr extra. **Wanted** unmodified dash mount Pye Cambridge High Band. G8CJM, QTHR, tel Medway 47280.

Pre-war USA radio mags—*Short Wave Craft, Radio & Television, Radio News, Radio Craft.* G8AIG, QTHR.

J.A.P. 4 stroke, 12V, petrol gennie, perfect £42; 4ft glassfibre dish and dipole feeds for 23, 13 and 9cm, £10; metalwork for GEC double 4CX250B 70cm pa with vlves, £12. T. C. Jones, 13 Sheppard Way, Minchinhampton, Stroud, Gloucs, tel Brimscombe 3541.

Tiger radio, z-match type 75AC, also matching Tiger radio swr mtr, £12 the pr. G3JQC, QTHR, tel Heckmondwike 2707 after 8pm.

Remcon Quantum 6-chann prop rc system, one servo, £50 ono; Sinclair Stereo 60 with two Z30 PAs, and PZ5 psu, £12 ono. G4AHX, QTHR, tel 061-445 6678.

Hallicrafters SX110, 550kHz-34MHz bndsprd 80-10m, gc, with manual £38; Katsumi EK9X electronic keyer as new £6.50; Hammarlund HQ-180A, mint, £120 ono. G4AFY, QTHR, tel Kidderminster 61752.

Clearing shack: CR150 TXs, test gear, vhf/uhf vlves, klystrons. G2CPM, QTHR, tel Newbury 464.

Trio TS510, ac psu, as new £130; Trio JR500 rx, spkr, as new £40; 1475 rx with manual, part working, £10; 19 set mk3, rx only, modified, £5. D. A. Sinclair, 89 Hastoe Park, Aylesbury, Bucks, tel Aylesbury 85200.

Heath GR64 rx 500kHz, 30MHz, £20; Codar transistor trf rx, 500kHz 30MHz £10. G3VAH, QTHR, tel North Shields 72379.

898 dial £5; 500pF Johnson capacitors (3), one split stator, £1.50 ea; homebrew transistor cnvrtr 160/80m, 1.6MHz i.f., £3, all plus p & p. Some historic vlves and phonograph, sae enquiries. G5LH, QTHR, tel Newcastle 662490.

Drake 2A rx with 2BQ Q mult/spkr fb wkg order, £40 ono, buyer plse test and coll. **Wanted** atu. G3CDR, QTHR, tel Dartford 26976.

Homebuilt rx using Electroniques GC166T (550kHz-30MHz) and i.f.a. 1·6/ssb mkIII Sinclair IC12 audio amp, stab psu, 898 dial, all controls, cab, all in wkg order, all info and ccts supplied, £40 ono. C. J. Bigger, Upper Grange Farm, Markfield, Leicester, tel Markfield 2525.

Trio 9R59D rx, perf cond, £35; also LG50 tx £20; dxcc etc with these, manuals inc. G3MWP, QTHR, tel Brentwood 4897.

AR88LF good cond plus spkr and spare vlves £28. G5VH, QTHR, tel Wigston 3197.

CR100 and noise lmtr £15; Joystick and Joymatch atu £4; 30W 2m tx with modltr xtal, cct and details, less psu, £10. Hastie, 44 High Street, Jedburgh, Rox, tel Jedburgh 2214.

3cm 10-pce w/guide kit in heavy brass instr case £8; various 3cm gear and w/guide; lega instruction manual, brand new, £1.50; DX100U exc cond, modified, use with or without SB10, £40. G3IUD, QTHR.

Hammarlund HQ180A rx, exc cond, £90; 3m "88" desk top projector £20; Jason audio gnrtr, good cond, offers. Carr extra. G8AWV, QTHR, tel 01-794 9934,

Trio JR500S rx in exc cond and wkg order, £30. H.F.V. Webb, 13 Spurway Road, Tiverton, Devon, tel Tiverton 4411.

HRO rx with coils and psu, recently resprayed, also v good internally, would swap for a Trio 9R59DE or S; also CR100 £5. G3ZNY, QTHR, tel Stony Stratford 2382.

Transistors—2N3632 £2, 2N3553 £1, 2N3866 50p; xtals—48·35, 48·45, 10·245MHz 75p; 10·7MHz x fltrs £1.50; QQVO6·40As, used, tested 75p; many other comps, sae all enquiries. G8FFV, 459 Sandy Hill, Up Hale, nr Farnham, Surrey.

Klystrons, 2K25 3cm, £2, 726A 9cm, £1, 2K39 3cm, £2; STC 9cm coax oscs—V235A/1K 80p, also 5B254M, 5B255M 80p, QQVO310 80p, QQVO320A £2.50, QQVO640a £3.50, 2C39A £2, 4X150a £1.50, DET22 £1. T. C. Jones, 13 Sheppard Way, Minchinhampton, Stroud, Gloucs, tel Brimscombe 3541.

EA12 perf cond £120 delvrd; Solartron CD711S scope with manual £60 delvrd. Anything radio or sailing consdrd in part exch. GW3UCJ, QTHR, tel Briton Ferry 812376.

Complete ssb/cw stn (homemade), 160-10m, rx all vlve, 1650kHz i.f. with fltr, tx as G3JJG July, Aug, Sept 1966 *Radio Communication*, 1-6146 60W p.e.p. ptt, sep psu, £60 ono. G3ONL, QTHR.

Trio 9R59DE rx fitted stab and i.f. gain, SP5D spkr and PR30 Codar Prslctr, £35 the lot. Buyer coll or would del rsnble dist. J. Harding, 3 Grenville Ave, Wendover, Aylesbury, Bucks, tel Wendover 3802.

Contr cable 12-core, brand new, suit ham-m, 15p yd; 75Ω h/duty coax 7/16in od, unused, 10p yd, sae samples; Willcox-Gay vfo, mint, with two 807s, £4, all carr paid. GD3TIU, QTHR, tel Marown 442 or 062-485 442.

30ft Hamtower compl with rotator and indicator also centre pole, £35; BC221 £15; megger ohmmeter £1.50. G3WJN, QTHR, tel Alcester 2520 daytime.

Samson electric keyer £8; class D wvmtr £2.50; LG300 mdltr & psu; low level speech clipper £2; trnsfrmr 750-0-750 250mA, £2.50; B2 tx £2, carr extra. G3PVA, QTHR.

Heathkit Mohican gen cov batt rx, ideal /p or /m use, covering mw and 1·6 to 30MHz, factory assmbld, complete with manual and cct diags, vgc. Offers to J. D. Flegg, 43 Wayside Walk, Harrogate, Yorks, tel Harrogate 84105 after 6pm.

SB1OU little used, £18 plus carr. G3FBA, QTHR, tel New Buckenham 486.

Heathkit Mohican GC1U rx with manual £25; Hallicrafters Super Skyrider S11 gen cov rx, 240V, with diags and 12in spkr, £15; class D wvmtr, int psu, £5. D. J. Gibbs, 42 Downshire Hill, Hampstead, London NW3, tel 01-435 2064.

Panda Explorer 150W tx, 80-10m; Pye PTC703 base stn, modified 70MHz, tunable rx; National NC100X rx with spkr; Hallicrafter SX17 rx with spkr; all in good cond. Offers? G3ICX, QTHR, tel Pershore 3165.

Tx/rx Trio 510, psu, tx unused, exc cond, £125. Montgomery, 23 Larkham Lane, Plympton, Plymouth, tel Plymouth 37003.

Marconi mk III 3in 10 camera channel, complete set manuals, various spares, several tubes, less lens, £12 buyer coll. G3UGR, QTHR.

Mercury cells, have been stored for sometime, but tested for voltage before despatch eg 1·34V per cell, ideal for transistor work etc, fraction of orig cost. Send 10p for samples. GW3UBV, QTHR.

BSR Monardeck TD2 tape deck, 4 track heads, in wooden case, £5 ono; scientific weighing balance, scale pan type, measures to 1/100gm with weights, £10 ono. M. Baker, Cornerstones, Green Close, Bicester, Oxon, tel Bicester 2574.

Wayne Kerr CT375 universal bridge, good cond and fully wkg, £40 ovno; Creed 25 punch with photoelectric reader and tape wndr £30 ovno; KW 75/1 lpf £2, buyer coll. Write G4ANA c/o G3UNU, QTHR (Nottingham).

Pye 2702 2m tx base stn chassis with 5894 and xtal £15; Pye 2002V 2m Ranger tx/tunable rx, 24V/mains, £10. Buyer coll. G8DET, QTHR, tel Danbury 4677 (nr Chelmsford).

Heathkit 32ft galv steel tower, perf cond, £25 ono; 6-over-6 J-Beam skeleton slot aerial £2. G8BJP, QTHR, tel Thanet 31069, 10 Sept onwards.

KW2000B, sep vfo, ac psu, perf mint cond, used by swl for six months only. Why buy new? Nearest offer to £200 consdrd. Heathkit 80m HW12A mic /M, dc psu, spkr, factory tested and aligned, new, £80 complete. Sissons, 25 Southlands Grove, Bromley, Kent, tel 01-460 8481 evenings.

CR70 £10. G4AXI, 54 St Pauls Road, Clifton. Bristol.

Lafayette mech fltr, type MF-455-10AZ27 with matching trnsfrmrs and full data, £5 ono. G3LR, QTHR.

Sommerkamp FT DX150 tx/rx, purchased Jan 1970, cond as new, full coverage, all bands 80-10m, 120W p.e.p. o/p, plus miniature external vfo for /M remote contr if desired, £140, complete with mic. G3KLF, QTHR, tel 078-089 512.

WANTED

KW E-zee match, Codar 12 M/S 12 R/C HRO, psu. G3TFS, QTHR, tel Ashtead 72689.

DX100 mod trans 358X rx or spares. Sell, exchange Delta tx/rx c/o unit; Green Davis 2m convrtr; 840A Eddystone rx. 174 Minstead Road, Erdington, Birmingham B24 8PX, tel 021-327 5937.

HC6/U Crystals 3·2 to 3·4MHz, 5 to 5·2MHz, 8·45 to 8·5MHz. Woods, 1 Baker Avenue, RAF Benson, Oxon.

Avo valve characteristic mtr No 2, or parts in any cond for rebuilding project, must be cheap. Full details frnt panel markings urgently required. Will pay carr for bonafide gifts or agreed purchases. G3YAO, QTHR, tel 01-654 6042.

KVG XF9B and xtals. Eddystone 898. G3YGR, QTHR, tel 01-850 6342.

TW-2 Communicator 2m tx/rx top price offered, or exch Swan 20m ssb/cw tx. Stephens, 158 Ashford Road, Iver Heath, Bucks, tel Iver 2060.

Hammarlund SP600 JX series, table top model pref, must be in orig and exc cond throughout, state JX number, details and price. G3GUU, QTHR.

Any microwave gear 1GHz to 30GHz. G8DGR, 5 Wentworth Court, Newbury, Berks.

Loan of circuit diagram Homelab sig gnrtr Mark 1, G3VEE, QTHR.

HW32A in gd cond with mic and matching spkr/psu. Also 50Ω 1KW dummy load. G4AFI, QTHR.

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4m a.m. walkie/talkie or transistor tx/rx, pse state asking price and give full details. G3ZPF, QTHR.

2m /M or /P Pye Cambridge, fm or a.m. model, or cnsdr homebrew transistorized. G2DCF, QTHR.

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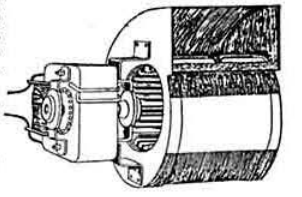

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