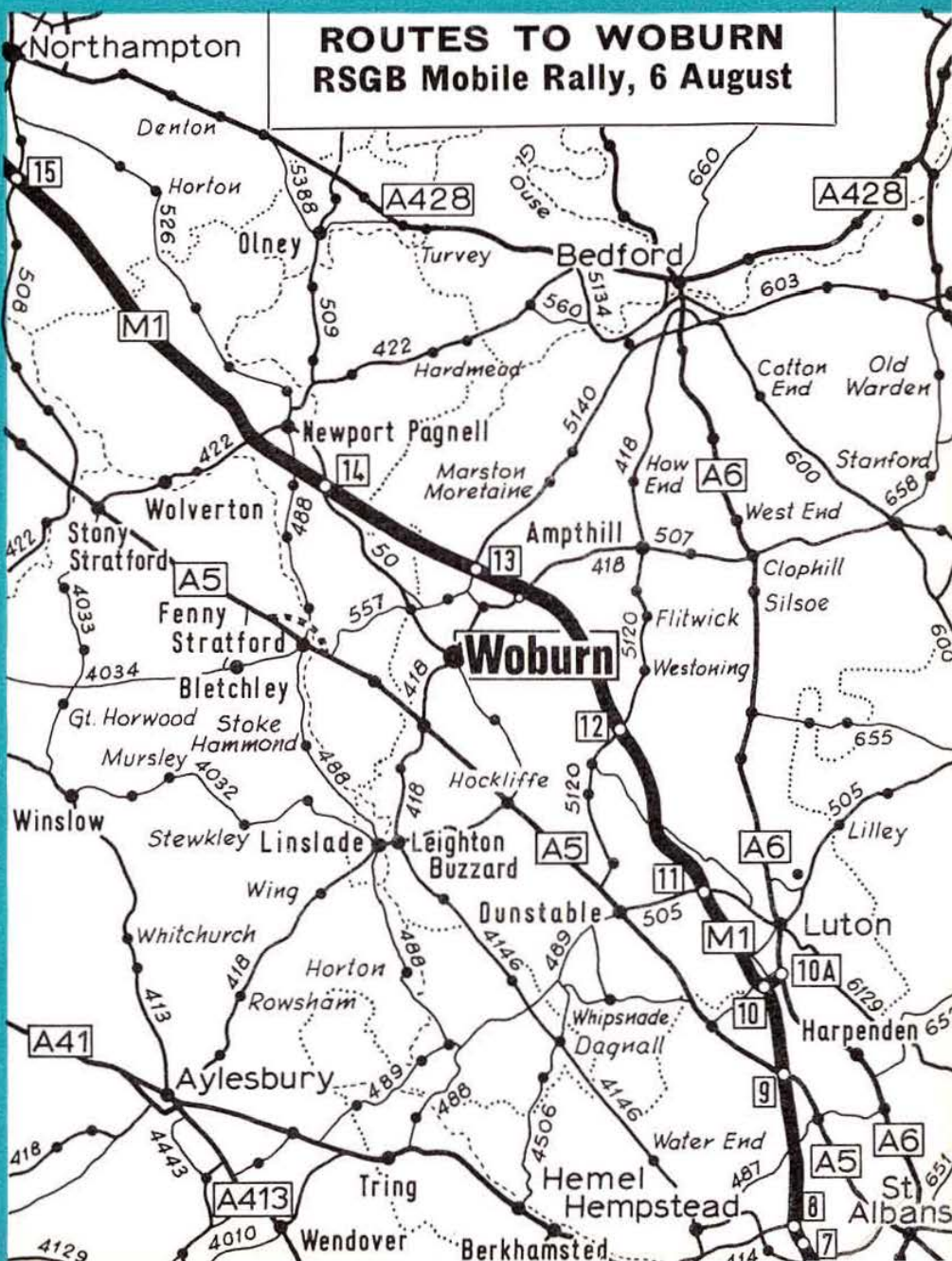
radio communication

July 1972

Journal of the Radio Society of Great Britain



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Volume 48 No 7 Price 30p

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SB Separates

HEATHKIT
Schlumberger

The famous Heathkit "DX Maxi-Rig"..."303," "401" & "200"

Heathkit SB-303

- **27 transistors, 1 IC on 8 plug-in circuit boards**
- **Receives USB, LSB, AM, CW & RTTY, 80-10 meters**
- **15 MHz reception**

Advanced design. Dual Gate MOSFET front end provides greater dynamic range with low distortion . . . gives you the sensitivity you need to copy weak signals without danger of overloading on very strong ones. RF Attenuator adjusts for optimum signal handling capability.

All solid-state circuitry employing the latest in techniques and devices delivers instant warmup, 100 Hz stability in 10 minutes and superior tracking. The exclusive Heath solid-state LMO with 1 kHz dial readout is factory assembled and aligned.

Compare the performance features. The new "303" offers as standard the features and versatility required for today's operations, yet most other receivers offer only endless (and costly) options. The new "303" gives complete SSB/CW transceive compatibility with the famous "400" or "401". Three position AGC (off, fast & slow). New 25 kHz and 100 kHz crystal calibrator lets you spot the new subbands quickly, easily, without interpolation and error.

New construction techniques. Point-to-point wiring has been virtually eliminated with the use of wiring harnesses. All eight circuit boards plug-in . . . and the special extender boards supplied enable you to bring a board out of the compact chassis to check readings while the "303" is operating.

Compare the specs. What really counts in any receiver is solid all-around performance under varying conditions . . . and the "303" has the specs to deliver. Sensitivity . . . less than a *quarter of a microvolt for 10 dB S+N/N*! Selectivity . . . 2.1 kHz on SSB. Image Rejection: 60 dB or more. IF Rejection: 50 dB or more. Compare the "303" against the competition.

Kit SB-303, 21 lbs. **£175·00** Carriage 90p

SBA-301-1, optional 3.75 kHz AM crystal filter, 1 lb.

SBA-301-2, optional 400 Hz CW crystal filter, 1 lb.

Kit SB-600, 8 ohm speaker, 7 lbs.

SB-303 SPECIFICATIONS: Frequency Range (MHz): 3.5 to 4.0, 7.0 to 7.3, 14.0 to 14.5, 15.0 to 15.3, 21.0 to 21.5, 28.0 to 30. **Intermediate Frequency** (IF): 3.395 MHz. **Frequency Stability:** Less than 100 Hz drift per hour after 10 minutes warmup under normal ambient conditions. Less than 100 Hz drift for ±10% line voltage variation. **Frequency Selection:** Built-in Linear Master Oscillator. **Modes of Operation:** SSB, CW, AM, RTTY. **Sensitivity:** Less than 0.25 uV for 10 dB S+N/N for SSB operation. **Overall Gain:** Less than 1.5 uV input for 0.5 audio output (single tone SSB). **AGC Characteristics:** Blocking – Greater than 3.0 V CW/SSB/RTTY. Dynamic Range – Greater than 150 dB CW/SSB. RF Attenuator: Variable 0-40 dB nominal. **Selectivity:** SSB – 2.1 kHz @ 6 dB down, 5.0 kHz maximum at 60 dB down (crystal filter supplied). CW – 400 Hz at 6 dB down, 2.0 kHz maximum at 60 dB down (crystal filter available as an accessory). AM – 3.75 kHz at 6 dB down, 10 kHz maximum at 60 dB down (crystal filter available as an accessory). RTTY – 2.1 kHz at 6 dB down, 5.0 kHz maximum at 60 dB down (uses SSB crystal filter). Image rejection: 60 dB or better. **IF Rejection:** 3.395 – greater than 55 dB. 8.595 – greater than 50 dB. **Spurious Response:** All below 1 uV equivalent signal input. **Temperature Ranges:** 10°C to 50°C ambient. **Dial Accuracy:** Electrical – Within 400 Hz after calibration at nearest 100 kHz or 25 kHz point. Visual – Within 200 Hz. **Calibration:** Every 100 kHz or 25 kHz. **Dial Accuracy:** No more than 50 Hz. **Antenna Input Impedance:** 50 ohm nominal unbalanced. **Audio Response:** SSB – 350 to 2450 Hz nominal at 6 dB. CW (with accessory filter) – 800 to 1200 Hz nominal at 6 dB. AM (with accessory filter) – 200 to 3500 Hz nominal at 6 dB. RTTY – 1840 to 3940 Hz nominal at 6 dB. **Audio Output Impedance:** Speaker – 4 ohm. Headphones – Low impedance. **Audio Output Power:** 4 watts at less than 10% distortion. **Muting:** Open external ground at Mute socket. **Power Requirements:** 120/240 VAC, 40 watts max. **Front Panel Controls:** Main tuning dial; function switch; mode switch; band switch; AGC switch; converter switch; AF gain/power on-off; RF gain/speaker disable; preselector; RF Attenuator. **Circuit Board Controls:** IF/Audio – Bias adjust; meter zero; meter full scale. Power Supply/BFO – +15 V adjust; 100 kHz adjust; RTTY – Wide shift; narrow shift; CW shift. **Connections:** Rear Panel – Phones; HF antenna; VHF antenna #1, VHF antenna #2; mute; anti-vox; speaker; HFO out; LMO out; VFO out; CW shift; four spare sockets; 3-wire line cord socket; accessory socket; VHF Converter, +15 VDC @ 25 mA, switched. RTTY Keyboard. **Cabinet Dimensions:** 12¼" W x 6⅝" H x 13" D. **Overall Dimensions** (with knobs & feet installed): 12¼" W x 7⅞" H x 14" D.

Heathkit SB-Series Communication Speaker

Fixed-station "speaker" facilities in handsome SB-series styling. Complete your SB-Series station with this complementary communications speaker. The SB-600 provides 8 ohm impedance to match audio output of Heathkit SB-Series and HW-Series equipment. Audio response 300 to 3000 Hz for optimum reproduction. And for Heathkit Transceiver owners, it provides mounting enclosure for the "remote" HP-23A power supply. Cabinet size is identical to SB-610, SB-620, etc. . . . 10" W x 6½" H x 10½" D.

Kit SB-600, 7 lbs. **£10·50** Carriage 40p

Please send me specification sheet for models:

Name

Address

RC 07/72

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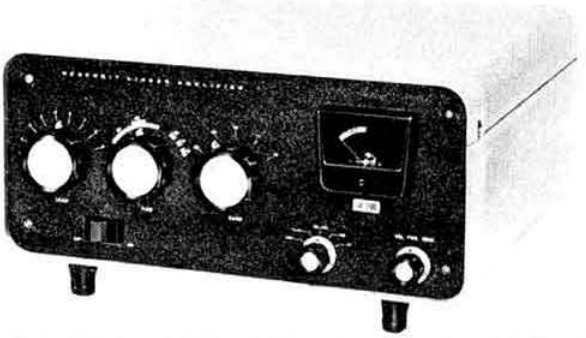
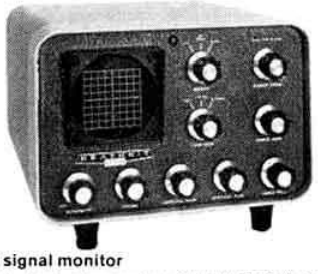
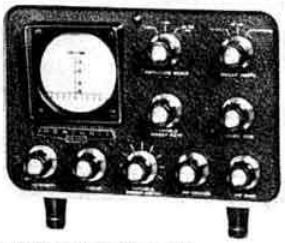
SB Separates





SB-610 signal monitor
accurately displays transmitted AM, CW, RTTY & SSB signals 160 thru 6 meters. 15-1000 watts. Displays signal envelope, AF & RF trapezoid patterns; 2-tone test oscillator built-in.
Kit SB-610, 14 lbs. **£47·50** Carriage 50p



SB-620 "Scanalyzer" permits monitoring large segments of spectrum... makes it easy to spot openings. Narrow sweep widths of 10 & 50 kHz permit single signal analysis. Operates with virtually all receiver IF's.
Kit SB-620, 15 lbs. **£73·00** Carriage 70p

Heathkit® SB-401 SSB Transmitter

Covers 80-10 meters; USB, LSB & CW. Single front panel switch selects transceive or independent operation of "401" and 300-series receiver. Usable with any receiver when optional SBA-401-1 crystal group is installed. Built-in 120/240 VAC power supply.

Kit SB-401, 36 lbs **£190·00** Carriage £1·00
SBA-401-1, crystal pack, 1 lb.

SB-401 SPECIFICATIONS — Emission: SSB (upper or lower sideband) and CW. **Power input:** 170 watts CW, 180 watts P.E.P. SSB. **Power output:** 100 watts (80-15 meters), 80 watts (10 meters). **Output impedance:** 50 to 75 ohm — less than 2:1 SWR. **Frequency range:** (MHz) 3.5–4.0; 7.0–7.5; 14.0–14.5; 21.0–21.5; 28.0–28.5; 28.5–29.0; 29.0–29.5; 29.5–30.0. **Frequency stability:** Less than 100 Hz per hr. after 20 min. warmup. **Carrier suppression:** 55 dB below peak output. **Unwanted sideband suppression:** 55 dB @ 1 kHz. **Intermodulation distortion:** 30 dB below peak output (two-tone test). **Keying characteristics:** Break-in CW provided by operating VOX from a keyed tone (Grid block keying). **CW sidetone:** 1000 Hz. **ALC characteristics:** 10 dB or greater @ 0.2 mA final grid current. **Noise level:** 40 dB below rated carrier. **Visual dial accuracy:** Within 200 Hz (all bands). **Electrical dial accuracy:** Within 400 Hz after calibration at nearest 100 kHz point (all bands). **Backlash:** Less than 50 Hz. **Oscillator feedthrough or mixer products:** 55 dB below rated output (except 3910 kHz crossover which is 45 dB). **Harmonic radiation:** 35 dB below rated output. **Audio input:** High impedance microphone or phone patch. **Audio frequency response:** 350-2450 Hz ±3 dB. **Power requirements:** 80 watts STBY, 260 watts key down @ 120/240 V AC, 50/60 Hz. **Dimensions:** 14⅞" W x 6⅝" H x 13⅜" D.

Heathkit SB-200 1 kW amplifier

Provides 1200 W PEP SSB input, 1000 W CW. Built-in solid-state power supply with circuit breaker protection. Metering for SWR, grid current, plate current, relative power, plate voltage. ALC output. Shielded, fan-cooled amplifier compartment. Pre-tuned cathode input circuit for maximum efficiency and low distortion.

Kit SB-200, 50 lbs **£127·50** Carriage £1·00

SB-200 SPECIFICATIONS — Band coverage: 80, 40, 20, 15 & 10 meters. **Maximum power input:** 1200 watts P.E.P. SSB, 1000 watts CW. **Driving power required:** 100 watts. **Duty cycle:** SSB, continuous voice modulation; CW, 50% (key down time not to exceed 5 min.). **Third order distortion:** 30 dB or better at 1000 watts P.E.P. **Output impedance:** 50 to 75 ohm unbalanced; variable pi-output circuit. SWR not to exceed 2:1. **Input impedance:** 52 ohm unbalanced; broad-band pretuned input circuit requires no tuning. **Meter functions:** 0-100 mA grid current, 0-1000 mA plate current, 0-1000 relative power, 1:1 to 3:1 SWR, 1500 to 3000 volts high voltage. **Front panel controls:** Load; Tune; Band; Relative Power Sensitivity; Meter Switch, Grid-Plate-Rel. Power-SWR-HV; and Power Switch, on/off. **Tube complement:** Two 572B/T-160-L (in parallel). **Power requirements:** 120 volts AC @ 16 amperes (max.), 240 volts AC @ 8 amperes (max.). **Cabinet size:** 14⅞" W x 6⅝" H x 13⅜" D.

Attractive credit facilities available 10% deposit 12-24-36 months

Please note that on any credit agreement the service charge will be refunded if you complete payment within 3 months. After 3 months an early settlement discount of 5% on the outstanding balance is given.

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THE SUPERB FT-101 (Ex-Stock) (with 160m., £15 extra).

Deposit **£24** followed by monthly payments as follows: 3 at **£21**, 9 at **£26** or 5 at **£15**, 13 at **£14** or 6 at **£12**, 18 at **£11** or 14 at **£10**, 16 at **£9** or 9 at **£8**, 27 at **£8**

The FT-101 is a 260w. p.e.p. SSB/AM/CW transceiver with an amazingly sensitive receiver. You'll hear signals which are inaudible on many other equipments. It comes complete with speaker and microphone, AC and DC P.S.U.s built-in. There's nothing to touch it for value!

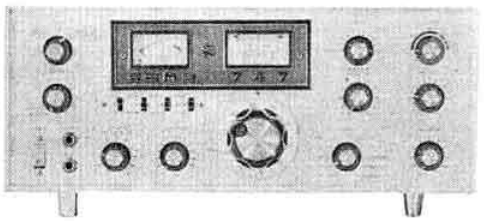
MATCHING FL-2100 LINEAR (Ex-Stock)

The FL-2100 is designed to match the FT-101 and runs 1200w. p.e.p. If it's a linear you require for some other exciter, compare the FL-2100 with 2 fans, AC and HV safety interlock and fully screened input circuitry. You'll not find better value!

YD854 **FV200 (Ex Stock) £38.00** **FT200 (Ex Stock) £134.00** **FP200 (Ex Stock) £38.00**

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

FT560 (£195) Ex-Stock



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

SPECIFICATIONS

Maximum Input Power: 560 W PEP SSB, 500W CW.
Sensitivity: 0·5 Microvolt for 20dB S/N (SSB 14 MC)
Selectivity: 2·3kHz (6dB down) 3·7 kHz (60dB down) six pole crystal filter nominal shape factor 1·6 : 1. Optional 600Hz CW filter is available.
Frequency Range: 3·5 to 4, 7 to 7·5, 10 to 10·5 WWV, 14 to 14·5, 21 to 21·5, 28 to 30 (Megahertz).
Unwanted Side Band Suppression: 55dB down (at 1000Hz).
Carrier Suppression: 50dB down from full output.
Distortion Products: More than 25dB down.
I.F. and Image Ratio: More than 50dB down.
Frequency Stability: Less than 100Hz drift in any 30 minute period after warm-up.
Audio Output: 1·5 watts, 350-2200Hz, 8/600 Ohm impedance.
Power Source: 117 or 234 volts A.C. 50/60 Hz.
Dimensions: 15¼" wide, 6¼" high, 13¼" deep.

YAESU PRICES. CARRIAGE PAID BY SECURICOR. MANUFACTURER'S 1 YEAR GUARANTEE.

FR-50B Receiver	£52.00	FV-101 Remote VFO	£38.00	FR-400SDX Rcvr. 160-10m,'4m,2m	£160.00	FT-560 Transceiver, 560W	£195.00
FL-50 Transmitter	£61.00	SP-101 Matching spkr.	£10.00	FL-400 Transmitter	£140.00	YC-305 35MHz Counter	£79.50
FV-50 Remotee VFO	£26.00	FL-2100 1200W Linear	£135.00	SP-400 Speaker	£10.00	YD-844 Table Microphone	£12.00
FT-75 Transceiver	£80.00	FT-200 Transceiver	£134.00	FL-2000B Linear, 120W p.e.p.	£135.00	YD-846 Hand Microphone	£5.00
FP-75 AC PSU/SPKR	£20.00	FP-200 AC PSU/spkr	£38.00	FL-2500 Linear, 2KW p.e.p. 160-10m	£118.00	FT-2F 2m 12Ch. FM Transceiver	£84.00
DC-75 DC PSU/SPKR/Mount	£20.00	FV-200 Remote VFO	£38.00	FT-401 Transceiver, S60W	£215.00	FP-2AC AC PSU/Speaker	£25.00
FT-101 Transceiver, 260W	£240.00	DC-200 DC PSU	£45.00	FV-401 Remote VFO	£38.00	FP-2ACB as above fitted NIC/CAD Batts.	£34.00
FT-101 Trans. fitted 160m	£255.00	FR-400DX Receiver 160-10m	£120.00	SP-401 Speaker	£10.00	FF-50DX L.P. Filter	£6.60

USED EQUIPMENT. (3 MONTHS GUARANTEE)

Heath SB101, +cw, v. good	£160.00	Heath HM-102, mint	£14.00	KW Atlanta, new	210.00	Hammarlund HX50, v. good	£90.00
Heath HP13A, DC PSU	£25.00	Heath GR-78's (2) Few months old	£60.00	KW Atlanta, as new	£160.00	Yaesu FT-400, mint	£160.00
Heath HDP21 Mic.	£10.00	KW600 Linear, superb	£70.00	KW Atlanta, v. good	£150.00	Swan 508 VFO, mint	£45.00
Heath SB-600 unused	£8.00	KW2000A (2 off), very good	£150.00	Digital 500, demo model	£225.00	Swan 270 AC or 12VPC TCVR, mint	£170.00
Heath SB-300, excellent	£90.00	KW201, superb	£75.00	Hammarlund SP600 JX, v. good	£75.00	Skywood CX203, new	£28.50
Heath SB-301, v. good	£99.00	KW202, excellent	£110.00	Hammarlund HQ170A, v. good	£73.00	Trio 9R59DS, new	£57.50

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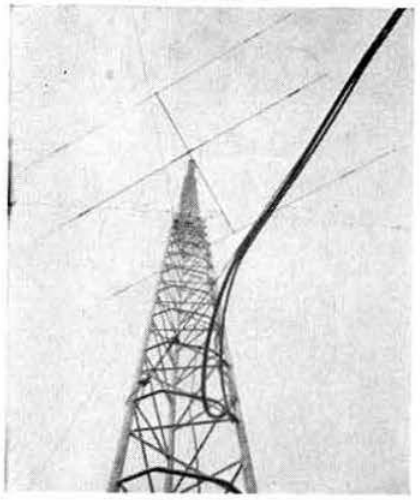
★ *Largest stock range in the U.K.* ★ *Money-saving packaged deals.*

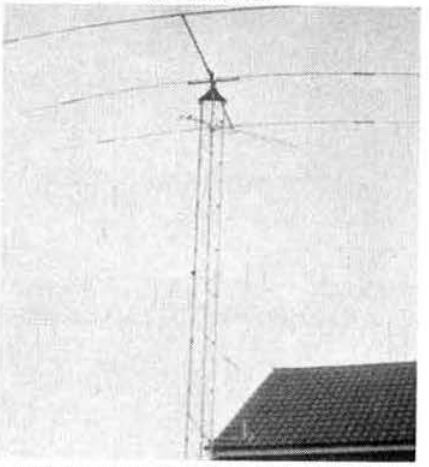
79' TELETOWER



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

TOWERS

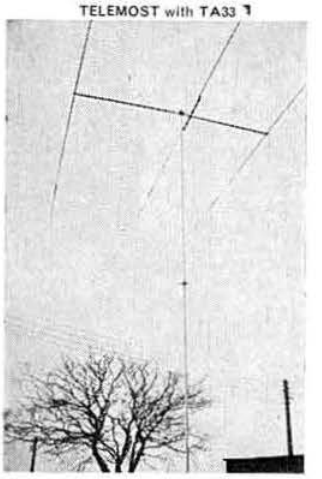
30' HAMTOWER



A self supporting galvanised steel tower for HF band beams. Each 10' side weighs only 22 lbs., so the tower can be erected single-handed.
Price: **£55.00** carriage paid.

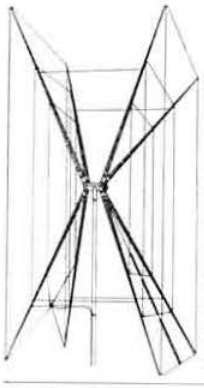
VERSATOWERS
Immediate delivery from our stock! Self supporting tilt-over towers 40', 60' and 85'.
P40', **£121.75,** P60', **£146.50,** T85', **£275.00.**

TELEMOST with TA33 ↑



The best in telescopic rotatable masts. Can be erected single-handed in minutes and extends vertically upwards.
Prices: (carr. paid).
Mast only 30' **£14·40** 40' **£16·50** 50' **£19·50**
Mast & Rig kit 30' **£19·95** 40' **£25·50** 50' **£31·50**

ANTENNAS



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★ Weighs only 21lbs.
★ Withstands 100 mph winds.
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★ Balun included.
★ Converts to 3 or 4 element quad.
★ Fibreglass tri-dectic spreaders.
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★ Low angle radiation.

THE FINEST FROM THE U.S.A.

HY-GAIN 18AVT (illus. rt.)

HY-GAIN 18AVT/WB THE GREAT NEW WIDE BAND VERTICAL SELF SUPPORTING FOR 10-80m. (ex-stock) **£33.00.** Take the wide band, omnidirectional performance of Hy-Gains famous 14AVQ/WB add 80m. plus extra heavy duty construction and you have the new 18AVT/WB ★ True ¼-wave resonance on all bands ★ 52Ω/P ★ SWR of 2 : 1 or less at band edges ★ 1 kW (AM) ★ Radiation pattern has an outstandingly low angle ★ Roof or ground mounting.

Hy-tower, 10-80m.	(self-sup.)	**£99.50**	Hy-Quad, 10-20m. 2 ele...	..	**£62.50**
18V, 10-80m. vertical	(self-sup.)	**£10.90**	DB10-15, 10-15m. 3 ele. ..	..	**£51.00**
12AVQ, 10-20m. vert.	(self-sup.)	**£16.50**	204BA, 20m. 4 ele. beam	..	**£80.00**
14AVQ, 10-40m. vert.	(self-sup.)	**£18.50**	203BA, 20m. 3 ele. beam	..	**£67.50**
18AVT, 10-80m. vert.	(self-sup.)	**£33.00**	153BA, 15m. 3 ele. beam	..	**£33.00**
LC8QQ, 80m. coil for 14AVQ ..		**£6.70**	103BA, 10m. 3 ele. beam	..	**£26.50**
TH6DXX, 10-20m. 6 ele. beam		**£88.00**	18TD, Reeltape portable dipole		**£41.00**
TH3MK3, 10-20m. 3 ele. 2 kW ..		**£69.50**	LA1 Lightning arrestor ..	..	**£14.50**
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Mustang, 10-20m, 3 ele. 2kW **£41.50**
TA33 Jnr. 'E' for 2" mast **£35.00**
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TA32 Jnr. 1-20m. 2 ele. **£24.50**
TA32 Jnr. 'E' for 2" mast **£25.00**
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Atlas Vertical 10-40m. guyed **£20.90**
SWL Listeners dipole **£10.90**

BANTEX FIBREGLASS VHF MOBILE ANTENNAS (Carriage 50p)

70/¼. 70 MHz, ¼ wave **£3.00**
144/¼. 144 MHz, ¼ wave **£2.75**
BGA, 144 MHz, ¼ wave **£6.15**
B5, 144 MHz, ½ wave .. **£4.35**
Magnetic mount .. **£4.95**
All aerials complete with base.

Note. Deduct 50p from price of aerial if base is not required.

WESTERN ELECTRONICS QUAD (boomless) 10-20m, **£27.00** (carr. paid).

WESTERN ELECTRONICS DIPOLES 10-80m, Type S. (500W) **£14.00**. Type HP, 1KW. **£15.25**. Type P. Portable version, fitted with our copper terylene braid for ease of coiling up onto winding spools, 75ft. of coax cord and weights **£17.50.**

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FT-200

FT-101

FTdx401

The Best in Mobile or Fixed Station

FT-101 Transceiver	£240	FV-101 Remote VFO	£38
FT-101 Fitted 160m	£255	FT-200 Transceiver	£134
SP-101 Speaker for FT-101	£10	DC-200 D.C. p.s.u. for FT-200	£45
FP-200 A.C. p.s.u. for FT-200	£38	SP-400 Speaker	£10
FV-200 Remote VFO for FT-200	£38	FL-400 Transmitter	£140
FR-400 Super de Luxe Receiver	£160	FL-2000B Linear Amplifier	£135
FL-2100 Linear Amplifier	£135	FT-401 Transceiver	£215
FV-401 Remote VFO	£38	SP-401 Speaker	£10
FT-2F 2m Transceiver	£84	YC-305 Frequency Counter	£79.50
FT-2 Auto	£129	YD844 Table Microphone	£12
FT-101 Fan	£8	YD846 Hand Microphone	£5
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Current Comment

As others see us

From a report on the 1971 Space Conference prepared by Tom Clarkson, ZL2AZ, former Assistant Postmaster-General of New Zealand, for IARU Region 3:

"Here I think I will mention my impression of only one particular delegation, and for this reason—its outstanding performance. Despite excellent work by others, the United Kingdom has, to my mind, pride of place in the amateur hall of fame. We knew beforehand that the UK policy was a liberal, constructive one towards amateur matters. The position of G2BVN on the UK delegation was of the greatest advantage throughout the conference, and it became clear that agreement for policy, and harmony among all concerned in that country had been the result of patient sound approaches and understanding achieved months perhaps years before. This point alone constitutes an example by RSGB that other national societies can well try to emulate.

"We found that the UK leader, Mr Donald Baptiste, and his spokesman on the Allocations Committee, Mr Anthony Fortnam, both had a sincere desire to do the best they could for amateur radio welfare. But there was more than that—they had the knowledge, ability, eloquence, pleasant assertiveness, and general savoir faire of the conference to advance our cause, always contributing the priceless ingredient of dignity.

"We had a sample of this on the first day of the working group, when I wrote, on 15 June . . . 'UK came out boldly in quite a comprehensive statement favouring amateur operation in exclusive and shared bands with footnote provision for safeguarding other services. We were all surprised and impressed by the forthrightness and eloquence of the UK statement. It included reference to the amateur service being under reliable control, both by administrations and by the amateurs themselves.'

"This splendid statement so admirably presented by Mr Fortnam was the earnest of other important actions; it is a pity we do not have a verbatim record of it. However, this and other pronouncements seemed to fall on deaf ears. As related separately, the committee on 6 July delivered its verdict—*execution* of the proposals for amateurs in the shared bands.

"Things were at their lowest ebb. Just the time to appreciate a friend in need. I think that when Mr Baptiste said he would present a paper to the plenary on the 435-438 band, and when it appeared soon after as a numbered document—a single bright ray shining into the surrounding depths of despondency—this seemed to make everything worth while—a heartening experience for all who really knew the truth of the matter, particularly the observers. We knew then that in this matter, whether it fared well or ill, everything that *could be* done *was* being done. And it was a proud moment for amateur radio when Mr Baptiste brought his talent into action, in presenting the paper to the plenary assembly of the conference.

"So the amateur radio affairs of the conference were illuminated by the splendid performance of the United Kingdom—its administration; and its national society, RSGB."

RSGB CALL BOOK

Affiliated Societies Section

Will the secretaries of all RSGB affiliated societies please advise the editor at RSGB headquarters of any omissions from, or any amendments to, the list of affiliated societies in the current edition of the *RSGB Amateur Radio Call Book* for inclusion in the 1973 edition which is now in course of preparation.

QTC AMATEUR RADIO NEWS

Radio Amateur Old-Timers' Association

There was an attendance of around 50 at the 14th Reunion held on 5 May 1972 at the Bonnington Hotel, London. Guests were: Mr Douglas Findlay, general manager of the RSGB, and Mr Harold Barnard, editor of *Wireless World*. During the evening Doug Findlay was elected an honorary member of the association, and presented with a special lapel badge.

Details of membership can be obtained from the hon secretary, Miss May Gadsden, 79 New River Crescent, London N13 5RQ, telephone 01-882 1272.

G5QA

The many friends of Herb Bartlett, G5QA, will be sorry to know that, as a result of a recent car accident, he is now immobile at home with a broken leg and other injuries. We extend our best wishes for a speedy recovery.

ITU

The International Telecommunication Union announces the accession of the Sultanate of Oman to the Montreux Convention thereby bringing the number of ITU member countries to 142.

1972 BATC Convention

The 1972 convention of the British Amateur Television Club is to be held at ITA Headquarters, 70 Brompton Road, London, on Saturday 16 September.

It is hoped that many radio amateurs who are not members of BATC will attend in order to learn more about this rapidly growing aspect of amateur radio.

"Electronics & Experimental Bulletin"

The Australian EEB, PO Box 177, Sandy Bay, Tasmania, Australia 7005, is directed towards experimental electronics at an intermediate level. The subscription is £1.05 per year (six issues).

The June 1972 issue contains the first of a two-part article "The reciprocating detector" by R. S. Badessa. This is an expanded treatment of the subject introduced by S. Oldberg in the March 1972 *Ham Radio*, and a simplification of the paper given last year to the IEEE: "A communications detector with a signal-synthesized reference". It is a significant development in communication technology. The June *EEB*

RSGB NATIONAL MOBILE RALLY

Woburn Abbey, Bedfordshire

Sunday 6 August 1972

From 11am

Talk-in stations GB2VHF, G3VHF and GB3RS on 2m, 4m, 80m and 160m

Attractions will include a large trade exhibition, RSGB bookstall and enquiries stand, grand raffle, Raynet stand, BARTG stand, and a bring-and-buy stand. All will be under cover.

Bring-and-buy rules: (*i*) All items to be marked with vendor's name, callsign, and price expected. (*ii*) All items to be coded "1 of 1", "2 of 4" etc. (*iii*) No item accepted for sale after 2.45pm. (*iv*) All unsold items to be collected by 5pm. (*v*) The RSGB accepts no responsibility for unclaimed items. (*vi*) 10 per cent commission will be charged on each item sold.

The RSGB makes no charge for entrance to the rally but all visitors must pay for entrance to Woburn Park, in which the rally takes place, at the rate of 40p per car irrespective of the number of passengers.

Car parking for the rally will be in a specially reserved car park adjacent to the marquee and not in the normal Woburn Abbey car park.

All the normal Woburn attractions will be available at small extra charges. Adequate cafeteria and toilet facilities exist.

How to get there (*see map on front cover*):
From the south via the M1—Leave the M1 at intersection 13 **not 12 as signposted.** Turn left off motorway and follow signposts through Husborne Crawley to Woburn Abbey.
From the south via the A5—Turn right at Hockliffe and follow the A50/528 to Woburn.
From the north via the M1—Leave the M1 at intersection 14 and follow the A50 to Woburn.
From the north via the A5—Turn left at A418, 5 miles south of Fenny Stratford, and follow to Woburn.
From other directions make for the points indicated above and proceed as indicated. **Avoid routes signposted to "The Wild Animal Kingdom" or "Game Reserve".** The rally takes place in Woburn Park and correct routes are signposted to "Woburn Park" or "The Abbey".

Organized by the Radio Society of Great Britain

will also contain an article on modulated light communication, and several other items of interest.

It is a tradition that *EEB* (whose approach is quite informal) is always late, therefore the "June" issue would doubtless be included on a subscription of a British amateur who requests it during the next few months.

First-day covers
Marconi-Kemp tests 75th anniversary

In addition to the specially designed first-day cover to be issued by the Barry College of Further Education Radio Society, mentioned on p283 of the May issue of *Radio Communication*; we have been advised of another first-day cover which will mark this anniversary.

The Marconi Philatelic Society has prepared a first day cover for the 7½p commemorative stamp to be issued on 13 September, and a special pictorial postmark will be used at Chelmsford to cancel the stamps.

First day covers will be posted at a mobile exhibition caravan at Marconi's original Hall Street Works in Chelmsford, and will bear a cachet to that effect. Some of Marconi's equipment used on these experiments will be on show at the combined Post Office and Marconi exhibition on that day. Orders for fully serviced first-day covers at 20p each should be sent to: The Marconi Philatelic Society, Marconi House, New Street, Chelmsford CM1 1PL. Please mark your envelope "Special Cover".

GB8NGS

This is the first Class B "special event station" to be licensed by the MPT, and it will be in operation over the period 1 to 31 July 1972 on the 144MHz band. The callsign is brought to members' notice by the organizer, G8FSO, so that the station will not be viewed with doubtful authenticity if heard by any member, as this is the first GB8 licence to be issued and some of us tend "not to trust these new-fangled prefixes."

144MHz repeater stations in the amateur service

by B. J. DOEL, G3SXK*

FOR many years professional radiotelephone systems have utilized the advantages of relaying one mobile station to another via a well-sited base station. To achieve this two frequencies are used, the mobiles transmitting on one of these and the base station on the other. The frequencies are allocated so that, with appropriate aerial filters, the base station can receive at the same time as it is transmitting. When one mobile station wishes to talk to another mobile he can ask the base operator for "talk-through", when a connection can be made from the output of the base station receiver to the input of its transmitter and hence a relay is effected. A further extension of the system is used during off-peak times when no traffic needs to be sent by the base station. Then it can be left switched to talk-through so that as soon as a signal is received by the base station it is automatically relayed to the other mobiles.

The frequency spacing between mobile and base station transmitters used for such systems is usually between 4 and 16MHz depending upon various established conventions and constraints. Provided it is not required to co-site a large number of base stations, when additional technical difficulties arise, it is possible to use frequency spacings of as little as 1½MHz or less. The isolation between the receiver and the transmitter aerial ports of a diplexer needs to be greater as frequency spacing is reduced.

During the past two years a number of automatic talk-through (repeater) stations have been established in the 2m amateur band in Germany, and give very effective mobile to mobile communication coverage. All appear to use phase modulation with a fairly high peak deviation (about ±5kHz). It is possible to gain access to these German stations from this country during "lift" conditions. Superb self-discipline is shown by the German operators who use these channels.

From information supplied to RSGB by DARC the following is a list of the channels used in Germany:

Channel No	Mobile or input frequency (MHz)	Relay transmitter frequency (MHz)
R2	144·15	145·75
R3	144·175	145·775
R4	144·2	145·8
R5	144·225	145·825
R6	144·25	145·85
R7	144·275	145·725
R8	144·3	145·7

The spacing between the channels is 25kHz and between transmitter and receiver 1·6MHz except for channels R7 and R8 which deviate from this. Channel 1 was the original Cuxhaven repeater, in at 144·15MHz, out at 145·85MHz, but this is now no longer in use.

At the May 1972 Scheveningen Conference IARU Region 1 decided not to adopt the West German system but elected instead to adopt as a European standard a 600kHz input/output system with all frequencies located in the band 145 to 145·9MHz. This leaves the lower part of the band free for cw and conventional phone working, whereas the German system causes interference to the cw sub-band and to the sub-band 144·15 to 144·5MHz which is frequently used on the Continent for dx phone A3, A3J and F3. The European standard channel allocation is:

Channel No	Mobile or input frequency (MHz)	Relay transmitter frequency (MHz)
R1	145·025	145·625
R2	145·05	145·65
R3	145·075	145·675
R4	145·1	145·7
R5	145·125	145·725
R6	145·15	145·75
R7	145·175	145·775
R8	145·2	145·8
R9	145·225	145·825

Note that some of the output frequencies of both systems are the same, eg compare German R4 with IARU Region 1 R8. This R4 channel is of particular interest as it is used by one of the nearest German repeaters located at Aachen.

To prevent spurious triggering of the relay transmitters by stations not wishing to use them but who happen to be using the input frequency of the relay station, some command other than just putting up a carrier wave on this frequency is required. Because of this some of the relay stations require a tone burst in the audio range to open them which has to be transmitted by the user at the start of each transmission. It must be stressed that the tone burst is not to make the system private but to reduce spurious triggering.

Is the time right to introduce repeater operation in this country? In some areas it would be a real advantage, in fact in most it would be a boon to mobile operators, but feeling runs high among 2m users over band planning, and any repeater would, for reasons already outlined, cut across these "agreements". However, there is already a common cw zone, a mobile calling channel, an rtty channel and an ssb section scattered across these zones, all having definite advantages.

Inconvenience to non-users can be reduced in two ways: firstly, by the use of vertical polarization so that the cross-polarization would reduce the signals by some 20dB, and secondly by using frequencies between channel allocations.

* Pye Telecommunications Amateur Radio Club, Newmarket Road, Cambridge.

The Pye Telecommunications ARC was advised by the RSGB that any experiment in the UK should be on these lines. The club had previously anticipated conducting experiments using the German channel 2. Although it had been a technical poser to get the 50dB or so isolation between receiver and transmitter ports in 1·6MHz, the problem had been overcome and it would have been possible to use the same aerial and feeder for both functions, making the system simple to instal and maintain.

To obtain the required isolation in 600kHz and still use one aerial would require tuned circuits the size of dustbins! Eventually it was decided that the problem could be solved by the use of two aerials, vertically spaced; one receiving, the other transmitting, and with extra tuned circuits in the receiver leg. Unfortunately this complicates both installation and maintenance.

The problem of using narrow spacings can be overcome by using two sites (one transmitting, the other receiving) interconnected by telephone or microwave link. This has been done by several groups in the USA but is probably outside the scope of most aspiring repeater groups in this country.

A provisional specification for an experimental UK repeater is as follows:

Transmitter:

Power output—10W.

Frequency—145·75MHz.

Mode—phase modulation (F3).

Peak deviation—±2·5kHz.

Receiver:

Sensitivity—0·5μV for 20dB quieting.

Frequency—145·15MHz.

Detector—FM/PM discriminator.

3dB bandwidth—5kHz.

60dB bandwidth—6kHz.

General system:

Aerial polarization—vertical

Opening tone: 1,700Hz ± 20Hz for half-second (this will be changed later to 1,750Hz)

Operation timer: 1min (resettable by tone). This is to ensure that if the repeater is held open unintentionally by a carrier, this is only re-radiated for 1min, after which the transmitter automatically turns off.

Identification callsign: in morse code at 12w/min F2 at 1/10 system deviation at the beginning and end of each transmission using a frequency of 1kHz.

Having decided on this specification, which proved to be acceptable to the MPT, and which would be relatively simple to operate, several members of the Pye Telecommunication ARC have built such a repeater in their spare time.

An approach was made to the MPT by the RSGB following consideration of the Pye Telecommunications ARC proposal. Following a meeting held at the MPT on 7 April, Mr D. E. Baptiste announced at the VHF Convention that the Ministry would agree to a controlled experiment and would shortly issue a licence for this purpose. The licence is for an initial period of 12 months and allocates the callsign GB3PI. The station will be established initially at the Pye Telecommunications premises in Cambridge where the permanent security staff can, on receipt of a telephone call, switch off the equipment. Later, and subject to MPT approval, it is hoped to transfer the station to a better radio site within range of London. The station will be under the control of RSGB Council Member Brian Armstrong, G3EDD.

Even if readers do not live within radio range of Cambridge in normal circumstances, they may like to become equipped for repeater operation. The proposed UK system will be compatible with the German equipment although, as mentioned, certain operating frequencies are different and the Cambridge receiver will have a narrower bandwidth. To use the repeater the requirements are as follows:

(1) An fm or pm transmitter [1, 2 and 3].
(2) An fm discriminator for your receiver [4 and 5].
(3) A vertically polarized dipole (or Yagi) aerial.
(4) An audio oscillator of 1,700Hz (1,750Hz)

The fourth requirement should be met with a fairly stable oscillator as the tone has always to be within a narrow tolerance to trigger the repeater. This tolerance is ±20Hz for the Cambridge repeater which is closer than the IARU Region 1 standard ±50Hz. When the German repeaters are in continuous operation, during openings, the tone does not appear to be necessary. However, it would appear that the system has grown somewhat since the last lift and operation may have tightened up with more stations in use.

A suitable af oscillator would be the bridged-T type shown in Fig 1, and a suitable printed circuit board layout is given in Fig 2, in the description of a keyed af oscillator which follows this article.

One problem which may have come to mind is the accurate setting of the frequency of the tone oscillator. A solution would be to build a digital counter [6], but this is probably going a bit far. Perhaps there is a friend with access to one. If not and you can hear the output of the repeater, one method would be to put up a carrier exactly on 145·15MHz and set your oscillator to a frequency you think about right. Then incrementally change this until you trigger the repeater's transmitter. It will reply with its callsign.

Another thing to remember is that just because a crystal marked with a frequency which multiplies up to 145·15MHz is available, it does not follow that it will come up spot on frequency. It will have to be trimmed on by a series or parallel capacitor. Ideally this should be done with the transmitter on dummy load using the home station receiver. Calibrate the crystal calibrator in the receiver against a beacon or the repeater output, then beat on the transmitter to the appropriate 10kHz marker. A check should then be made with someone else using the channel

To obtain best results the user's transmitter should be within 1kHz of the centre of the repeater's receiver channel. The result of operating further off channel will be gross distortion of the signal relayed.

Acknowledgements

This article incorporates the latest Region 1 IARU information regarding standardisation of repeaters provided by RSGB vhf manager, G3FZL. The author wishes to thank Pye Telecommunications Ltd for their co-operation and the use of facilities and would ask that any queries, reports or complaints be addressed directly to the Pye Telecommunications ARC and not to the company.

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A keyed af oscillator

This circuit is suitable for modulating an fm. transmitter to gain access to the German repeater system and the experimental UK repeater established at Cambridge. Several prototypes have been made and temperature tested over the range −5° to 55°C, the frequency remaining within the tolerance required to operate the repeaters.

Circuit description

TR1, TR2 and TR6 form a high impedance amplifier which is caused to oscillate by feedback through the twin-T frequency determining network of C1, C2, C3, C4, C5, C6, R1, R2, R3 and RV1.

When TR3 is switched on, the load resistor of TR2 is bypassed so the amplifier has no gain and the circuit does not oscillate.

Components list

C1	1000pF ±5% polystyrene, polyester or silvered mica*
C2	680pF ±5% polystyrene, polyester or silvered mica*
C3	1000pF ±5% polystyrene, polyester or silvered mica*
C4	680pF ±5% polystyrene, polyester or silvered mica*
C5	1000pF ±5% polystyrene, polyester or silvered mica*
C6	680pF ±5% polystyrene, polyester or silvered mica*
C7	47µF 40V −10% +50% Mullard electrolytic
C8	150µF 16V −10% +50% Mullard electrolytic
C9	1000pF −20% +40% disc ceramic
*For improved temperature Stability	
R1	150kΩ ±5% } high stab { MR5 Welwyn
R2	150kΩ ±5% } high stab { TR5 Electrosil or similar
R3	see text, 3·9 to 5·6kΩ } high stab
R4	22kΩ ±10% ¼W
R5	47kΩ ±10% ¼W
R6	2·2kΩ ±10% ¼W
R7	47kΩ ±10% ¼W
R8	100Ω ± 10% ¼W
R9	100Ω ±10% ¼W
R10	100kΩ ±10% ¼W
R11	1kΩ ±10% ¼W
R12	27kΩ ±10% ¼W
R13	2·2kΩ ±10% ¼W
R14	Select for required output level and input impedance of the transmitter modulator to obtain full deviation (100Ω to 220kΩ)
RV1	1kΩ Lin pc Pot ±20% ¼W, eg Plessey MP or Erie Type 80
TR1	BC108 or BC107 Mullard or 2N3704* Texas
TR2	BC108 or BC107 Mullard or 2N3704* Texas
TR3	BC108 or BC107 Mullard or 2N3704* Texas
TR4	BC108 or BC107 Mullard or 2N3704* Texas
TR5	TIS 43 Texas or 2N2646* GE, 2N1671* GE
TR6	BCY70 or BCY71 Mullard, 2N3703* Texas or BC212*
TR7	BC108 or BC107 Mullard or 2N3704*Texas BC182*
D1	1N914 Texas or OA202 or an similar Si diode

*These alternative types do not correspond to pc layout exactly, check the base connections if they are used.

A kit of parts with printed circuit board will shortly be available from Burns Electronics, 35 Beulah Hill, London SE19, at a cost of £4·70, or £5·70 assembled.

When the key terminal is connected to the 0V rail, C7 commences to charge via R7 and takes the base of TR3 below its emitter, hence switching it off, until C7 is charged to a level where base current can flow again in TR3. During

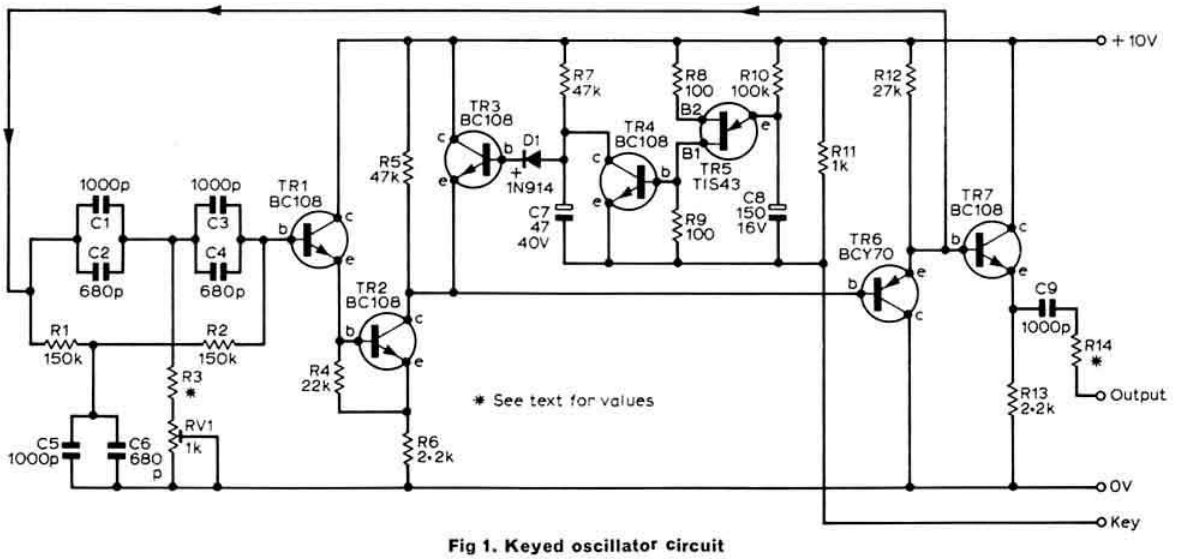


Fig 1. Keyed oscillator circuit

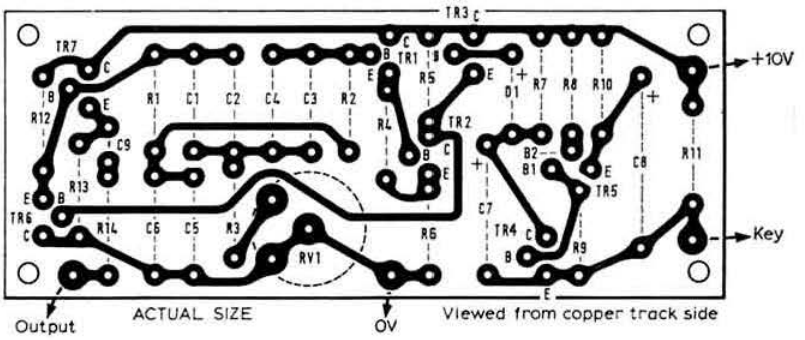
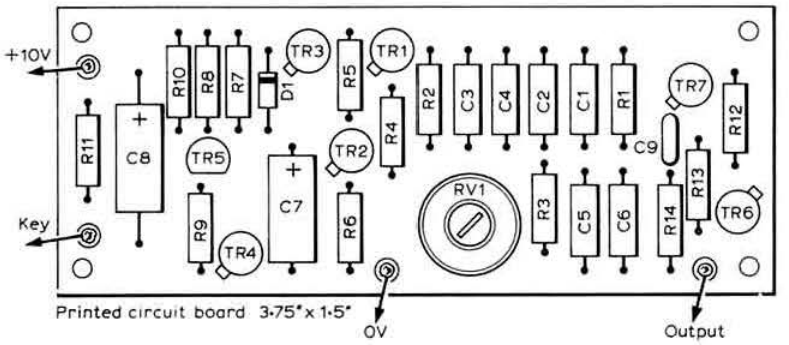


Fig 2. PC layout, 3·75in by 1·5in



this period, about ½s when TR3 is not conducting, the amplifier oscillates.

TR7 emitter follower isolates the output of the oscillator so there is no loading by the modulator and R14 can be adjusted to give the required level into the modulator (a max of 0·8V peak-peak is available).

To set the frequency of the oscillator disconnect D1 from circuit so the oscillator runs continuously and adjust RV1.

Range of frequencies available:

R3 = 5·6kΩ RV1 adjusts from 1,570 to 1,650Hz
R3 = 4·7kΩ RV1 adjusts from 1,640 to 1,730Hz
R3 = 3·9kΩ RV1 adjusts from 1,720 to 1,830Hz

Set to 1,700Hz (initially) for Cambridge repeater and 1,750Hz for most of the German repeaters.

If messages of longer than one minute are to be sent through the Cambridge repeater the tone must be repeated periodically, (less then 60s, more than 10s).

TR4 discharges C7 (switching off TR3) when the unijunction TR5 is triggered. This occurs on the relaxation of R10 and C8 with TR5 and is initially about 30s, then about 20s thereafter. If this feature is not required, components TR4, TR5, R9, R8, R10, R11 and C8 may be omitted.

The initial tone burst will be about half a second and the succeeding bursts about 400ms. These are short enough not to detract from the readability of the message.

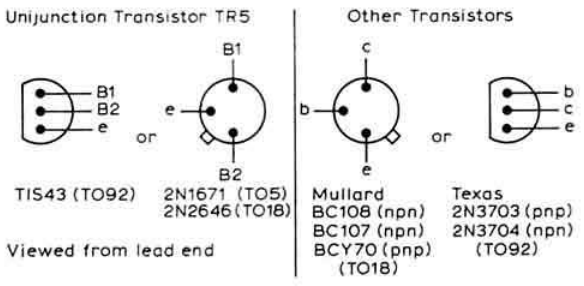


Fig 3. Base connections of transistors and alternatives

The oscillator can be keyed by either supplying 10V continuously and connecting the key line to 0V on transmit or by connecting the key line to 0V permanently and supplying 10V to the circuit when transmitting.

The RSGB News Bulletin Service

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

SCHEDULE

Time	Frequency (MHz)	Location and coverage (hf) or beam heading (vhf) of station
0930	3·6	Bromley, Kent (SE England)
1000	3·6	Cheltenham (SW England)
	145·8	Aberdeen (NNW)
	145·095	Farnham, Surrey (NE)
1015	3·6	Belfast, (N. Ireland)
	145·8	Bangor, Co Down (N)
1030	3·6	Derby (N. Midlands)
	144·337	Weston-super-Mare (NW)
	145·8	Aberdeen (SW)
	145·89	Bishop Auckland (N)
	145·3	Sutton Coldfield (NW)
1045	145·89	Bishop Auckland (E)
	145·095	Farnham, Surrey (SW)
1100	3·6	Bridlington (NE England)
	3·6	Aberdeen (NE Scotland)
	144·3	Sutton Coldfield (SW)
1130	3·6	Motherwell (S Central Scotland)
	145·5	Bradford (NE)
1200	145·5	Bradford (SE)

A transistorized Top Band transmitter

Designed by D. S. JONES, GW3XYW*

Described by W. H. ALLEN, MBE, G2UJ

THIS transmitter provides facilities for cw and either amplitude or double sideband with suppressed carrier modulation (dsb) and has given reliable service with good reports since it was built some two years ago. The quiescent current being less than 200mA at 12V makes it suitable for portable operation with, if necessary, no more than a pair of 6V "lantern" dry batteries for power supply.

Eyebrows may be raised at mention of dsb modulation, bearing in mind the theoretical requirement that the receiver must supply the missing carrier in correct *phase* when receiving this mode, but experience has shown that for fully 95 per cent of the contacts the distant operator has assumed, until told, that it was normal ssb, while the remainder—with less selective receivers?—have commented on the unusual form of modulation.

The reasons for the adoption of dsb rather than ssb were less complexity and cost, in as much as no expensive filter was required. Clearly, without synchronous demodulation dsb can only operate at 50 per cent of the efficiency of ssb, which would result in a 3dB loss of signal, ie about half an S-point.

The circuit

From the circuit diagram (Fig 1) it will be seen that the Colpitts vfo, comprising TR1, with TR2 as a directly coupled emitter follower, drives the buffer amplifier TR3 in the collector circuit of which is the primary winding of T1. The secondary of this transformer is connected to a diode balanced modulator which eliminates the carrier. The following stage is the driver for the push-pull output pair of transistors TR5 and TR6. In the absence of modulation the pa standing current should lie between 50 and 100mA and is adjusted to a minimum by RV1. The necessary bias to provide a carrier for cw or a.m. operation is controlled by RV2 so that on cw the driver and pa stages pass a maximum current of 800mA. On a.m. RV2 is set so that the rf output, as indicated on a swr bridge, is half that obtained on cw. Only half the audio input from the modulator is required on a.m. as opposed to that necessary for dsb.

The two positive voltage terminals may be "commoned" if the power supply has sufficiently good regulation to withstand the fluctuating current drawn by the pa stage without seriously varying the voltage on the vfo and buffer amplifier stages. Otherwise the low current required by these may be obtained from a battery or other suitable source.

The circuit of the four-transistor modulator will be found in Fig 2. The resistance/capacitor network between the second and third stages is designed to tailor the audio frequency response of the unit so that output is 3dB down at 300 and 2,000Hz as compared with mid-frequency.

Construction

The transmitter itself was built on a tinplate chassis 8½in long by 3½in wide with a ¼in turn-up all round to add

* 22 Alltiago Road, Pontardulais, nr Swansea, Glamorgan.

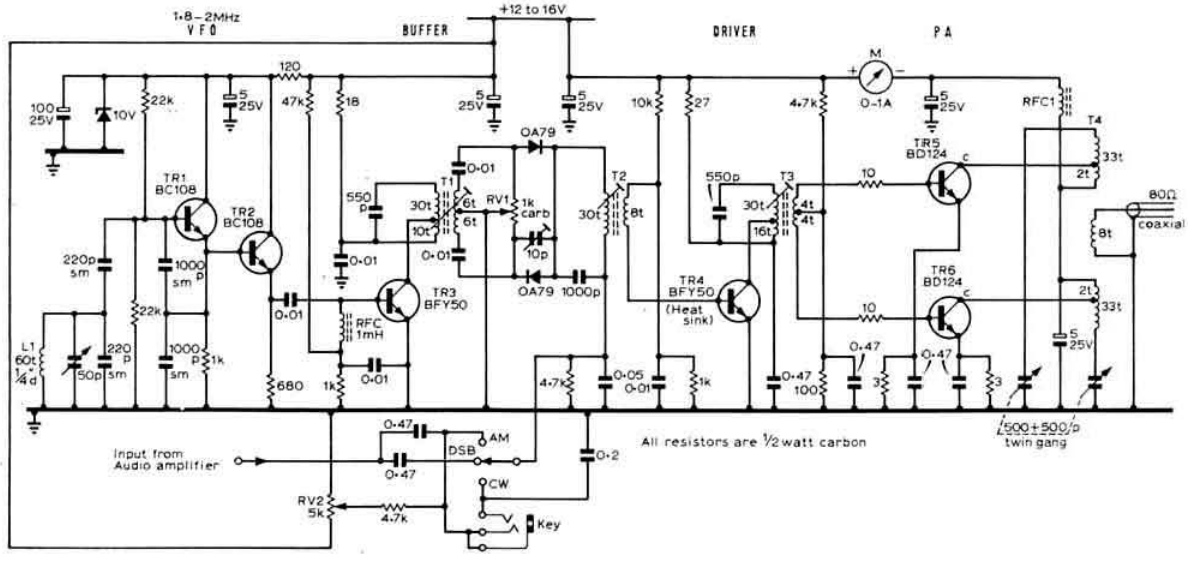


Fig 1. Circuit diagram of the transmitter. The 10pF trimmer shown connected in parallel with one of the diodes in the balanced modulator should be placed across the diode having the least capacitance.

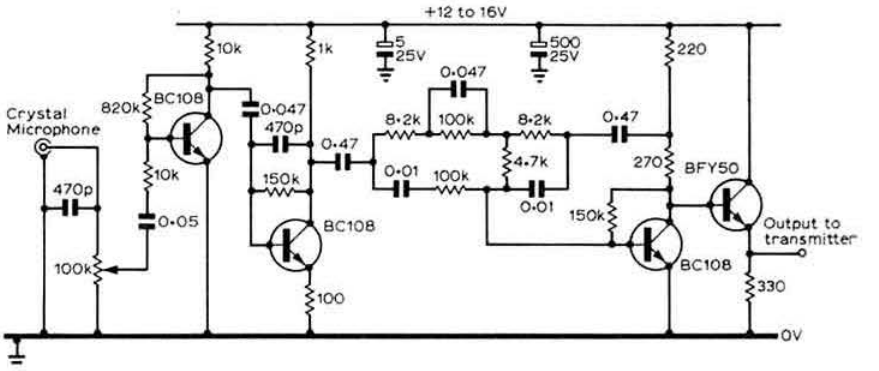


Fig 2. Circuit diagram of the modulator. The 470pF capacitor shown across the microphone input should be between the potentiometer slider and earth

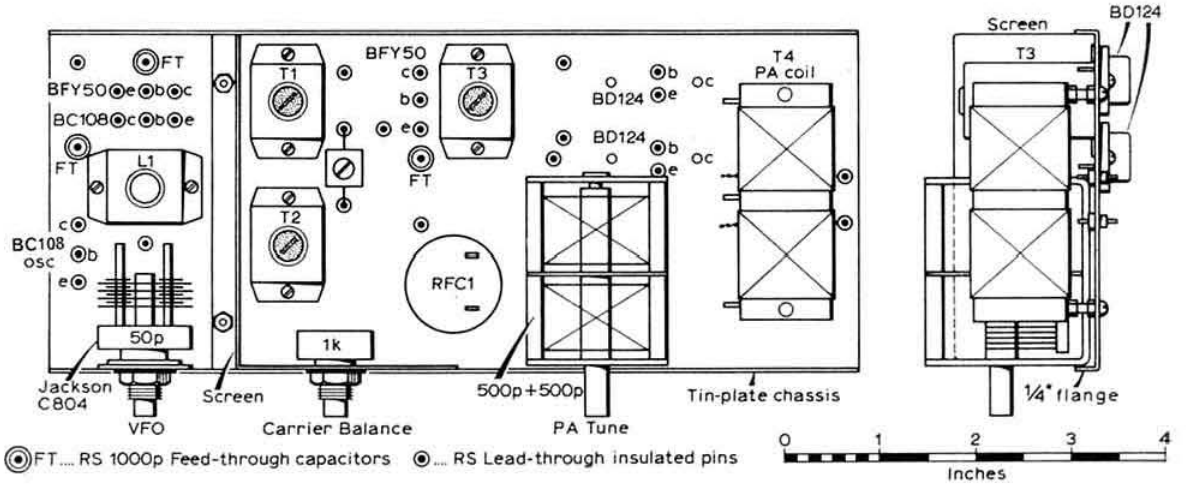


Fig 3. Plan view and right-hand elevation of the transmitter chassis showing the positions of the main components

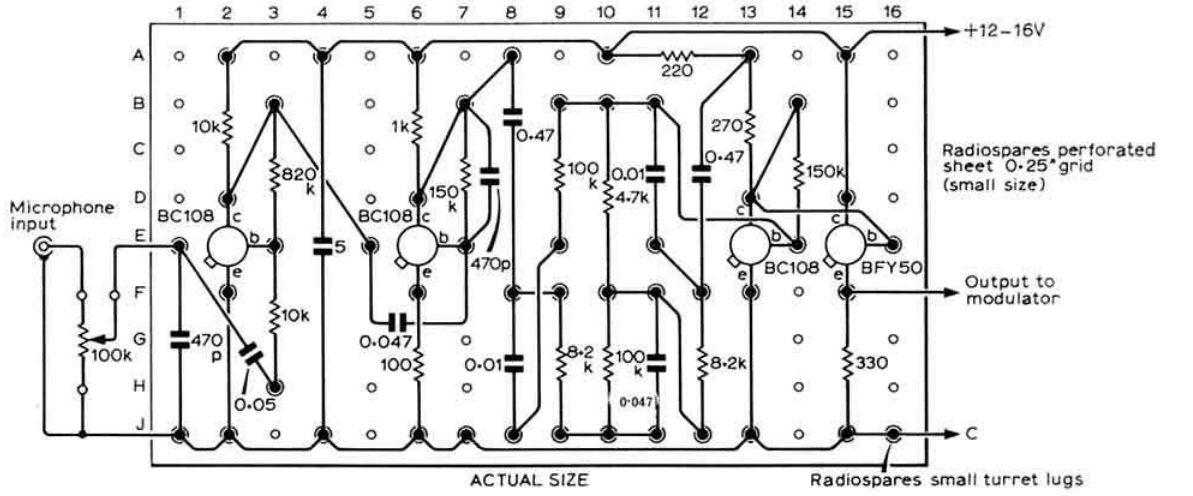
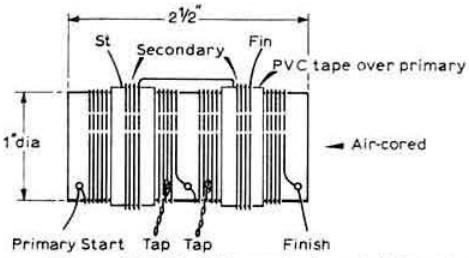


Fig 5. Layout of the modulator section



Primary — 66 turns (33+33) of 22 swg wire tapped at 2 turns in positions shown

Secondary — 8 turns (4+4) of 22 swg wire wound over primary

Fig 4. Constructional details of pa tank circuit, T4

rigidity. The layout of the main components is indicated in Fig 3. L1, T1, T2 and T3 were mounted in cut-down i.f. cans salvaged from an old television receiver. Winding details, together with those for T4, are set out in the coil table and in Fig 4 respectively.

All components requiring insulation from the chassis were mounted on R.S. Components lead-through insulated pins. The output transistors (TR5 and TR6) were mounted underneath the chassis at the points indicated and insulated therefrom by means of mica washers.

The modulator was constructed on a piece of R.S. Components perforated sheet, with a 0·25in grid with small turret tags from the same source fitted in the required positions to which the various components were secured. This board measured 4¼in by 2⅜in and was mounted separately from the transmitter unit. Fig 5 indicates the layout employed.

Coil Table

L1	60 turns of No 34 swg enam close wound.
T1 (primary)	40 turns of No 34 swg enam close wound and tapped at the tenth turn from the "cold" end.
T1 (secondary)	6 + 6 turns of No 34 swg enam bifilar wound over centre of primary winding
T2 (primary)	30 turns of No 34 swg enam close wound.
T2 (secondary)	8 turns of No 34 swg enam close wound over "cold" end of primary winding.
T3 (primary)	40 turns of No 34 swg enam close wound, tapped at tenth turn from the "cold" end.
T3 (secondary)	8 turns of No 34 swg enam centre tapped, wound over centre of primary winding.

All above coils are wound on standard 8mm diameter formers with iron dust cores and all in ¾in by ¾in aluminium screening cans. A single layer of pvc or Sellotape separates the primary from the secondary winding in the three transformers.

T4 (see Fig 4)	On former 1in diameter by 2½in long. Primary, in two sections each of 33 turns of No 22 swg enam with ¼in space between sections and each tapped 2 turns from the centre tap. Secondary, two sections each of 4 turns of No 22 swg enam wound over centre of each section of primary winding to make an 8-turn coil. A single layer of pvc or Sellotape separates primary and secondary windings.
CH1	30 turns of No 22 swg enam on length of ferrite aerial rod, mounted in aluminium can 1in diameter by 1¼in high.

Although it is sometimes found that transistorized transmitters are prone to cause tvi, there has been no difficulty in making the present design perfectly clean in this respect by attention to screening, the employment of a low-pass filter in the aerial feeder and the decoupling of all external leads.

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Electronic switching in amateur radio equipment

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

(Part 3)

RF switching

Low power rf switching can be carried out using diodes or transistors in similar ways to those described for low power audio. Again FETs tend to be very useful in this context and a gate described by Siliconix Ltd [3] is shown in Fig 23. The claimed performance includes an "on" loss of less than 6dB and an "off" attenuation greater than 65dB, the latter being mainly determined by the shielding between source and drain of the fet. The 2N5397 has a very low source-to-drain capacitance but other vhf FETS also perform well. Attenuation and loss are claimed to be "constant to around 200MHz".

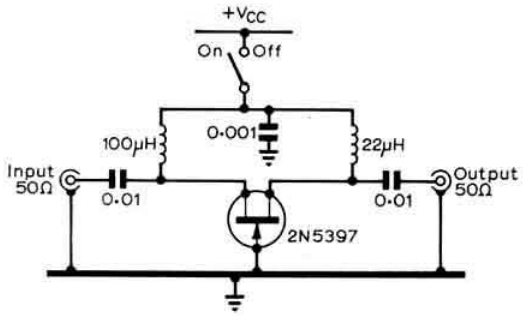


Fig 23. High performance single-fet rf gate circuit described by Siliconix Ltd

A gate used by the author in a noise silencer circuit [4] is shown in Fig 24. Because the circuit is balanced the drain-source capacitances of the two FETS tend to cancel and the off attenuation is increased over that of a similar circuit using only one fet. Also, switching transients are cancelled out without the need for any external compensation techniques. The transformers can be ordinary miniature i.f. types or untuned toroidal types.

The advantages of balanced circuits are also often exploited with diode gates as in the ring modulator shown in Fig 25. If no current is passed into A and B the circuit remains balanced and the attenuation is high. When B is made positive with respect to A, however, the two diodes D2 and D4 conduct, thereby connecting the transformers together, the extent of coupling depending on the control current. If A is positive with respect to B it is diodes D1 and D3 which conduct and coupling again occurs, but the output phase is reversed relative to the first case. This type of circuit can be used as an attenuator and switch over very wide frequency ranges, eg 0·1 to 500MHz in some commercial units. Semiconductor integrated circuit balanced mixers such as the Plessey SL640 can be used in a similar way.

There are a number of gating circuits using diodes which are suitable, especially for use in small-signal applications. One of these is shown in Fig 25B and was contributed by the RSGB's technical reviewer, to whom I am also indebted for the following performance information. The circuit performs particularly well if the inherently well-matched diodes incorporated in the CA3019 monolithic diode array are used, since the output pedestal is then small. For high frequency operation, performance is considerably improved if "hot-carrier" diodes such as the HP 5082-2550 are used.

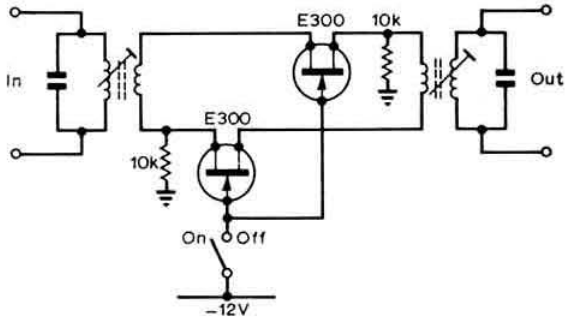


Fig 24. Balanced fet gate with high off-attenuation and high isolation between control input and the signal path

Both low and high power rf switching is involved together when one wishes to transfer an aerial from a receiver to a transmitter and vice versa. For powers up to 6W peak, a.m., several circuits have been used by the author at vhf. The first is shown in Fig 26 and was described in [5]. When transmitting, drive is applied to the Class C pa transistor TR1 which then passes its normal supply current. This same current is also made to pass through D1, thereby coupling the rf output to the aerial. At the same time no bias is applied to diodes D2 and D3 and, therefore, currents

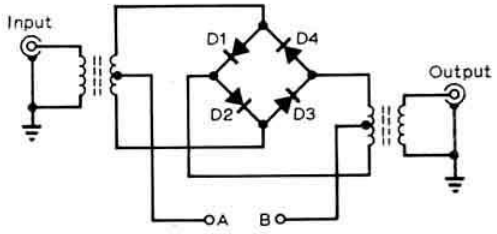


Fig 25. Ring-modulator circuit

* 11 Moor Park Avenue Leeds, LS6 4BT.

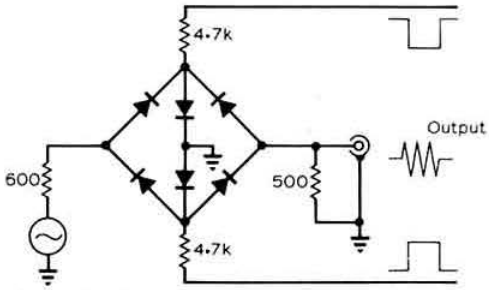


Fig 25B. Series-shunt diode gate using the CA3019 diode array made by RCA

of neither polarity can pass through these diodes because of their series opposition connection and therefore the receiver input is disconnected from the rf power source. When receiving, on the other hand, D1 has no bias current because in the absence of drive TR1 takes no current and, therefore, the transmitter is now isolated from the aerial. Diodes D2 and D3 are both biased on from the switched ht line for the receiver and the aerial is connected to the receiver input. It is necessary that D2 and D3 should be types with low rf series resistance such as BA143 switching diodes or BA141 varactor diodes. D1 can be an OA202.

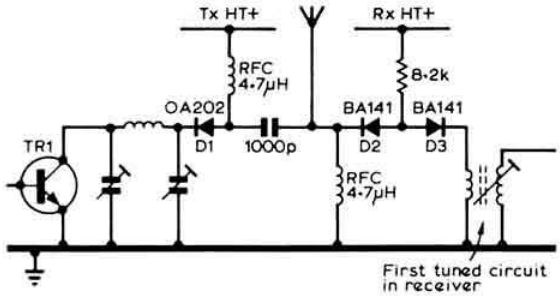


Fig 26. Aerial switch using back-to-back diodes in series with the path to the receiver and in which the full pa current is used to bias "on" the transmitter isolation diode

In principle it is better if diodes used in a switch which is in series with the aerial to a receiver are *non*-conducting in the receive mode, then any non-linearities will not affect adversely the cross-modulation properties of the receiver. This can be arranged as shown in Fig 27. In conjunction with C3 and C4, L2 forms a low-pass filter in the receive mode and D2 is reverse-biased and effectively a high Q capacitance. On transmit, however, D2 is biased on and the equivalent circuit is then as shown in Fig 28; L2 and C3 can be thought of as forming a parallel tuned circuit which is resonant at the operating frequency and, therefore, presents little loading to the transmitter. The voltage delivered to the receiver is divided down in the ratio of R to the impedance of L2, R being the dynamic impedance of D2.

In practice, D2 and its bias supply can be replaced by a pair of silicon planar diodes connected in parallel with anode to cathode (ie "crossed"). The author is currently using a pair of Fairchild FD101 types (similar to 1N914) in the circuit shown in Fig 29 in a 2m transceiver. The tank circuit is found to give very little loading effect and no isolating diode is required at the power levels concerned (6W p.e.p.). This type of circuit gives a bonus both in the low-pass filter input to the receiver and in the presence of the crossed diodes which also protect the receiver front-end against large inputs from any other source. Good matching of the low-pass filter to the receiver is needed, however, if mis-match losses are to be avoided, but this is not a big problem. The circuit constants shown were satisfactory in the author's 2m transceiver.

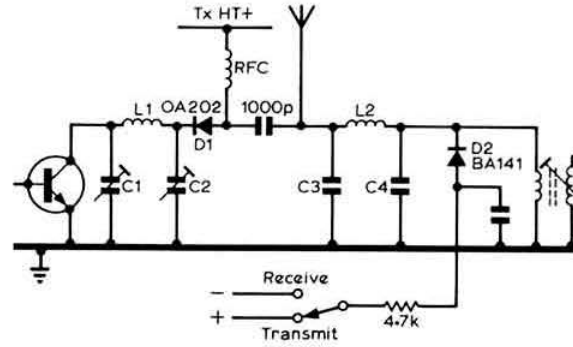


Fig 27. Modification of Fig 26 to avoid the use of conducting diodes when the aerial is connected to the receiver

Crossed diodes are also effective at quite high power levels. In pulsed magnetic resonance spectrometers, for example, it is customary to pass rf pulses of 500W and lasting for up to say 100ms through a crossed pair of 1N914s or similar diodes. The idea is that when the rf pulse is removed the transmitter is isolated from the load and any small noise output from the transmitter will be attenuated. The greater the power level passing through the crossed diodes the smaller the percentage loss and harmonic generation caused by the half-volt threshold of the diodes. Thus a t/r switch based on this technique would be as in Fig 30. Design data for suitable low-pass filters for this and the three previous circuits can be gleaned from the standard radio handbooks.

An even better type of t/r switch has been described by K. W. Angel of RCA [6] and differs mainly in that the crossed diode pairs are replaced by bistable "four-layer switching diodes" of unspecified type. The big advantage of this idea is that the t/r switch is self-activating and that once the diodes are in their low-resistance state, which happens during the first half-cycle of rf, there is negligible power lost in the diodes. Angel found that even miniature glass-encapsulated four-layer diodes could carry 80W at 150MHz continuously without degradation of characteristics, even though the paint on the package darkened with the generated

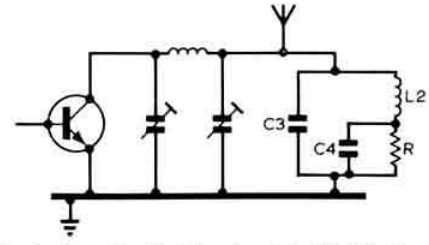


Fig 28. Equivalent circuit of the circuit in Fig 27 in the transmit mode

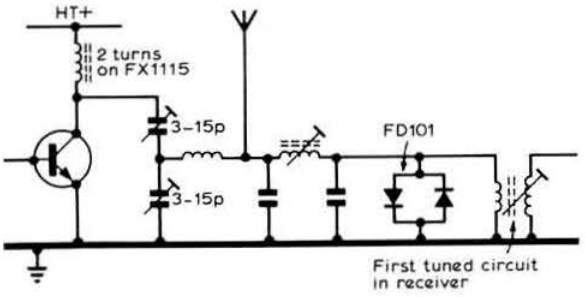


Fig 29. Circuit used by the author in a 1·5W 2m transceiver

heat. Larger stud-packaged diodes withstood 350W continuously. These diodes have breakdown threshold voltages in the tens of volts and something like 30W were needed to make the switch operate. It is stated in the paper, however, that the 2N3512 transistor was also found to perform very well as an avalanche device (the base being left open-circuit). Its use was abandoned in favour of the four-layer diodes because of the far lower breakdown voltage of the transistor, viz 5V. This meant that the prototype aerial switch suffered from the "fatal problem" that "a 100W transmitting antenna located two feet from a receiving antenna caused the antenna switch to breakdown and block the receiver". In typical amateur situations this would be no problem at all and this type of switch seems potentially very attractive, especially since such a low avalanche breakdown voltage means that far lower transmitter powers would be able to trigger the switch. Apparently "a properly heat-sinked 2N3512 could withstand 1·2A of 150MHz rf continuously at 60 C with no significant change in characteristics".

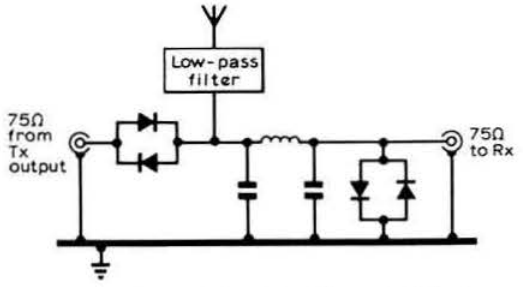


Fig 30. Aerial switch using only crossed diodes

Variations on the theme of Fig 27 are also described in a paper by J. M. Siemensma of Mullard [7]. The switching elements in this design are two BB105 varactor diodes and they are biased on with a current of 20mA when transmitting, whereas when receiving the diodes are reverse-biased by the ht voltage. The transmitter power quoted is about 12W a.m. In order to compensate for the capacitance of the diodes when they are reverse-biased (6pF) the one in series with the transmitter output, ie the one in the same position as D1 in Fig 27, is shunted by an inductor which is blocked to dc by a 100pF capacitor. The full circuit is reproduced in Fig 31. The power insertion loss in the transmit condition is 3·3 per cent and in the receive condition it is 3·5 per cent. The third diode in Fig 31 is used to give further protection against the small amount of signal which passes the first section of the low-pass network.

Conclusion

It is now practicable to eliminate mechanical relays in almost any form of transmitting and receiving equipment used by amateurs, not only at low powers but also at powers up to the legal limit. Whether or not this is desirable in any particular case depends mainly on economic factors and on the relative availability of components. It is the author's opinion, however, that it will not be long before relays appear rather antique except maybe for high power aerial circuits. He is also in no doubt that this opinion will be vigorously contested!

References

[1] *Electronic Engineering*, Vol 42, No 505, March 1970, p 48. By J. C. S. Richards.

[2] "Loudspeaker transmit/receive switch", by D. A. Tong, 1970, *Wireless World*, **76**, 476.

[3] Circuit given in "RF FET data packet", published by Siliconix Ltd, Saunders Way, Sketty, Swansea, South Wales SA2 8BA (1971).

[4] "A noise silencer for a.m. receivers", by D. A. Tong, to be published in *Wireless World*.

[5] "A hand-portable transceiver for 70MHz", by D. A. Tong, *Radio Communication*, April 1972, 202-208.

[6] "An rf activated antenna switch", by K. W. Angel, 1966, IEEE *Transactions on Vehicular Communications*, *C 15-U*, 77-80.

[7] "Electronic aerial switch for mobile transceivers", by J. M. Siemensma, 1968, *Mullard Technical Communications*, No 91, 30-31.

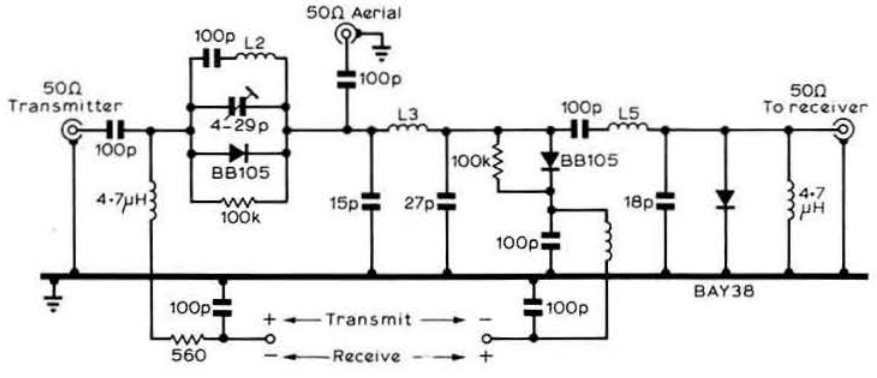


Fig 31. Aerial switch described in [7] and similar to the circuit of Fig 27 with the addition of an extra low-pass protection section to the receiver path and the use of separate bias for the transmitter isolation diode

A 30MHz i.f. amplifier for use in microwave receivers

by C. W. SUCKLING, G3WDG*

Introduction

Intermediate frequency amplifiers for microwave receivers currently in use fall into two classes; the first group have all stages tuned to the i.f. frequency (typically 30MHz), the second employ a double conversion technique. The i.f. amplifier described here falls into the latter class. It consists of a 30MHz front end, the output of which is mixed down to 10·7MHz. Most of the gain of the subsequent 10·7MHz amplifier is provided by a CA3013 integrated circuit, which also acts as a limiter and fm detector. The idea for the latter part was provided by the Henry's Radio "IC FM Tuner". Using commercial components, the bandwidth is only 250kHz; compared to the 1MHz "standard" this may seem somewhat narrow, but this does not seem to be a problem—in fact one gains approximately 6dB in signal to noise ratio.

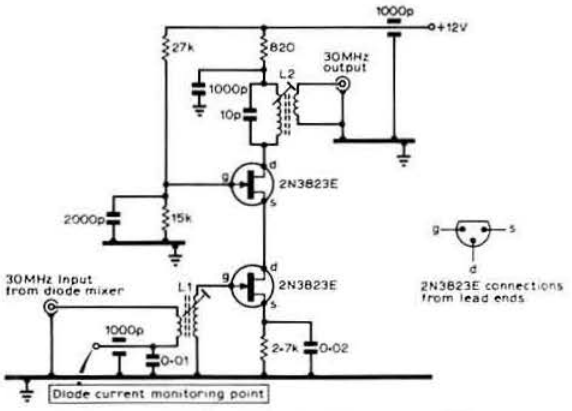


Fig 1. Circuit diagram of 30MHz preamplifier

Notes on Fig 1

(1) All decoupling capacitors are disc ceramics.
(2) The diode current monitoring point should be strapped to earth if this facility is not required, otherwise a suitable meter should be connected between it and earth.
(3) Coil details, L1 and L2:
20 turns of 28swg closewound with a 5-turn link winding over the earthy end; the former is a 0·3in Aladdin with ferrite core and screened by a 1⅛in by ⅜in by ⅜in aluminium can.
(4) The FETs and diecast boxes may be obtained from:
J. R. Hartley, 78b High Street, Bridgnorth, Shropshire.

* 31 Oakwood Road, Chandler's Ford, Hants, SO5 1LW.

The 30MHz preamplifier

This consists of a pair of 2N3823E FETs in cascode, providing approximately 20dB gain. The circuit details are shown in Fig 1, and the layout in Fig 2.

It is recommended that the layout is adhered to and that all leads are kept as short as possible, particularly the one joining the drain of the first transistor to the source of the second. The unit is built on a piece of double-sided copper laminate which forms the lid of a 3½in by 1⅝in by 1in Eddystone diecast box. A screen, 1 $\frac{15}{16}$in by ⅝in, also made from double-sided copper laminate is soldered across the centre of the lid, and a small hole drilled in its centre to allow passage of the lead joining the two FETs.

When making the coils, the link windings should be wound on the cold end of the main windings, and should not be wrapped around the wire going to the hot end of the coil. This also applies to L3 in the main amplifier.

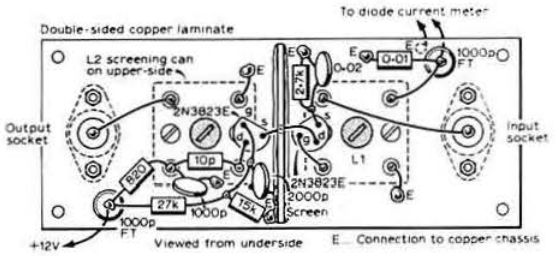


Fig 2. Layout of the preamplifier

The main i.f. amplifier

The circuit diagram is shown in Fig 3 and the layout in Fig 4. The 30MHz signal from the preamplifier is converted to 10·7MHz by the 2N3819 mixer, with a 19·3MHz local oscillator using a 2N706. The 10·7MHz difference signal is amplified by another 2N706 and then by the CA3013 ic. Built into the ic are diodes which, in conjunction with an external transformer, form a ratio detector for fm. Also included in the ic is an audio preamplifier.

Again it is recommended that the layout as shown is followed closely, and that unnecessary lead length should be avoided; the only necessary exception is the 2·2pF local oscillator coupling capacitor. The unit is built on a 7in by 1½in piece of double-sided copper laminate. The finished assembly is mounted at right angles to the lid of the 7½in by 4¾in by 2in Eddystone diecast box in which it is mounted. The +12V supply and audio output are brought out through 1,000pF feedthrough capacitors in the lid of the box.

No audio amplifier is described here, as it is felt that constructors will have their own preferences. By way of example, however, a broadcast receiver af section, a Plessey SL403 ic, and a PC5 have been used satisfactorily.

Alignment

The alignment may be satisfactorily carried out without a signal generator, although one is useful. It is assumed that the microwave system has already been constructed, and that shf local oscillator drive is available which, together with the crystal mixer, will form a noise generator for alignment

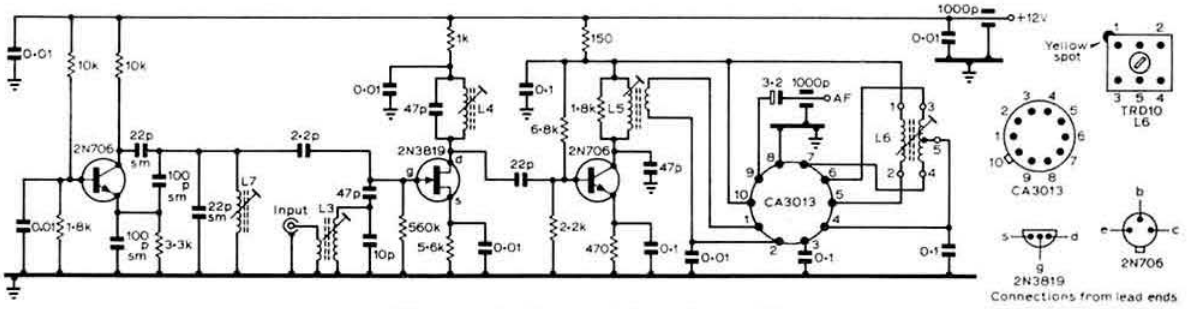


Fig 3. Circuit diagram of the main amplifier

Notes on Fig 3

1) All decoupling capacitors are disc ceramics; capacitors marked "sm" are silver mica.
(2) The anticlockwise numbering of the ic in the circuit diagram is for convenience—connections are shown above.
(3) Coil details:
L3 as L1 in preamplifier.
L4 28 turns 28swg on 0·3in former with core and screening can.
L5 "1st IFT orange spot, 10·7MHz".
L6 "TRD10 discriminator 10·7MHz ratio detector transformer". (L5 and L6 from Henry's Radio as part of the ic fm tuner kit they supply, obtainable separately).
L7 10 turns 28swg on 0·3in former with core.

purposes. A general coverage receiver is also required if no signal generator is available.

Some useful preliminaries should be carried out first. The cores of L6 are set level with the top and bottom of the former; as supplied they should already be close to these positions. Set the slug in L5 halfway in, and almost withdraw the slugs from L1, L2, L3 and L4. Connect the preamplifier to the input socket of the main amplifier with a few inches of coaxial cable, and connect a suitable audio amplifier to the audio output.

Apply +12V to the main i.f. amplifier only, leaving the supply disconnected from the preamplifier, when an increase in noise level should be heard. Using the general coverage receiver, set the core in L7 so that the local oscillator is running on 19·3MHz. Both cores of L6 may then be peaked for maximum noise. Then peak L5 and L4. L5 should be found to be fairly broad.

The shf crystal mixer is then connected by about 1ft of coaxial cable to the preamplifier input. Adjust the shf drive to give 5–10mA diode current; in this state the diode acts as a very efficient noise source. The +12V supply may then be reconnected to the preamplifier, and L3, L2 and L1 peaked up. The tuning points of these should be with the cores about halfway in, but L1 is quite broad. The shf drive is then removed, and the noise level should fall considerably. With drive reapplied so that about 1mA diode current flows, repeak all tuned circuits (except L7 of course). On no account should the cores of L1, L2, L3 or L4 be fully in—instability will almost certainly result. If this happens, realign, making sure that the above sequence is followed.

When the unit is correctly set up, it should be possible to hear an increase in noise level with only 10–20μA crystal current, particularly if a klystron is used as a local oscillator.

Results

Three receivers using this amplifier are in use by the Bristol University Microwave Group, with satisfactory results. On 3cm it has been possible to extract a R5 signal over a 30-mile optical path from a station running 10W erp (eg 10mW to a 1ft dish), using an open waveguide as the receiving aerial. The i.f. amplifier has also been used with wideband 3·4GHz and 21GHz receivers.

Acknowledgements

The author would like to thank G8CVS and G8ADP for building and testing the design, and G8DEK and G3BNL for providing signals to test the receivers in the early stages.

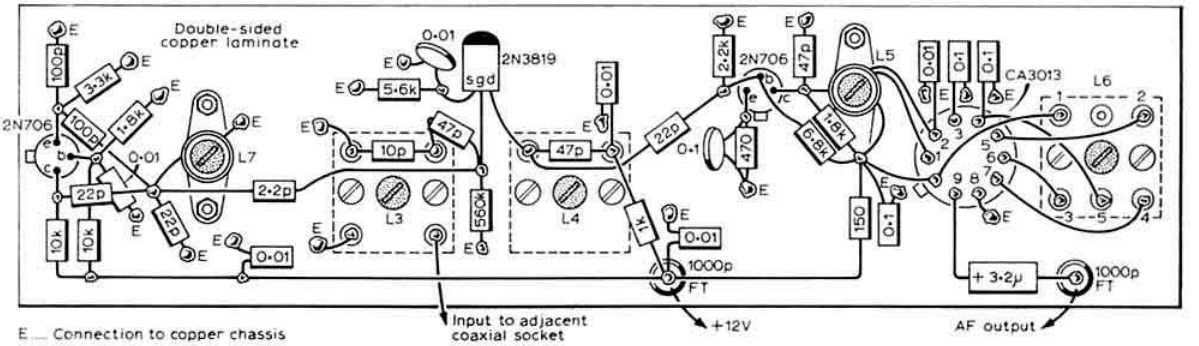


Fig 4. Layout of the main amplifier

A turnstile omnidirectional aerial for vhf

by J. B. HODGSON, G3YKB*

THE turnstile, also known as "crossed dipoles", provides a simple yet very effective horizontally polarized, omnidirectional aerial. It consists of two horizontal dipoles mounted at right angles which are fed with equal power but at 90° phase difference (Fig 1). Matching to 75Ω is quite simple and with a little adjustment a very low swr can be obtained.

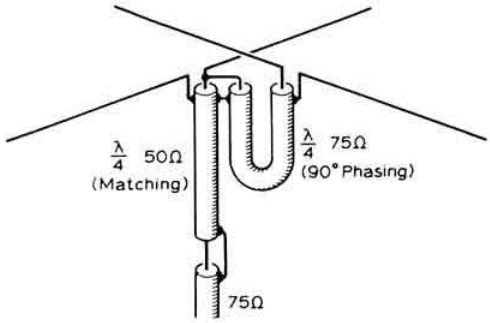


Fig 1. Phasing and matching arrangement

Polar response and matching

Theoretically, if the dipoles were point sources, the polar response would be perfectly omnidirectional (the turnstile has been likened to a horizontal dipole being rotated at the frequency of operation, ie 144 million rev/s at 2m). However, due to the finite size of the elements (approximately 1m at 144MHz), the response tends towards a "rounded square" (Fig 2) [1]. This is, nevertheless, a significant improvement over that of aerials, such as the halo, which exhibit definite nulls. A further feature of the turnstile is its vertical radiation pattern, ie mutually perpendicular to the elements, which is considered to be one of the best circularly-polarized radiations, but apart from extra-terrestrial communications this feature is unlikely to be of value to many amateurs.

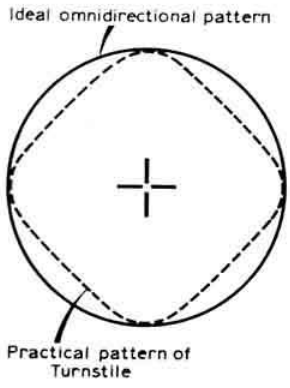


Fig 2. Polar response

The impedance of the basic turnstile is that of two dipoles in parallel, ie approximately 36Ω. Therefore, if the connection to the transmitter is short, a length of 50Ω feeder should be suitable with a mismatch no worse than 1·4 : 1. For longer feeders the solution is to use a quarter-wave transformer and 75Ω cable to the transmitter. The characteristic impedance of this quarter-wave section being derived from:

$$Z_t = \sqrt{Z_o Z_L} \qquad [2]$$

where Z_o is the feeder impedance (75Ω) and Z_L is the load impedance (36Ω).

Thus $Z_t = \sqrt{36 \times 75} = 52\Omega$

which is quite close enough for one of the standard 50Ω cables to be used.

Construction

None of the dimensions is particularly critical, excepting that if the diameter of the elements is changed, then the lengths need to be altered accordingly [2]. However, it would be prudent to cut the elements oversize and trim them later with the aid of an swr meter. The construction of the aerial is focused round the central insulator, which in the original version was a short length of 2in diameter nylon but could be

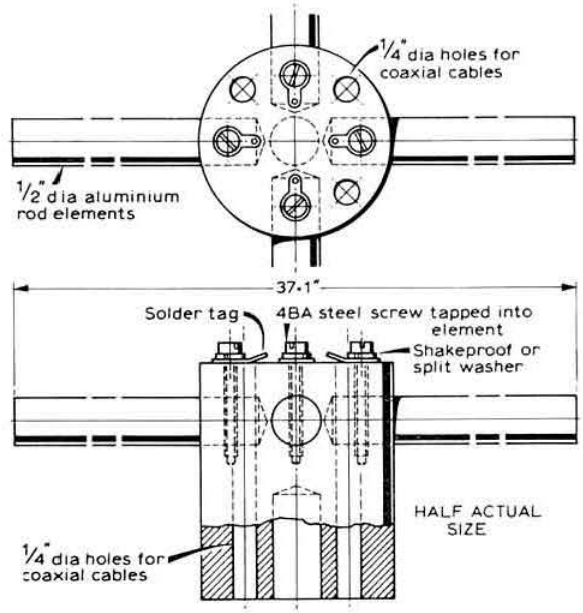


Fig 3. Details of central insulator

22 Hanger Lane, Ealing, London W5 3HH

any other suitable material such as Tufnol, ebonite, srbf etc. Details and dimensions are shown in Fig 3, the $\frac{1}{2}$in diameter hole at the base of the block being provided to give a push fit on to the vertical support.

When measuring the quarter-wave matching and phasing sections, the velocity factor of the cable must be taken into account. This is typically 0·66 for solid dielectric cables and 0·82 for cellular types, but if possible this figure should be verified. Thus, the lengths of the coaxial sections for 144MHz operation should be:

$$\frac{300}{145} \times \frac{1}{4} \times 0{\cdot}66 = 34{\cdot}5\text{cm}$$

and care should be taken to keep the stripped braid and separated inner wires as short as possible. Wiring of the cables is shown in Fig. 4.

Finally a liberal coating of Araldite is given to all exposed wires and terminations to prevent ingress of moisture.

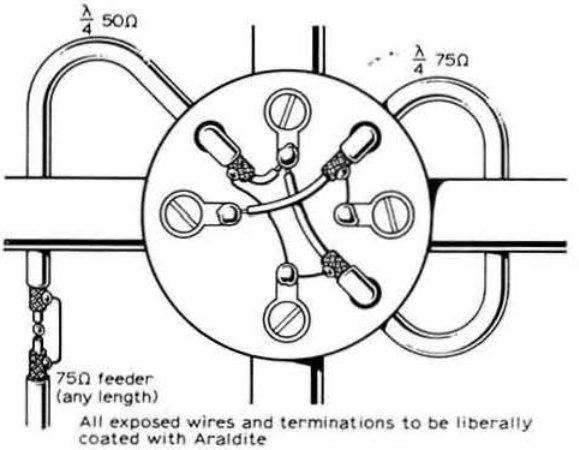


Fig 4. Connections of coaxial sections

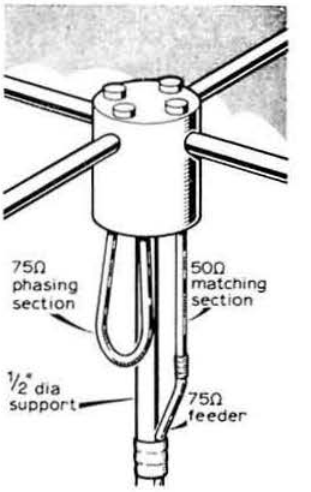


Fig 5. General appearance of turnstile

Conclusions

This type of aerial has been in use at G3YKB on 144MHz for over two years and although the radiation pattern does not quite follow the expected "square" there are no nulls. Furthermore, there seems to be very little vertically-polarized radiation and the standing wave ratio is remarkably low. It should prove interesting to observe how the vertical radiation pattern responds when the next Oscar satellite is launched.

References

[1] *Electronic and Radio Engineering*, Frederick E. Terman, McGraw Hill 1955, p. 909.

[2] *Radio Communication Handbook*, 3rd Ed, p. 398. 4th Ed, pp. 14.10, 14.11.

The Magnetic Devices Series 951 coaxial relay

The Series 951 coaxial relay from Magnetic Devices is designed for aerial switching at frequencies in the order of 450MHz. It is also suitable for applications where low inter-contact capacitance is required.

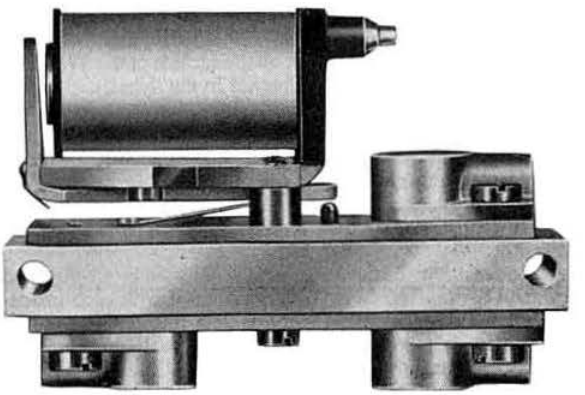
A small, fast-operating device with a single changeover stack enclosed in a brass housing, it is designed for use with UR43 coaxial cable.

The cable is readily solder-connected without disturbance to the relay and then firmly secured in position by brass clamps.

If a plug and socket connection should be required, a short length of cable should be attached to the relay. A free coaxial plug and socket can then be used in conjunction with this cable.

The characteristic impedance is 50Ω and the cross-talk figure −39dB. Relay coils with operating voltages up to 100V dc can be supplied.

A relay of this type, having a coil resistance of 170Ω suitable for operation with a 12V dc supply, costs £2.71 for quantities between 1 and 9.

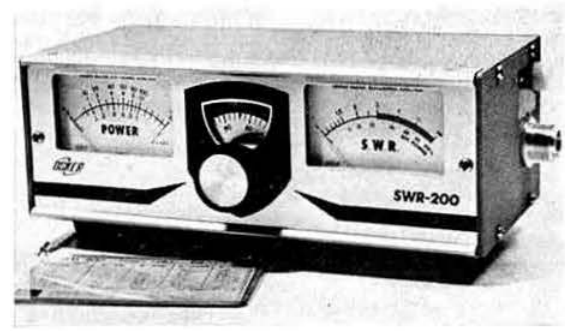


Further information can be obtained from the Sales Department, Magnetic Devices Ltd, Exning Road, Newmarket, Suffolk.

EQUIPMENT REVIEW

The Osker SWR200 bridge and power meter

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



THERE are many swr bridges available to the amateur but the SWR200 has three unusual features; it has two indicating meters, switched impedance change-over from 52 to 75Ω, and it is power calibrated. The two meters allow forward and reflected power to be monitored simultaneously, a useful feature which serves to instil confidence that all is well with both transmitter and aerial system. Impedance change-over is accomplished by pushing a button at each end of the instrument. Dimensions of the SWR200 are 76mm (3in) high, 110mm (4⅜in) deep, and 220mm (8⅝in) wide. The front panel is coloured silver and black, and the case has a fawn wrinkle finish. Rubber feet are fitted. The instrument under review was supplied by Western Electronics (UK) Ltd of Osborne Road, Totton, Southampton, and costs £18.50 (post paid).

A coaxial directional coupler is used to minimize reactive components, and a frequency range of 3–200MHz is claimed. The power meter scale is calibrated for 2, 20 and 200W fsd, but powers up to 2kW may be used, provided the specified safety ratings of mismatch are not exceeded. The swr meter also shows percentage reflected power.

The rf termination is stated to be uhf type (SO-239) and the two plugs provided fitted perfectly. They would not, however, tighten fully on other SO-239 sockets, and "normal" PL259 plugs would not tighten on the sockets of the SWR200. There appears to be pitch difference in the threads.

The tests

Since the reviewers' power source was an SB101, measurements were restricted to 100W maximum in the range 3·5 to 30MHz. A Marconi TF1020A 52Ω power meter was used as a reference and was connected directly by a type N to PL259 adaptor.

The sensitivity of the instrument is adjusted by a calibrated control with reference to a chart provided with each instrument, but it was thought that prospective buyers would be interested in minimum fsd readings. The table of results shows this together with comparison of power readings between the Marconi TF1020A and the SWR200.

The mid-scale area of the 0–200W range was chosen as the most useful point for the tests since the majority of transceivers in use produce this order of power.

Manufacturers' Specification

Power ranges:
0–200W, 0–2kW at 3·5 and 7MHz.
0–20W, 0–200W, 0–2kW at 14, 21 and 28MHz
0–2W, 0–20W, 0–200W at 50 and 144MHz.
Accuracy: ± 15 per cent at swr of 1.

Safety rating
2kW at swr 1·1 : 1
750W at swr 1·5 : 1
200W at swr 3·0 : 1

Full-scale minimum power
100W at 3·5MHz
50W at 7MHz
15W at 14MHz
5W at 21 and 28MHz
1W at 50 and 144MHz

Band MHz	SWR 200 Watts	TF1020A Watts	SWR	Min for fsd Watts
3·5	85	100	1 : 1	68
7·0	95	100	1 : 1	22
14·0	90	100	1 : 1	10
21·0	80	80	1 : 1	3
28·0	90	100	1 : 1	2

The accuracy at mid-scale and the minimum fsd figures are therefore met.

After each measurement the impedance was switched to 75Ω and one would have expected an swr of 1·5 : 1, but only on 14, 21 and 28MHz did it rise as high as 1·5 : 1. A further test was carried out on 28MHz to assess the calibration over the lower half of the power scales with the following results:

SWR200— (on 200W range) Watts	TF1020A Watts	SWR200— (on 200W range) Watts	TF1020A Watts
10	17	60	70
20	28	70	80
30	41	80	90
40	52	90	100
50	60		

It should be borne in mind that the TF1020A, although a professional instrument, is accurate only within ± 5 per cent. It is fairly new and is believed to be within specification.

VSWR tests

Unfortunately the reviewers do not have access to a set of calibrated resistors to enable accurate measurements to be made.

When used in anger on a system using a TH3 Jr aerial, the swr figures were close to those obtained with a professional instrument, although in common with many instruments of this type a different reading is obtained depending on the power level used.

Guarantee

No specific guarantee is provided with the instrument but the distributors state that malfunction due to faulty components will be remedied without charge within one year of purchase. Obviously this excludes damage due to incorrect use of the equipment.

Summary

If a professional instrument is required in order to monitor in-line rf powers there are several available, but the price paid would probably be greater than that of the amateur transceiver feeding it. The SWR200 is an in-line power and swr indicator for use by amateurs: the handbook says this.

Despite these comments, the accuracy is adequate for normal amateur use and the simultaneous monitoring is a very useful feature. This has to be remembered when comparing the price to that of other instruments available. The SWR200 was used for several weeks and during that time no oddies or peculiarities were noticed outside those mentioned in the review. The power level control was smooth and free from noise and jumpiness on all bands used. It is smart in appearance and matched well the very popular Japanese equipment currently available.

BOOK REVIEW

The Radio Amateur's Handbook (1972 edition). By the headquarters staff of the ARRL. 704 pages, copiously illustrated and with many tabulations. Obtainable from RSGB, 35 Doughty Street, London WC1N 2AE. Price £2.60 inclusive of postage and packing.

This forty-ninth edition contains the most extensive revision ever attempted; 13 chapters have been rewritten and the whole book has been reorganized. There are 47 more pages and no advertisement section. A new 28-page chapter on frequency modulation and repeaters is included, and many new drawings and charts are used throughout.

Notable in the power supply chapter is a new adjustable regulated transistor power supply, 3·5 to 21V at 1·5A, which possesses short-circuit protection.

Fuller treatment of ICs is found in the chapter on semiconductor devices, and a timely section on digital-logical integrated circuits. Many who are unfamiliar with the jargon of logic circuits, yet are alive to the tremendous importance of the subject, find the fundamental principles are most easily grasped with the help of some applications. The increasing significance of this subject in communications surely indicates an expanding treatment in future editions. The necessarily unmathematical analyses of semiconductor devices are commendable, and the bibliography at the end of the chapter will help; such bibliographies are given in many chapters and are a useful addition.

Transistor crystal oscillators get extended treatment, and a highly stable vfo for 3·5 to 4MHz, designed to have minimum harmonic and spurious outputs, will be noted. The generation of extremely stable frequency by phase-locked loops, of three different varieties, is covered, and one complete design is shown.

Noteworthy are a 10W single valve (dual) crystal controlled transmitter for 1·8 to 14MHz, and a six-band transmitter for the cw operator. The latter has full break-in, shaped keying, linear vfo calibration, tr switch, built-in power supply, and a solid-state heterodyne conversion scheme: input 240W. There are also several new high-power linear amplifiers, and a 15W solid-state one for 3·5 to 30MHz.

At vhf, a transverter giving 40W output on 50MHz from a low-powered 28MHz transceiver is shown, and a transverter working from any 14 to 28MHz, 20W peak, output and giving 20W p.e.p. on 144MHz.

On the receiving side there is a treatment of balanced and double balanced mixers; also a 3·5 to 30MHz preselector using two J-FETs in a cascode circuit, so neutralization is not needed. The gain is about 20dB. At 432MHz there is a low-noise converter with rf stage and mixer, designed for 28MHz output.

An interesting item is a mobile power supply for transceivers: from 12V it supplies 900V dc at 300mA, 250V dc at 200mA, negative 150V dc at 40mA, and an adjustable bias from 10 to 150V. Also of interest is a 146MHz fm receiver using a two-stage limiter and discriminator: a 0·2μV signal with 5kHz deviation is said to be plainly audible.

Amateur tv and slow-scan get coverage, as does space communications. New modulators, an L-transmatch, optimum-gain two-band aerial arrays, a tilt-over tower for home construction—only a fraction of the new material can be mentioned here.

The hopes of the editor and his ARRL associates that the complete revision will enhance the already high reputation of the handbook are thoroughly merited. It seems certain to do so.

T.P.A.

Catalogue review

Recently received from Burns Electronics are copies of their Equipment catalogue and the Short Form catalogue, the latter giving details of the extensive range of components and accessories which are now available.

Items available comprise a complete range of test equipment, together with converters for the 70, 144 and 432MHz bands. The latest developments in converters for 70 and 144MHz employ a protected mosfet rf stage with a Schottky barrier diode ring mixer and a highly selective oscillator chain. These units offer low noise, low spurious response and a high immunity to strong adjacent signals. An interesting unit is the Multiverter MC3 offering converters for 70, 144 and 432MHz, together with stabilized power supply, in one case.

The components available are not of the surplus variety but represent the latest types in the various fields now available to the home constructor.

Copies of the catalogues may be obtained by sending 10p to Burns Electronics, 35 Beulah Hill, London, SE19 3LR.

Take to the hills

Some thoughts and notes on going "portable" on the vhf and uhf bands

by I. J. KYLE, GI8AYZ*

THE quotes round portable in the title are deliberate, as most people use equipment which would be better described as "transportable", and the writer is no exception. No formulae for subminiature magic boxes will therefore be found in this article, merely advice on how to go mountain-topping for much enjoyment with minimum effort and expenditure.

Why go portable at all? For some unfortunates it is almost a necessity if contacts are to be made further than the end of the road. For others it is the urge to put some rare spot or county on the air. For many it is simply an extension of home-station activities coupled with that get-away-from-it-all mood that comes to most people at some time. The ready availability of surplus radiotelephones of various breeds has given the /P scene an enormous boost, as has the B licence with the restriction to 2m and down, but there must be many who think about going portable who shy off because of the problems, real or imaginary, of assembling a suitable station. It is for these poor souls, who have not yet experienced the delights of a sunlit hilltop with the contacts rolling in that this article is intended.

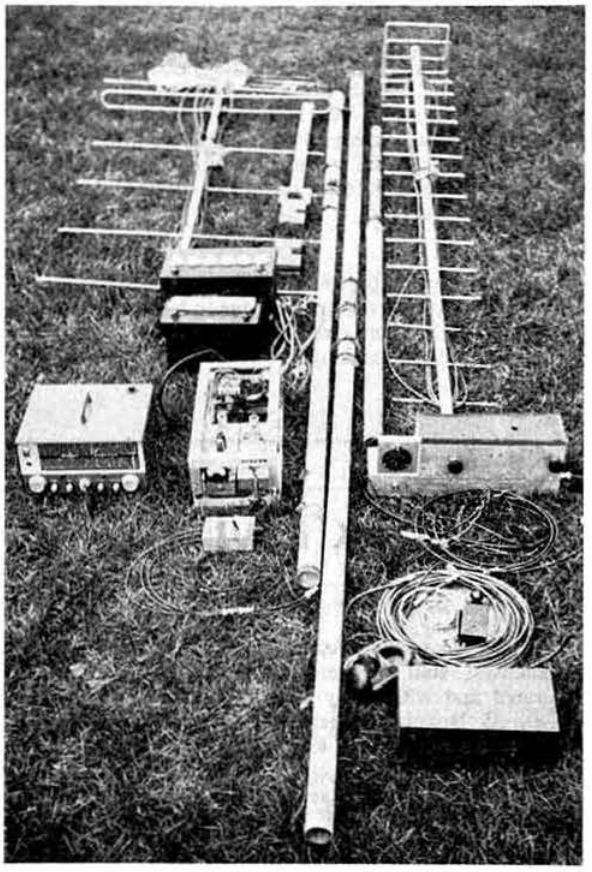
Basic requirements

As in most other things it is desirable to start small and work up until confidence and competence are established. Start by taking stock of what is available around the shack or readily obtainable with the resources at your disposal, and compare the resulting list with the basic requirements: these are (a) receiver, (b) transmitter, (c) power supply, (d) aerial and means of support, (e) transport and (f) site. To the true "portableer", (f) will be the crucial decision, with all the rest following from and being governed by it.

The next decision to be taken is: what form is the operation going to take. Will it be almost "permanent portable" because of the home QTH; altruistic expeditioning to help the paper-chasers; simply the ability to sling all the gear in the car and take to the hills for personal pleasure and the occasional contest, or is the competitive instinct strong and winning contests the aim? Each of these has its own peculiar fascination and specialised requirements, but the third choice is arguably the best way to start.

Selecting a site

Let us then assume that it has been decided to have a go without getting in too deep. Get out the maps (¼in and 1in OS are best) and pick a suitable selection of likely spots, and if contests are in mind it would be as well to add 10-mile maps to the collection. For scoring contest logs the OS 1:1,000,000 maps are ideal, provided your geography of the UK is sound enough to fill the gaps caused by the small scale. It is no good looking for Nether Wallop on such a map, you must know its approximate whereabouts and verify off a larger scale map or gazetteer.



Complete two-band station laid out for kit inspection before loading

Pick your spots carefully, remembering that sheer height is not the only factor in the equation, and make a reconnaisance of all get-at-able possibilities. Many sites that look good on the map may have disadvantages on the ground, such as tv masts, vhf relays and power lines. An open hill with a steep fall-away in the direction you want to work is what to aim for, and a sea-path near at hand is nice but a bit hard to come by in, say, Oxfordshire. After a while you will develop a feeling for potentially good sites.

Find out who owns the ground selected and call on the owner to get permission for use; quite apart from being common courtesy this may bring to light any local ordinances or restrictions. It may also result in an even better spot coming to light as local knowledge is tapped. A side effect of such calls can be freedom from interference by authority in any of its uniformed guises since the residents will know what you are doing.

Equipment

Once the likely sites have been prospected and the natives satisfied as to your bona fides, the next step is to get the equipment assembled, sorted out and stowed. The limiting factor tends to be the power supply and the concomitant

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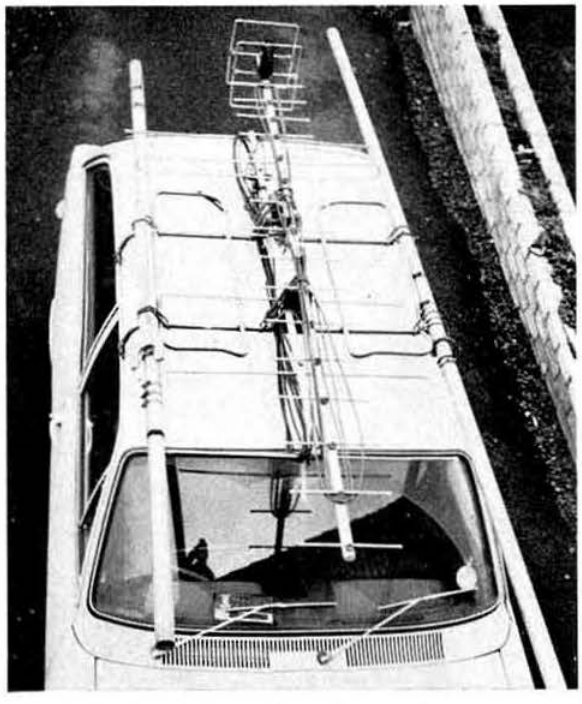
problem of transport. If a heavy programme of operations is envisaged then one must consider the cost of a portable generator, particularly if high power is to be employed. Against this course is the hard economic fact that the hp charges and depreciation on a p/e set for one year will pay for sufficient battery power on low power to last at least two years. Even if a p/e set is available, it is desirable to keep the equipment fairly compact in the interests of comfort in the car, and this automatically tends to restrict the power a little. Simplicity and reliability are of the essence, as anyone who has had to sort out a complicated transceiver in the front of a Mini will know.

Transmitter

The transmitter can be of conventional pattern running up to about 25W input if a.m. is used, up to 50W if nbfm or cw. Almost any of the surplus radiotelephones can be suitably adapted for 2 or 4m according to whether low or high band; note adapted, not modified. Few of them will stand increased input without losing out on talk power or intelligibility. A Pye Ranger or similar can readily be modified to provide both the drive and the modulation for a 70cm tripler, although there are better ways of getting there.

The author is a staunch advocate of homebrew, and uses the nominal 15W transmitter described on pages 7.19 to 7.21 of the *Radio Communication Handbook*. This, with its associated modulator and transistor inverter, is built into an alloy frame for protection and get-at-ability. For a long time this also doubled as main station transmitter; all that is necessary to convert it for mains operation is to remove the connector from the dc unit to the master socket and substitute the connector from the mains supply deck. The transmitter or the control box should contain the aerial relay and either an swr indicator or a simple rf sampling meter to facilitate tune-up. Transistors can be used with advantage, of course, and many very suitable designs have appeared in the pages of *Radio Communication*.



Aerials and poles in carrying position on the roof rack

Receiver

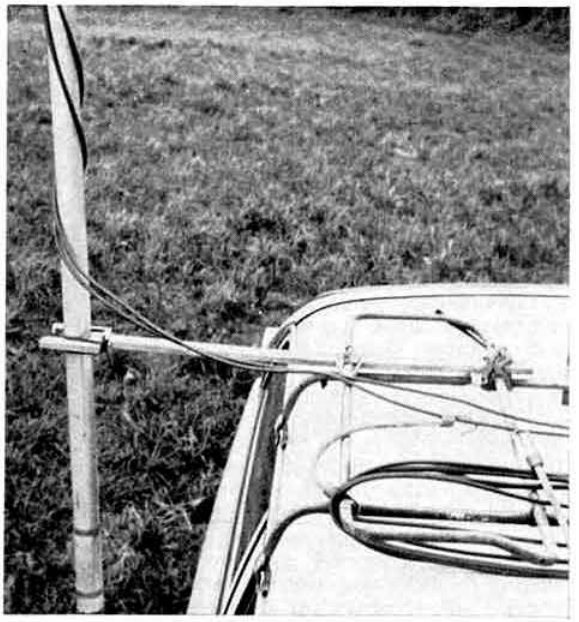
The receiver can be much more of a headache. While lots of good clean fun can be had with one of the aforementioned radiotelephones using both the transmitter and receiver, there can be no doubt that a separate tunable receiver is a vastly superior proposition. There are now several transistorized communication-type receivers on the market at reasonable prices, to say nothing of specialized one-range receivers and transceivers. They all have their own advantages and limitations, and the choice is very much a compromise between pocket, performance and space.

Stowage

The de-luxe way to get round the stowing problem is to design and build a complete station, including the tunable i.f., so that it fits into all the odd corners and pockets that, alas, seem to be disappearing from the modern car. The correct placing of the receiver is most important; it must be situated so that comfortable operation is possible over extended periods, particularly if contests are to be indulged in. Even if only occasional portability is intended, meticulous preparation is essential. Improperly locked cores and trimmers have an irritating habit of vibrating all over the place on the run out, with disastrous effects on the temper when nothing apparently goes up the feeder or gets down.

Aerials and masts

Portable aerials can come in all shapes and sizes and are usually easier to put up than take down without damage; weight and size should be kept as low as possible. High gain systems are by nature lengthy or unwieldy and not always the great advantage they seem. Some years ago the author devised a lightweight mast to hold up a Parabeam and this has been in use ever since. It is extremely light in weight, reasonably strong, and cheaply and easily replaced if it gets bent. It consists of a number of lengths of 2in diameter aluminium rain water piping, obtainable at most builders' suppliers in 6ft sections with cast couplers. Buy the number of lengths you need, and a few more for joints and spares, and persuade the supplier to knock off the couplers. Also purchase sufficient 2in worm-drive hose-clips to provide four for each section of mast. Cut the spare sections into 15in lengths and split each to make an expandable sleeve. This can be done with an ordinary panel saw as the material is soft. Force the end of each length that did *not* have the cast coupler on it halfway into a split sleeve and secure with two hose-clips, and place two more clips loosely on the unoccupied end of the sleeve. These sections will carry two vhf beams to 24ft easily and, if properly stayed, even higher. Stay plates can be fashioned from 14g alloy and threaded on to the appropriate section using a split wooden collar secured with the inevitable hose-clip as a bearing. The author has erected this mast single handed, with a 6-el for 2m and a Parabeam for 70cm to 30ft, and properly storm guyed it stays up through the worst the Antrim coast can offer. Shortened to 20ft it carries these two aerials without stays when notched into a crookstick fixed to the roof-rack with "bunji-clips".



"Pan-handle" steady for mast. Make sure the roof rack is well secured

The author has struggled with most types of MoD mast and will back the drainpipe special against any on a weight/cost/effectiveness basis. With one beam it can be erected, or dismantled and stowed, in about 8min; with two beams it takes about 14min. The feeders are cut for the maximum mast height and coiled round the Yagis to which they are permanently jointed and weatherproofed. The Yagis travel fully assembled, stacked in mounting blocks on the roof-rack. One thing that can make any system easier to erect is to replace the usual steel mast clamps with ones fabricated from high duty alloy. Even ½lb of weight saved at the end of 24ft makes lifting a lot easier. Save time and scarred knuckles by using wing nuts where possible and if you can get the hose-clips similarly kitted so much the better.

Power supply

Whether p/e set or wet battery, the power source will well repay painstaking maintenance. P/E sets should get the manufacturer's recommended maintenance and be exercised during prolonged lay-off periods, as should batteries. During the winter, exercise the batteries and give them a freshening charge every month. Discharge them into a load at a measured rate every so often, and then recharge at a known rate. All elementary stuff indeed, but all too often the most overlooked part of the game. And there is nothing more infuriating than to have a battery die just as the band opens, so keep a little in reserve.

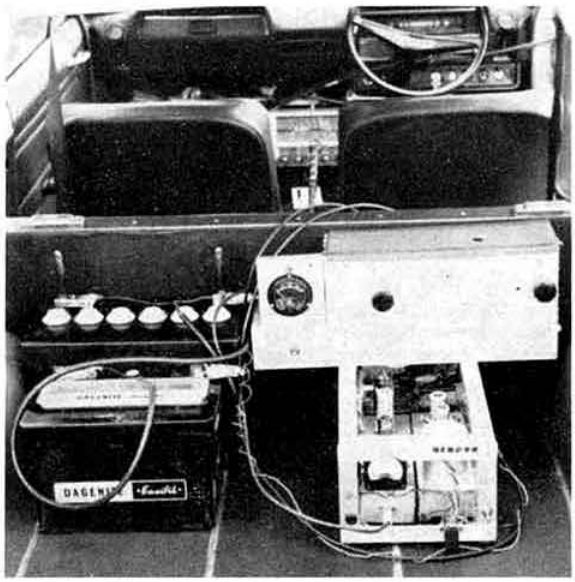
Going operational

Assuming that all the essentials have been got together, have a practice session with the mast in the garden. Now kick it all straight and do it again. And again, and again, until you can put it up, and even more important, take it down and stow it in the dark. During this exercise you will find out why wing nuts and bunji-clips are to be preferred over hex heads and string. Next soak-run the receiver and transmitter so that any new components are properly aged and unlikely to upset the trim. Load up and make sure that the equipment cannot finish up on the bonnet or round your neck if you have to slam on the brakes. If it is a nice evening go up the nearest hill and have a *quick* trial. Finnagles's Law should now take over and something will either blow up, burn out or go missing, so you can set about filling up with spares.

A small stoutly made wooden box, say 8in by 8in by 4in, with a lid makes a good spares box. Fit this with a block of softwood down one side drilled to accept fuses, bulbs and other small spares. Fill the rest of the box with expanded poly foam (ceiling tiles cut and stuck together will suffice) and slice holes in it to hold a complete set of valves, and your spare crystals if not mounted in the transmitter. Tools can go in a canvas or leather roll, and an inexhaustible supply of sticky tape is a must. An operator's lamp on a long lead will prove useful as the days shorten, and a 3 or 6W lamp will provide ample illumination where you need it. A clip-board, which will hold the log, scratch paper and the watch all easily seen, and simultaneously provide a firm writing surface, is also useful, and it can also hold a check list on which, before going out, particularly on a contest, everything is ticked off as it is loaded.

Whether you operate from car or tent, personal comfort is an important item. A car gets much colder than a tent in the small hours of the morning even if the engine is run up occasionally. Warm clothing is a necessity, not a luxury. Remember that while July and August afternoons can be

Mast and beams erected



Internal arrangement. 70cm transmitter (top) and 2m transmitter each with own battery. Two connectors unite to effect "QSY to 70cm". The receiver below the parcel shelf can be seen between the seats

blisteringly hot, the early mornings can be perishingly cold. The author works from the depths of a "hard-lying" sleeping bag in tough conditions and has successfully avoided frost-bite even during the March 1970 2m Open when there was a foot of snow around (and on) the car. Do not forget the inner man, particularly during contests. It is all too easy, in the heat of battle, to say, "I'll grab a bite soon" and realise four hours later that the internals are objecting to the clouds of tobacco smoke that have been their only diet since very early breakfast. Suitable choice of menu plus a small butane or spirit stove means that a substantial hot meal can be prepared and eaten in a remarkably short time. You will feel much better able to plunge back into the fray when your stomach is comfortably filled.

A last point or two. Whenever you go out portable, either seriously or simply for the fun of it, remember your manners. If you are up on the high spots you will probably be the strongest signal in the district. Observe the metre-wave man's code and *make sure the rig is "clean"*. Pushing a QQVO3-10 to 25W of 120 per cent modulated signal is a sure way to attract attention—of the wrong sort. Do not forget to announce your whereabouts and tuning intentions, and above all never lose your sense of humour or your temper. "If you can do all this, my son, and still. . . . .you're a better man than I am".

Have fun up the mountains and give me a call while you are there.

Coaxial compatibility

by ELLARD W. FOSTER, W5KE*

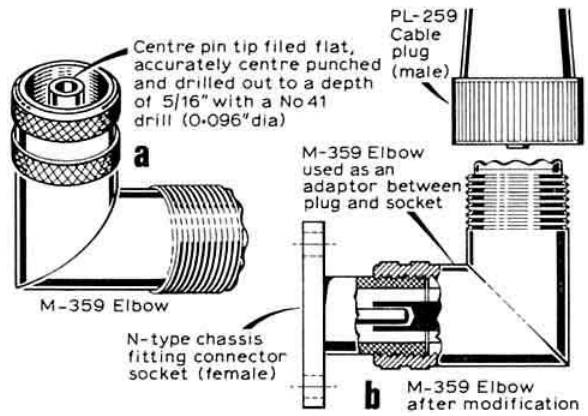
MOST amateur radio equipment has coaxial fittings to mate the old reliable uhf type plugs like the PL259. The PL259s do very well, until it is desired to hook up a piece of commercial or military surplus equipment using N-type fittings. The outer jacket of the PL259 will fit the threads on an N chassis connector, but the centre conductor parts are woefully mismatched.

A convenient adapter can readily be made from an M359 uhf elbow. The solid male centre pin is first filed flat and centre punched, and then drilled to a depth of $\frac{5}{16}$in using a size 41 drill, see Fig 1(a). The hollowed centre pin on the modified M359 will slip over the centre conductor of the N chassis connector without damaging it, see Fig 1(b). It will still fit the centre conductor of an uhf chassis connector in the usual way, so it can be left on the PL259 as part of the cable fitting.

The same idea may also work directly on PL259 plugs, but there is a possibility of breaking the connection to the centre conductor of the cable.

The following further suggestions are offered for the benefit of the amateur who may have a nice piece of coaxial cable fitted with an N male connector, but no equipment to match it.

First, it has been discovered that the N male will make a slip fit with a BNC chassis, T, or elbow fitting. There are no



mating threads for the outer knurled ring, but that is not necessary for an electrical connection of both inner and outer conductors. If it is a uhf female to which one wants to connect the N equipped cable, one of the generally available UG273/U BNC to UHF adapters can be used (without modification) as a splicing device.

To increase flexibility and include the BNC male to N female, just drill the centre pin of the UG273/U with a 41 drill to a depth of $\frac{5}{16}$in as recommended for the UG359/U elbow, taking care to hold this centre pin while drilling because it usually turns within the insulation.

So, with a modified UG359/U and a modified UG273/U one can have compatibility between three types of coaxial cable fittings, except between the N male and the BNC female. But, what about the HN fittings, BNCs, and the miniatures? There is still plenty to think about at W5KE.

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How many hertz in frequency?

by DAVID RANKIN, VK3QV*

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HOW many hertz in frequency? Orthographically speaking of course there are none but read on to learn how many there can be in some electronic circumstances.

The beginning

Recently a friend of mine purchased some crystals for his new solid-state fm carphone. But when he started out on the installation his troubles began—he could not get the crystals to come up on frequency. The receiving side was not too bad, but the transmitted signals were quite a few kilohertz off channel and no amount of fiddling with the trimmers would bring the crystals within cooee of the wanted frequencies.

What had gone wrong and why?

There are a number of reasons why a crystal does not oscillate precisely on its marked frequency and most of these were covered recently by another article [1]. However, from the friend's experience cited above, one more reason comes to light. This involves the way of specifying the crystal frequency, and a few words on this subject may save others from expensive mistakes and omissions.

The problem

Many of the popular carphones in the 146MHz fm band use transmitter crystals around 4MHz, so let us concentrate on this frequency initially and expand our discussion to other frequencies later. A 4MHz crystal unit for the transmitter implies a multiplication factor of 36 times.

Thus: 146,000kHz ÷ 36 = 4055·555kHz (the five is recurring).

We could thus say we need a crystal on 4,055kHz, or on 4,055·5 or on 4,055·6 or 4,055·55kHz, etc. Just how should we specify the frequency or "How many hertz in frequency?" If we say the frequency is to be 4,055kHz, then we are actually 555·55Hz off the calculated frequency, and that multiplied 36 times puts us just about 20kHz away from 146MHz—too far away to be of any use to anyone.

On the other hand, if we say the frequency of the crystal should be 4055·55555kHz then we would be too academic because who among the amateur ranks (and the professionals for that matter) can precisely measure carphone frequencies to 0·01 of a hertz? What purpose would such accuracy serve? No doubt the crystal manufacturer would smile at such a request and ignore the last few digits in your frequency specification anyway. Obviously then, there is some middle course, but what is this happy medium and how do we determine it?

Referring again to [1], we saw how the frequency adjustment tolerance affected the final outcome, and before we can answer the question about the happy medium we must look at this tolerance because it plays an important part in the number of figures we should quote in a frequency.

Adjustment tolerance

Let us consider two points in reference to this tolerance.

(*a*) In scientific circles, a concept of "order of magnitude" is used. Simply, if a measurable event is said to be affected by a condition of "one order of magnitude" less than the event, then, initially at least, the effect of the condition is regarded as being negligible and may be disregarded. On the other hand, if the condition is of an "order of magnitude" greater than the event, then the effect of the condition is significant and it cannot be disregarded. For most practical cases, the "order of magnitude" is considered as being a factor of 10 times and we will use this concept here. We will, in effect, consider a variation of 1/10th in our tolerance figures to be of negligible importance with respect to the nominal frequency.

(*b*) What is the tolerance in terms of hertz for varying percentage tolerances typically offered by crystal manufacturers? At 4MHz the following would apply:

a tolerance of ±0·01 per cent is ±400Hz
and ±0·005 per cent is ±200Hz
and ±0·003 per cent is ±120Hz
and ±0·0015 per cent is ±60Hz
and ±0·001 per cent is ±40Hz

Let us now apply our "order of magnitude" concept to these tolerance figures.

±400Hz → ±40Hz
±200Hz → ±20Hz
±120Hz → ±12Hz
±60Hz → ±6Hz
±40Hz → ±4Hz

} may be considered as a negligible variation

Thus, if we have an allowable tolerance of ±400Hz, and if we quote our actual frequency to within ±40Hz, then we can say that we are specifying this frequency to a sufficient degree of accuracy consistent with the adjustment tolerance desired. Obviously, if we want a tighter tolerance we must be more precise about our frequency specification and this follows from our example, viz: for an allowable tolerance of ±40Hz we should quote our frequency to the nearest ±4Hz.

Frequency specification

The recommended method of specifying the digits of 4MHz crystals now becomes:

For a ±0·01 per cent tolerance—quote the frequency to within ±40Hz of nominal frequency.

For a ±0·005 per cent tolerance—quote the frequency to within ±20Hz of nominal frequency.

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Table 1. Recommended method of frequency specification in range 2 to 60MHz and for tolerances of ±0·005, ±0·003 and ±0·001 per cent

Frequency kHz	Adjustment tolerance (as stated) in terms of hertz with recommended method of frequency quotation		
	For ±0·005 per cent (±50 ppm)	For ±0·003 per cent (±30 ppm)	For ±0·001 per cent (±10 ppm)
2,000	±100Hz → Quote to nearest 10Hz	±60Hz → Quote to nearest Hz	±20Hz → Quote to nearest Hz
4,000	±200Hz → " " " 10Hz	±120Hz → " " " 10Hz	±40Hz → " " " Hz
8,000	±400Hz → " " " 10Hz	±240Hz → " " " 10Hz	±80Hz → " " " Hz
10,000	±500Hz → " " " 10Hz	±300Hz → " " " 10Hz	±100Hz → " " " 10Hz
20,000	±1kHz → " " " 100Hz	±600Hz → " " " 10Hz	±200Hz → " " " 10Hz
30,000	±1·5kHz → " " " 100Hz	±900Hz → " " " 10Hz	±30Hz → " " " 10Hz
40,000	±2kHz → " " " 100Hz	±1·2kHz → " " " 100Hz	±40Hz → " " " 10Hz
50,000	±2·5kHz → " " " 100Hz	±1·5kHz → " " " 100Hz	±50Hz → " " " 10Hz
60,000	±3kHz → " " " 100Hz	±1·8kHz → " " " 100Hz	±60Hz → " " " 10Hz

For a ±0·003 per cent tolerance—quote the frequency to within ±12Hz of nominal frequency.

For a ±0·0015 per cent tolerance—quote the frequency to within ±6Hz of nominal frequency.

For a ±0·001 per cent tolerance—quote the frequency to within ±4Hz of nominal frequency.

However, we can take this idea a little further, and in doing so make its practical application a little simpler. It is not particularly convenient to quote a frequency within ±40Hz, but because of our decimal system of arithmetic, quotation to the nearest ±10Hz is quite simple—just leave the digits following the 10Hz digit out. Although we should observe the normal arithmetical laws concerning "rounding off": eg rounding off ... 65·432 to two decimal places becomes ... 65·43, while ... 34·567 becomes 34·57 to two decimal places.

Thus, the recommendation above simplifies to:

For ±0·01 per cent types specify within ±10Hz
For ±0·005 per cent " " " ±10Hz
For ±0·003 per cent " " " ±10Hz
For ±0·0015 per cent " " " ±1Hz
For ±0·001 per cent " " " ±1Hz

In other words, we should specify our 4MHz crystal as: 4055·56kHz if we require it to be manufactured within ±0·01 per cent, ±0·005 per cent or ±0·003 per cent; and as 4055·556kHz if we desire ±0·0015 per cent or ±0·001 per cent adjustment tolerance.

Two observations:

(*a*) In the case of recurring decimals, round off to the nearest figure for the last digit quoted.

(*b*) The compromise suggested is on the conservative side and will mean that the frequencies specified will be a little more precise than need be.

It becomes a relatively simple matter to extend the idea to other frequencies and Table 1 shows the results for adjustment tolerances of ±0·005 per cent, ±0·003 per cent and ±0·001 per cent and for frequencies between 2 and 60MHz. Readers should do their own calculations for tolerances and frequencies not covered.

Table 2 summarizes the actual frequencies used in the most popular carphone configuration for the three simplex fm channels currently used in Australia. An adjustment tolerance of ±0·003 per cent has been used as this is considered a suitable compromise between convenience and cost. A tighter tolerance crystal may cost more money, but it should be easier to net to frequency because the actual manufacturing tolerance is less and the crystal will be manufactured closer to nominal frequency within the terms of the actual specification.

Table 2. Recommended method for quotation of crystal frequencies for Australian fm channels based on a crystal adjustment tolerance of ±0·003 per cent

TRANSMITTER CRYSTALS

Formula (f_c = carrier frequency)	145·854MHz simplex	146·000MHz simplex	146·146MHz simplex
$\frac{f_c}{36}$	4,051·50kHz	4,055·56kHz	4,059·61kHz
$\frac{f_c}{24}$	6,077·25kHz	6,083·33kHz	6,089·42kHz
$\frac{f_c}{12}$	12,154·50kHz	12,166·67kHz	12,178·84kHz

RECEIVER CRYSTALS

Formula (f_c = carrier frequency)	145·854MHz simplex	146·000MHz simplex	146·146MHz simplex
$\frac{f_c - 2{\cdot}0^*}{14}$	10,275·29kHz	10,285·71kHz	10·296·14kHz
$\frac{f_c - 10{\cdot}7}{3}$	45,051·3kHz	45,100·0kHz	45,148·7kHz
$\frac{f_c + 10{\cdot}7}{3}$	52,184·7kHz	52,233·3kHz	52,282·0kHz

*Simplified version of actual formula used by manufacturer.
N.B.—Only some of the more popular formulae are included in this table. Interested readers should be able to calculate frequencies correctly for other cases.

Conclusion

We have set up a technique for specifying, with the appropriate number of digits, the frequency of a quartz crystal. Although our discussion centred around transmitter crystals, the technique is equally applicable to receiver crystals and in addition can be used for specifying crystals for any purpose—not just fm equipment. The decisions to be made concern the actual frequency required plus the permissible adjustment tolerance—the numbers of digits in the frequency specification will then follow from the idea presented here.

By the way, the friend mentioned in "The beginning" got into trouble because he had only specified his crystal frequencies to the nearest kilohertz—and in this case, "near enough" was not "good enough".

Finally, the author makes no claim to fame as an orthographer.

Bibliography

[1] D. Rankin, VK3QV, "Crystals for Carphones—and other things," p209 *Radio Communication* April 1972.

MICROWAVES—1,000MHz and up

by DAIN EVANS, G3RPE*

The performance of microwave equipment over optical paths

THE performance of a communication system can be calculated if the transmitter and receiver characteristics are specified and the attenuation of signals over the path to be covered is known. Unfortunately, in the case of non-optical paths containing obstructions it is usually too difficult to calculate the path loss with sufficient precision. However, for optical paths the use of free space attenuation provides an acceptable measure of path loss, and estimates of the potential can be made which are valuable both in designing systems and also in providing a reference against which subsequent performance can be judged.

For those who like to design their equipment on the back of an old envelope, it is more convenient to consider the performance of a standard system and the way in which changes affect it rather than to calculate each case from the basic formulae. The standard system adopted consists of a 1mW transmitter feeding a dish 1ft in diameter, and a receiver having a noise factor of 10dB, a bandwidth of 1MHz, fed also from a 1ft dish. Performance is given in terms of the length of the optical path corresponding to a signal/noise ratio in a receiver of 10dB: this value is a reasonable minimum for both a.m. and fm signals.

The path lengths calculated on this basis for each of the microwave bands is given in the table. A perhaps surprising feature is the larger values at higher frequencies. This is a reflection of the increased gain of the aerials, which together vary as the fourth power of frequency, compared with the path loss which varies inversely as the square of frequency. (Roughly speaking, the power we can conveniently generate also varies inversely as the square of frequency, which leads to the well-known amateur rule that radiated power is independent of frequency!) For practical systems, the changes affect the signal/noise ratio observed in the following ways:

1. Transmitter power: add 10logP decibels where P is the actual power in mW.

2. Transmitter aerial: add 20logd decibels where d is diameter in feet. Alternatively, if an aerial of specified gain is to be considered, then the difference between its gain and that given in the table should be added or subtracted as appropriate.

3. Path length: subtract $20\log\frac{l}{l_s}$dB where l is the actual path length and l_s is that given in the table.

4. Receiver aerial: as transmitter aerial.

5. Receiver noise factor: add the difference (10dB—actual noise factor).

6. Receiver bandwidth: add $10\log_B^1$dB where B is the bandwidth in megahertz. Where they are of significance, other losses such as in cables should be subtracted.

The application of these relationships can best be shown by an example. For this we will consider the potential of 3cm equipment typical of that in current use.

	Standard system	Actual system	Difference
Transmitter power	1mW	50mW	+17dB
Transmitter aerial	1ft	2ft	+ 6dB
Path length	33 miles	33 miles	0dB
Receiver aerial	1ft	2ft	+ 6dB
Receiver noise factor	10dB	12dB	— 2dB
Signal/noise ratio	10dB		+27dB

The overall s/n ratio is therefore 37dB

Several points can be made concerning this extra 27dB gain: (*a*) It could of course be used to increase the path length by putting the value 27dB into (3), the path length corresponding to a 10dB s/n ratio is shown to be 740 miles. Alternatively, we could ask what s/n ratio is to be expected over a 100-mile path. (This would break the existing UK record as well as win a Microwave Award). The extra attenuation involved in trebling the path length is 20log3 ie 10dB, which still leaves 17dB in hand. It is worth noting that the longest optical path in the UK cannot be greater than 180 miles under normal conditions: it becomes clear from these calculations that the equipment used in the example is more than adequate.

(*b*) Even over a path of moderate length, 33 miles, there is sufficient reserve to overcome quite large deficiencies in equipment. Even a poor receiver having a 20dB noise factor, which uses a 5MHz wide tv i.f. strip, and which is fed from an aerial 10dB down in gain would still copy signals.

(*c*) If the equipment is working as specified, it should be possible to attenuate the input to the receiver (or the output from the transmitter) by about 27dB before signals become difficult to copy. The difference between this value and that actually measured is a useful guide to its efficiency. The reliability of the comparison of course depends on the precision with which all the relevant factors can be measured or estimated. A calibrated attenuator is of obvious value in making precise measurements. Even without one, useful checks can be made by removing aerials or substituting others of different gain. Thus, continuing with the same example, the gain of a 2ft dish is about 33dB while that of the open end of a waveguide is about 6dB, a difference of 27dB. If on removing one aerial signals can still be heard over a 33-mile path, then the equipment is working well.

(*d*) It is worth noting that however well or badly the equipment is working, measurement of by how much the receiver input can be attenuated will provide a good guide to its maximum range: in round figures, for every 6dB in hand the path length can be doubled.

TABLE

Frequency MHz	Aerial gain dB	Optical path length miles
1,296	8·7	4·3
2,304	13·7	7·6
3,437	17·2	11·3
5,750	21·7	19
10,000	26·5	33
21,000	32·9	70

The potential range for a 10dB s/n ratio of a standard system using a 1mW transmitter, and a receiver of noise factor 10dB, bandwidth 1MHz, with aerials 1ft diameter.

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

SWL NEWS

by BOB TREACHER, BRS32525*

Top Band dx

It is not too difficult to listen to the dx on the hf bands, particularly with a good receiver, but have you ever listened for it on Top Band? This raises the question of what is dx, and although the term G-DX is used, the serious Top Band listener will be looking much further afield.

Several European countries, notably HB9, PA0, DL, OE, OH and OK allow amateur transmissions on the band though some restrict them to a narrow segment around 1,835kHz and OK operation is cw only. ZB2 and ZC4 have been activated only rarely, while operation from 9H1 has not been permitted since 1970. It is customary for European stations to transmit around 1,827kHz and listen at the bottom of the band, so to hear both sides of a QSO you will need two receivers or a flexible wrist.

The real dx, however, is found mostly between 1,800 and 1,810kHz at night when conditions are suitable. Although some dx is audible during the evening, after midnight and before 0600 is probably the best period, which calls for late nights or early mornings (or an all night vigil). As one would expect, W1s are probably the most common (W1BB, W1HGT and K1PBW being particularly well known) but VO and VE are frequently heard. Signals often peak towards sunrise here, when the midwest W stations are sometimes audible. On occasions phone operation is possible but intercontinental working is more usually by cw and as the speeds are not fast and the callsigns are sent frequently it is not difficult to identify stations even with little or no practice at reading morse.

More dx will be audible in the winter simply because there is more darkness, but in recent years some very fine working from UK into Africa and the East has taken place even in the early autumn. When conditions are very good almost any aerial will bring in the dx but to hear the weaker stations an atu is a great help and the aerial should be high up, say, more than 30ft if possible. Opinions differ about the best plane for the aerial though it is generally accepted that a vertical will be more responsive to dx than local signals.

Jim Batchelor, BRS30484, 28 Asket Walk, Seacroft, Leeds LS14 1JE. His main interest is in rtty but Jim has a fine array of receivers and test gear also. In the foreground can be seen part of his rtty set-up. Latest rtty QSLs received include SM and OE

News and views

It may be of assistance to many SWLs keen on QSLing direct to stations heard that Commonwealth RCs are no longer accepted in AP, VE, VK, 4S7 or 9Y4, and IRCs should therefore be sent. IRCs are not accepted in the country in which they were first issued; for example, if one is issued in the USA it will not be accepted by the USA mail authorities in return for USA postage stamps.

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1972 Countries Table

	10	15	20	40	80	160	Total
BRS17567	103	163	175	33	77	3	554
A4483	106	124	133	57	56	4	480
BRS25901	59	117	153	54	67	3	453
A7139	92	101	102	63	52	13	423
A7460	74	101	101	53	50	9	388
A7531	99	111	105	26	38	1	380
BRS33211	56	73	123	46	61	4	363
A6220	47	86	116	49	49	7	353
BRS33364	49	110	96	33	36	2	326
BRS32524	14	79	114	38	54	3	302
BRS33370	59	74	105	14	38	4	294
A7780	71	80	79	16	40	5	291
A6686	46	93	95	17	20	4	275
A7159	36	50	70	22	45	2	225
A7785	0	0	123	33	57	5	218
BRS33243	46	38	36	22	64	0	206
BRS32359	0	22	81	35	35	2	175
A7681	1	34	52	27	44	13	171
A8037	24	47	43	16	19	1	150
BRS33231	8	27	57	13	27	2	134
A7757	27	18	51	11	24	2	133
BRS33210	11	30	33	14	33	8	129
BRS32635	0	38	43	12	23	3	119
A7920	0	0	61	19	35	4	119
A8054	0	0	99	19	0	0	118
A7732	11	21	31	11	30	0	104
BRS32759	0	40	51	7	0	0	98
A7321	4	37	23	9	17	7	97
A7790	7	26	28	13	12	2	88
A7999	4	11	49	8	1	0	73
A7097	0	26	22	0	14	1	63
A7706	8	20	20	4	7	0	59
BRS32779	10	19	26	1	0	0	56
BRS30694	0	10	23	10	9	2	54
A7387	20	16	3	3	3	1	46
A7262	6	7	17	4	8	2	44
A7661	0	11	16	4	12	0	43
A7700	7	7	8	1	2	1	26
A7827	2	3	17	1	1	2	26
A7857	4	3	11	7	0	0	25
A7787	1	4	9	0	1	3	18

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

IARU Region 1 Conference

by R. F. STEVENS, G2BVN* and G. M. C. STONE, G3FZL**

THE ninth triennial conference of the Region 1 Division of the International Amateur Radio Union was held in May of this year at Scheveningen, Holland. Previous conferences were held in Paris (1950), Lausanne (1953), Stresa (1956), Bad Godesburg (1958), Folkestone (1960), Malmo (1963), Opatija (1966) and Brussels (1969).

Twenty-nine of the 39 subscribing member societies of the division were represented by delegates or by proxy. The countries and national societies participating were: Algeria (ARA), Austria (OeVSV), Belgium (UBA), Czechoslovakia (CRCC), Denmark (EDR), East Africa (Kenya, Uganda and Tanganyika (RSEA), Faeroe Is (FRA), Finland (SRAL), France (REF), Germany (DARC), Ghana (GARS), Hungary (MRAS), Ireland (IRTS), Liberia (LRAA), Luxembourg (RL), Malta (MARS), Netherlands (VERON), Nigeria (NARS), Norway (NRRL), Poland (PZK), Portugal (REP), Romania (FRR), South Africa (SARL), Spain (URE) Sweden (SSA), Switzerland (USKA), United Kingdom (RSGB), USSR (RSF), and Yugoslavia (SRJ).

Also in attendance were the President of IARU, Mr R. W. Denniston; the President of IARU Region 2, Mr A. Pita; and the Secretary of IARU, Mr J. Huntoon.

The conference was held in the Scheveningen conference centre at the Hotel Kurhaus; the host society being the Netherlands national organization, VERON.

* Secretary, Region 1. ** RSGB VHF manager.

Opening ceremony

The chairman of the Region 1 executive committee, Per-Anders Kinnman, welcomed guests and delegates and introduced Ir F. Maarleveld, the Deputy-Director of Radio Communication of the Netherlands PTT. In his speech, Ir Maarleveld traced the history of amateur radio in the Netherlands, particularly mentioning emergency communications and activity in technical fields. He emphasized that through his contacts beyond the borders of his own country an amateur can contribute to a better understanding among people and nations. Against this background Ir Maarleveld extended a hearty welcome to the conference.

The chairman then introduced Mr R. E. Butler, Deputy Secretary-General of the International Telecommunication Union. Mr Butler mentioned the links between the ITU and the IARU, particularly the participation in ITU conferences and the recognition of the amateur space service at the 1971 WARC. In emphasizing the necessity of preparing for future conferences at national levels, Mr Butler spoke of the activities of the ITU in technical fields, particularly its work as an executing agency for the United Nations development programme for the development of the infrastructure. He felt that there could be closer co-operation by national societies with ITU field project personnel to the advantage of all concerned. Emergency communications was an area in which the amateur service had participated with distinction, and recent ITU proposals concerning communications to or from disaster areas were not intended to supplant such effort

The chairman of Region 1, Per-Anders Kinnman, SM5ZD, addressing the opening plenary meeting. On the platform are (r to l) Ir F. Maarleveld, Deputy Director of the Netherlands PTT; Mr R. E. Butler, Deputy Secretary-General of the International Telecommunication Union, and Roy Stevens, G2BVN, Region 1 secretary

Conference comments

Detailed consideration was given to the future of the amateur service in the light of the decisions and background of the Space Conference, 1971.

Preparation will commence immediately to deal with the possibility of a World Administrative Radio Conference in 1978-80.

The IARU and its representatives shall participate in the technical conferences of the ITU and its organizations (eg CCIR).

National societies shall actively seek the support of their administrations for future proposals concerning the amateur service.

The intruder watch is an essential activity and the formation of further national organizations is necessary. The principle of an IARU Monitoring Service was adopted.

The insufficient immunity of electronic entertainment equipment to electro-magnetic fields is a matter of major concern. A working group of experts is to be set up to provide information for national societies and to liaise with international bodies such as CCIR, IEC and CISPR,

Ways are to be sought whereby member societies may contribute to the operation of emergency telecommunication systems in the event of national disasters.

The world amateur beacon plan (28MHz) is to continue and results of observations shall be communicated to professional organizations. G3DME was nominated as chairman of the beacon working group.

The Region 1 hf band plan was amended to include centre frequencies for rtty operation.

Revised rules for European fox-hunting championships were agreed. The next championships will be held in Hungary in 1973.

Revised maximum size and weight for QSL cards are recommended as an aid to sorting and despatch.

The Region 1 band plan for 430-440MHz was amended. Recomended standards and channels were adopted for fm repeaters and fixed channel fm stations in the 144MHz band. Standards for the microwave bands were agreed.

National societies shall discuss with their administrations areas for co-operation by the amateur service in the field of propagation research.

RSGB will co-ordinate the allocation of beacon station frequencies in the 144MHz band.

Support shall continue to be given to the setting up of national club stations in African countries.

No increase will be made for the next three years in the annual contribution made by member societies to the Region 1 Division, which remains at 60 Swiss centimes per licensed member.

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but rather to extend the possibilities and secure future participation. Mr Butler then declared the conference in session.

First plenary meeting

Mr Marino Miceli, a member of the delegation of the Italian national society, ARI, then gave a short address on the work of Marconi in the field of radio communication. He recalled that in May 1897 Marconi and Kemp conducted experiments in radio communication between Flatholm Island in the Bristol Channel, England and Lavernock Point in Glamorgan, Wales. During these tests radio signals were transmitted for the first time across water and between two countries. The 75th anniversary of the Marconi-Kemp tests was being celebrated by functions in the UK and by the world-wide participation of amateur radio stations.

In his introductory remarks to delegates the chairman spoke of the importance of the 1971 WARC for Space Communication and of the work carried out on behalf of the amateur service. This, however, was only a beginning and the decisions to be taken at this conference would plan the way for further participation to enable the amateur service to play a valuable part in radio communication in the future. Mr J. Huntoon, secretary of the IARU, then announced the admission of Romania (FRR) to membership of the union.

The first plenary meeting concluded with the election of chairmen for the committees of the conference, these were:

Committee A (administrative and operational, Mr L. v. d. Nadort (Netherlands);
Committee B (vhf/uhf/shf), Mr C. van Dijk (Netherlands);
Committee C (credentials and finance), Mr J-B. Wolff (Luxembourg);
Election Committee, Mr R. J. Hughes (UK).

Reception

During the evening of Monday 15 May, the directors of the Netherlands PTT invited conference delegates and guests to a reception in the Postal Museum at The Hague. In addition to providing a pictorial record of events in the history of postal communications, the museum contains many items of historic radio apparatus, most still in working order. Of particular interest was a demonstration of the original Netherlands broadcast transmitter.

Committee meetings

Meetings of Committees A and B were held on 15, 16 and 17 May, with meetings of Committee C on 15 and 16 May. Several working groups were set up to consider specialized subjects and the results of the work of the committees were recorded in documents presented to the final plenary meeting on 19 May. An account, in greater detail, of the views and recommendations form the latter part of this article. At this time it is sufficient to say that although meetings hours were extended there was difficulty in completing the agenda.

Administrative and operational committee ("A")

This committee worked under the chairmanship of Mr L.v.d. Nadort, (PA0LOU), with Roy Stevens, G2BVN, as secretary. The agenda comprised 22 main headings and the items for discussion were supported by papers distributed to all member societies before the conference.

RSGB delegates to this committee were Messrs R. J. Hughes, G3GVV, E. G. Ingram, GM6IZ, and L. E. Newnham, G6NZ.

Part of a Committee A meeting (r to l): DJ1BQ, DL1FL, DL2FT, OK1ADM, OK1DDK, GM6IZ, G3GVV, G6NZ, YO3CZ, UA3AF, interpreter, LX1JW, F5HX, F8TM and OE1SFA

The amateur service

The future development of the amateur service comprised the most important item on the agenda of this committee. The implications of the Space Conference were considered and in particular the necessity of complete liaison between national societies and their administrations long before the commencement of a conference. There is the possibility of a World Administrative Radio Conference during the period 1978-80 and it is necessary to commence work *now* for this occasion at which *all* amateur service allocations will be under scrutiny.

In order to ensure that there shall be a sound technical basis for proposals affecting amateur bands the IARU shall seek representation on the CCIR and attend technical conferences of the ITU. By a decision of the ITU the IARU may participate in conferences without administrative costs. It was repeatedly emphasized that the initial work in this area must be between national societies and their administrations. Liaison between IARU Headquarters and the three regional associations is essential.

Intruder watch

A radio station may operate in derogation of the Radio Regulations as long as its operation does not cause harmful interference to the radio communication services operating in accordance with the convention and regulations. This means that a commercial station may operate in an amateur band and may continue to do so unless a report of harmful interference is made to the administration. From this basic fact stems the need for an active and efficient intruder watch. The conference considered proposals put forward by the Region 1 IW co-ordinator, Mr C. J. Thomas, G3PSM, and adopted, in principle, the setting up of an IARU Monitoring Service. Co-operation between the IARUMS and the monitoring organizations of national societies is essential to maintain the status of amateur allocations. The committee considered the monitoring information provided by the intruder watch and noted the particularly poor position on the 7MHz band. Requests for removal of the interference will continue to be made to administrations.

27MHz operation

Several societies reported difficulties arising from the activities of operators using frequencies in the region of 27MHz, most of whom are unlicensed. In many cases the press is unaware of the differences between the licensed stations of the amateur service and operators who are frequently unlicensed and often cause malicious interference. To the uninformed all such persons come under the heading of "radio amateurs". ARI (Italy) tabled a paper setting out the problems encountered in their country. A report covering European activities is to be prepared by the Executive Committee.

BCI and TVI

The basis for discussion was a document prepared by VERON (Netherlands) which expressed concern at the insufficient immunity of electronic entertainment equipment to electro-magnetic fields. Additional comments had been tabled by DARC (Germany), RSGB and UBA (Belgium). It was agreed that electro-magnetic compatibility (emc) presented problems only secondary to those of frequency allocations. With unfavourable administrations there was a danger of suppression of stations operating in the amateur service particularly when these were located in areas of high density of population. A working group is to be set up and there will be a complete exchange of information within Region 1 societies and also liaison with professional bodies such as CCIR, IEC and CISPR.

Emergency communications

Consideration was given to the information recently published by the ITU concerning the setting up of a satcoms disaster scheme. Following the excellent record of the amateur service in emergency communications it was agreed that

participation by member societies in future schemes for the erection and maintenance of emergency telecommunication links or systems is highly desirable. Consideration will be given to the methods by which this may be achieved.

Beacon transmitters (28MHz)

The proposals for the continuance and expansion of the existing world amateur beacon (WAB) network made by RSGB were adopted. It was agreed that beacon stations should operate in the portion 28·150 to 28·200MHz. Beacon stations at present operating or which will shortly come on the air are:

DL0IGI	28,195kHz	ZC4CYP	28,180kHz
3B8MS	28,190kHz	VE3RMR	28,175kHz
GB3SX	28,185kHz	ZC4VHF	50,500kHz

RSGB will co-ordinate the future planning of beacons and Alan Taylor, G3DME, was nominated as chairman of the beacon working group. C. Dereser, DJ7AA, continues as vice-chairman.

Fox-hunting

Revised rules for the European fox-hunting championships were agreed and on the proposition of RSF (USSR) the title of International Referee was adopted. The next European fox-hunting championships will be held in Hungary in 1973 following the invitation of the Hungarian Radioamateur Society.

Region 1 publications

The Region 1 News will continue to be published as a source of news and information for all member societies. Revised editions of the French and English versions of the *Amateur Radio* booklet will be published. It was reported that more than 5,000 of each language edition of this booklet had been distributed. The booklet *Conference Recommendations* will be revised and a working group has been set up to carry out this work. A revised edition of the *Rules of the Region 1 Division* will be prepared and printed.

The Region 1 executive committee (l to r): W. Nietyksza, SP5FM; A. Jacob, F3FA (vice-chairman); Per-Anders Kinnman, SM5ZD (retiring chairman); Win Dalmijn, PA0DD (chairman-elect); H. Walcott Benjamin, EL2BA, and Roy Stevens, G2BVN (secretary). YU3AA and OH5NW (treasurer) are also committee members

Membership table

Country	Society	Number of licensed members reported to conference in 1969	1972	Total members 1 Jan '72
Algeria	ARA	26	—	—
Ivory Coast	ARAI	25	—	—
Italy	ARI	2,500	3,210	6,480
Monaco	ARM	19	—	—
Cyprus	CARS	14	16	38
Bulgaria	CRCB	406	650	4,900
Czechoslovakia	CRCC	1,970	2,060	4,850
W. Germany	DARC	11,599	13,703	21,120
Denmark	EDR	2,857	2,405	4,000
Faeroe Is	FRA	55	—	—
Ghana	GARS	—	13	13
Ireland	IRTS	196	172	230
Liberia	LRAA	—	178	—
Malta	MARS	16	35	50
Mauritius	MARS	44	—	—
Hungary	MRAS	—	1,196	3,600
Nigeria	NARS	12	9	61
Norway	NRRL	1,220	1,614	1,982
Austria	OeVSV	1,174	—	—
Poland	PZK	2,141	1,898	3,714
Greece	RAAG	70	—	—
Lebanon	RAL	50	40	40
France	REF	2,807	3,927	9,645
Portugal	REP	250	398	752
Luxembourg	RL	87	—	—
E. Africa	RSEA	37	26	78
USSR	RSF	5,008	8,250	110,000
UK	RSGB	7,836	9,164	17,062
Rhodesia	RSR	133	—	—
S. Africa	SARL	—	1,500	1,720
Finland	SRAL	2,000	2,232	2,441
Yugoslavia	SRJ	1,723	1,945	50,000
Sweden	SSA	2,361	2,557	3,066
Belgium	UBA	800	780	1,158
Spain	URE	1,068	1,407	3,850
Switzerland	USKA	750	911	1,636
Netherlands	VERON	1,299	1,678	3,500

HF BAND PLAN

The existing Region 1 band plan was approved subject to certain additions. This is shown below.

Band		Type of emission
3·5–3·6MHz		cw[2]
3·6MHz	±20kHz	rtty[1]
3·6–3·8MHz		cw and phone [2, 3]
7–7·04MHz		cw
7·04MHz	±5kHz	rtty [1]
7·04–7·1MHz		cw and phone
14–14·1MHz		cw
14·09MHz	±10kHz	rtty [1]
14·1–14·35MHz		cw and phone
21–21·15MHz		cw
21·1MHz	±20kHz	rtty [1]
21·15–21·45MHz		cw and phone
28–28·2MHz		cw
28·1MHz	±50kHz	rtty [1]
28·2–29·7MHz		cw and phone

Notes

[1] For rtty, recommended section of operation shared with cw.
[2] 3,500 to 3,510 and 3,790 to 3,800kHz reserved for inter-continental working.
[3] 3,635 to 3,650kHz is used by USSR stations for inter-continental working.

QSL cards
It was recommended that the maximum size of cards should be that of DIN A6, 105mm by 148mm, with a maximum weight of 4 grammes. To facilitate sorting, callsigns should be written on both sides of QSL cards. It was strongly recommended that where operators do not desire to receive a QSL this fact should be clearly stated during the contact.

Other matters
Among the other items discussed were the extension of reciprocal licensing facilities; the collation by the Secretary, Region 1, of the licensing conditions of all member societies; and the establishment of favourable subscription rates for national journals among member societies.

VHF Committee ("B")

As its name implies, this committee deals with conference matters arising from the use of frequencies above 30MHz. In common with the Committees A and C, its decisions are subject to ratification by the final plenary meeting. The chairman of Committee B is C. van Dijk, PA0QC, and the secretary, Geoff Stone, G3FZL.

The highlights of the activities of Committee B which are of immediate importance to all UK vhf/uhf/shf operators are dealt with under the following general headings: Band plans; Repeaters; Contests; Microwaves; Scientific Studies.

Band plans
Band plans are constantly under review, especially 2m and 70cm. The need for change in the 2m band plan has arisen especially to make provision for repeaters and fm simplex operation which is the biggest growth area of vhf activity in Europe. In this case the problem is that a large number of repeaters have already been set up, especially in West Germany, without any international co-ordination and hence there have been several different national band plans for repeaters. The West Germans have in operation a 1·8MHz spacing system with the lowest input channel 144·15MHz (output 145·75MHz) being designed principally around surplus mobile business radio equipment originally designed for 25kHz or even wider channel spacing. NBFM (F3) is in use but many operators use deviations in excess of the IARU Region 1 standard which is 3kHz peak. By the use of the 144·15MHz channel, sidebands spill over into the cw portion of the band. Furthermore, the total frequency band covered by input channels is 144·150 to 144·300MHz which is used on the Continent for dx phone operation and increasingly for ssb. Hence there was strong opposition to adopting the German (DARC) standards for Region 1 and alternative proposals were tabled by Finland (SRAL) for a 600kHz system operating entirely in the band 145 to 145·825-MHz. The RSGB and all other European countries strongly supported the SRAL propoal and this was adopted. Technical standards were also adopted and are given below. In addition, provision was made for fm simplex channels to be compatible with the repeater channels, as can be seen in Table 3.

Another 2m band plan item discussed concerned the sub-band allocated to beacons, 145·95 to 146MHz, which is becoming crowded. It was agreed that an international frequency registration scheme would be operated by RSGB for Region 1 using the following criteria:

TABLE 1

IARU Region 1 2m band plan

144 to 144·15MHz	CW only
144·15 to 145·9MHz	CW and phone
145·9 to 146MHz	Beacons
145·0 to 145·25MHz	Repeater input channels
145·50 to 145·85MHz	Repeater output channels and fm simplex
145·0MHz	Mobile calling channel
145·3MHz	RTTY
145·41MHz	SSB centre frequency

TABLE 2

IARU Region 1 70cm band plan

430 to 432MHz	Phone—especially microwave link communication
432 to 432·1MHz	CW
432 to 432·05MHz	Beacons
432·1 to 433·5MHz	CW and phone
431 to 431·5MHz	Repeater input channels
438·6 to 439·1MHz	Repeater output channels
433·5 to 440MHz	Amateur tv
435 to 438MHz	Amateur space communications
433·3MHz	RTTY
432·15MHz	SSB centre frequency

Beacon band: 145·95 to 146MHz (145·9 to 146 later);
Channel repetition: Distance between beacons to be not less than 1,000km;
Channel separation: 1kHz, but greater than 5kHz for beacons geographically close.
The beacon band extension from 145·95 down to 145·9 would only come into operation progressively when existing channels were all allocated and the life of Oscar 6 had expired—the limit of this for planning purposes was accepted as end 1973. National societies are encouraged to move existing beacons into this band unless they are either extremely well established or there is some good reason for having them outside the beacon sub-band. The whole revised IARU Region 1 2m band plan is shown in Table 1.

The 70cm band plan also required attention following the allocation of the 435 to 438MHz band to space communication and the need to move beacons from the sub-band 433·45 to 433·5MHz, where they interfere with amateur television in the 433·5 to 440MHz band. It was agreed that beacons should be placed in the sub-band 432 to 432·05MHz shared with cw and that amateur television and space communication would have to share; there being no other alternative. The problem of sharing was not considered to be too great with a good choice of aerial systems; the vertical polar diagram of tv can be kept down while space communication aerials need to beam upwards. There may, however, be local difficulties which can only be resolved between the people concerned. Provision was also made for repeater systems in the 70cm band, which are authorized in Switzerland and are expected in Germany shortly. All member societies agreed to press national administrations for repeater facilities in the 70cm band. The revised 70cm band plan is shown in Table 2; note that an international rtty channel has also been agreed.

TABLE 3

Repeaters, 2m band

Channel	Input	Output
R1	145·025MHz	— 145·625MHz
R2	145·050	— 145·650
R3	145·075	— 145·675
R4	145·100	— 145·700
R5	145·125	— 145·725
R6	145·150	— 145·750
R7	145·175	— 145·775
R8	145·200	— 145·800
R9	145·225	— 145·825
FM simplex channels		
SO	145·0MHz mobile calling frequency	
S21	145·525	
S22	145·550	
S23	145·575	
S24	145·600	
S25 to S33	As R1 to R9 output frequencies	

Repeater, 70cm band

Channel	Input	Output
70	431·05MHz	438·65MHz
72	431·10	438·70
74	431·15	438·75
76	431·20	438·80
78	431·25	438·85
80	431·30	438·90
82	431·35	438·95

No change has been made to the 23cm band plan other than to agree an rtty channel of 1,297·3MHz.

The effect of these international agreements on UK 2m and 70cm band plans will now be considered by the RSGB VHF Committee and changes will be effected as soon as possible. The first UK fm repeater, GB3PI, will be set up in accordance with the IARU Region 1 plan and the 70cm beacons, GB3GEC, GB3SC and GB3DM, are to be relocated in the new beacon sub-band.

Repeaters

Apart from frequency allocations it was necessary to agree technical standards for repeaters. The following were adopted:

Mode	NBFM 12F3, 3kHz peak deviation;
Tone access	1,750Hz ± 50Hz;
Pre-emphasis	+ 6dB/octave at transmitter;
De-emphasis	− 6dB/octave at receiver.

It was also agreed that all repeaters shall be under the control of the national society or its agent. It is interesting to note that in addition to West Germany, 2m band repeaters are already in operation in Austria, Denmark, Finland and Sweden, and one in Czechoslovakia shortly which will be the first linear translator in Europe.

Contests

The IARU Region 1 scheme for vhf contests is to have sub-regional contests—that is, organized by national societies with no international judging—on the first weekends of March, May, July and November (the latter being a night cw contest), and regional contests with international judging for the first weekends of September and October. There has been some criticism of the timing, 1800 to 1800gmt, which results in portable stations frequently having to complete packing up in the dark, and the long time it takes to publish results of the internationally judged contests. Timing has now been changed with effect from 1 January 1973 to 1600 to 1600gmt and a streamlined procedure adopted for judging the regional contests with the objective of having results communicated to all vhf managers/national vhf contests committees by the end of the year of the contest. The streamlined procedure will be operated by RSGB as the international judge for 1972 but this will not change in any way the rules already published in the April 1972 issue of *Radio Communication*.

It was also agreed that as far as practicable sub-regional contests would be held concurrently on the 2m, 70cm and 23cm bands while the regional contest in September will be on 2m only. The October event will continue to be on 70cm, 23cm and other microwave bands. This will not affect the RSGB VHF NFD as notice was given that this event would continue as previously except that the new timing of 1600 to 1600gmt would be adopted in 1973. Belgium (UBA) will also continue to run a three-band contest at this time. The impact on the RSGB event will not be serious as contact with other European countries is mainly on 2m and the 2m entry for VHF NFD can form part of the UK entry for the regional contest.

General concern was also expressed about the international problem of stations who flagrantly disregard IARU Region 1 band plans or who radiate poor quality signals. It was agreed that in future, member societies would operate monitoring stations during contests and furthermore the scoring system was altered so that contacts with phone stations operating in cw sub-bands will not count for points. Some observations were made informally of the RSGB practice of calling for both QTH and QRA Locator in national contests. There is likely to be some confusion in future as on the proposal of West Germany (DARC), the originators of the QRA Locator system, Region 1 has now changed the title to the more nearly correct QTH Locator. Thus in the UK we shall, unless we have a change of policy, be asking for both QTH and QTH Locator. This problem will be considered by the VHF Contests Committee. (Note: the Ministry of Posts and Telecommunications requires a portable station to send his location but they do not recognize the QRA Locator system for this purpose.)

A new date has been adopted in Region 1, on the proposal of RSGB, for a sub-regional microwave contest—1GHz and up (coinciding with the existing RSGB microwave event). This will be a 24-hour event on the third weekend of June each year and will be introduced on an experimental basis initially. RSGB will liaise with those countries having particular interest in microwaves at present, Belgium, France, West Germany and Holland, to co-ordinate rules and compare results. A multiplier system was also agreed for multi-band contests (this has been RSGB practice for some time) to enable an overall winner to be determined. It is 144MHz by 1, 432MHz by 5, 1,296MHz by 25, 2,400MHz by 50, and higher microwave bands all by 100.

Microwaves

Technical standards for microwave systems were also proposed by RSGB and these were unanimously adopted with a minor change to include the mode A3J for the 1,296 and 2,400MHz bands and to permit F1 as an alternative to A1.

Full details will be published in due course by G3RPE in his microwave column.

Scientific Studies

Of particular interest was a paper presented by S. Canivenc, F8SH, regarding his observations of sporadic-E propagation in the 144MHz band. He had analyzed two events, one on 4 July 1965 and the other on 24 May 1971; reports had been sent in by a number of 2m band operators, and these had been compared with ionospheric sounding data from a number of sources, including the UK Radio and Space Research Station at Slough, and with meteorological data. Some correlation was evident. Following the paper, a discussion ensued on the need for stimulating scientific observations and to encourage more participation. It was agreed that France (REF) should act as a focal point for sporadic-E investigations and RSGB for auroral propagation observations. Guidance leaflets will be prepared for circulation to member societies. Of particular interest to UK 2m band operators was a report from OH5NW that he has frequently heard G stations during auroral openings but has been unable to raise them as they seem to be more interested in local contacts—or do not hear OH5NW calling them. He is going to submit reports to RSGB in future.

Conclusion

This was a most stimulating and friendly conference from the vhf viewpoint. Considerable progress was made in international standardization and in agreeing future action to defend our allocations above 30MHz, especially in the band 430 to 440MHz, which will increasingly be subject to external pressure from both mobile business radio and maritime interests.

Credentials and finance committee ("C")

As the name implies, the main purposes of this committee are to scrutinize the credentials of the delegates and observers to the conference and to make recommendations concerning the finances of the Region 1 Division. This committee has a restricted membership of five ordinary members, and RSGB were represented by Mr E. G. Ingram, GM6IZ. The committee met under the chairmanship of Mr J-B. Wolff (Luxembourg), with Roy Stevens, G2BVN, as secretary.

The honorary treasurer of the division, Mr W. J. L. Dalmijn, PA0DD, introduced his report and budget which had previously been circulated to all societies. The financial position of Region 1 was extremely good due to the increased number of members and the able conduct by the treasurer of the affairs of the division. After discussion it was agreed to give varying measures of financial support to the Intruder Watch, the WAB project, the Radio Amateur Satellite Corporation, national club stations in African countries, and equipment for the International Amateur Radio Club station at Geneva. Other items arising before the next conference will be dealt with by the executive committee. It was agreed that there should be no increase in the annual contribution per licensed member which is to remain at 60 Swiss centimes.

Executive committee

At the final plenary meeting important changes took place in the constitution of the Executive Committee. Consequent upon a conference decision, the number of ordinary members of the committee was increased from two to three. After serving for 22 years as a member of the committee, the present chairman, Per-Anders Kinnman, SM5ZD, did not stand for re-election.

The new committee, elected by ballot of the member societies present, is:

Chairman, W. J. L. Dalmijn (VERON); vice-chairman, A. Jacob (REF); secretary, Roy F. Stevens (RSGB); treasurer, Axel Tigerstedt, (SRAL); members, H. Walcott Benjamin (LRAA), Wojeich Nietyksza (PZK) and Janez Znidarsic (SRJ).

Next conference

The delegation of OeVSV, Austria, offered the services of their society as the host for the 1975 conference and this was accepted with acclamation.

SWL News

continued from p443.

David Walker, A7714, asks whether there are any other SWLs in the Horndean, Hampshire, area. If so, David will be pleased to hear from them. His telephone number is Horndean 4414.

Regular listeners to the 80m dx nets will be aware of the jamming which goes on constantly while the dx is trying to QSO the many European stations on the frequency. It is suggested by R. A. Beament, A6117, that the swl could be of particular importance in trying to ascertain from where these transmissions are radiated. Some culprits have already been prosecuted for using radio equipment illegally and there is, of course, the RSGB's Intruder Watch which keeps a close watch on our bands. However, SWLs with df equipment may also be able to assist in this worthwhile cause. Any swl keen on df work and particularly interested in tracing illegal transmissions is invited to contact Mr Beament at "Ladram", York Road, Camberley, Surrey.

Miscellany

Details will be appearing in the August issue of *Radio Communication* of an swl contest to be run by the Cray Valley Radio Society during September.

The address of John Townsend, A7999, was inadvertently omitted from the May issue; it is 7 Dales Brow, Swinton, Lancashire.

All correspondence relative to the September issue should reach me by **19 July.**

TECHNICAL TOPICS

by PAT HAWKER, G3VA

OVER the years there has been a vast increase in the complexity of systems and equipments used in professional radio communications. And many of these trends have rubbed off on the amateur station. In the early 'thirties, transmitters were often just power oscillators, or perhaps a co-pa; the receivers were 0-v-1 and 1-v-1 or primitive superhets (rejected by many as too complex or too noisy); good frequency control implied the amateur knew whether he was on 30, 35 or 40m; a stable receiver that the problem of hand-capacity had been minimized. Not—as one can see from examination of early photographs—that the overall stations were simple or crude—but often the individual units were.

Few people would seriously want to go back to this type of hf operation. But it must have been very pleasant to feel that you could build a new receiver in a couple of evenings from a handful of components, and then really to understand the effect of each individual component on performance.

Sometimes one finds an echo of this feeling even among professional communicators. Take for example the recent remarks in *Point-to-Point*: "In the more prosperous countries the demand for sophisticated systems and equipments often produces designs of a complexity greater than necessary or even desirable in the less developed areas of the world. On several occasions I have had twenty- or thirty-years-old Marconi equipment proudly shown to me by customers as 'the best equipment we have ever had'. By the normal criteria of performance, reliability, power consumption and the like, this is manifestly not true. I believe the truth lies in the ability of some customers to operate and maintain to the optimum these relatively simple units, whilst the more complex equipments can often overload the available pool of electronics engineering expertise. At this point one asks if we should not attempt to design some modern but equally simple equipment? At the same time, it should be possible to minimize cost, since complexity is the most determined enemy of economy."

Of course the writer in this Marconi journal is thinking in rather different terms to the average amateur. But there is surely a parallel in our activities. It is, I suspect, why "direct-conversion" receivers have made quite an impact during the last few years; one reason why people still enjoy building simple rigs for vhf or Top Band while shying away from complex equipments that need six months or a year to complete. It takes a dedicated enthusiast to start planning a major project unless it comes in the form of a complete kit or detailed parts list. Many of us know how much the disappearance from the market of a well-known coil-pack has inhibited receiver construction. We feel that home construction should still have something to offer those who regard amateur radio as a relaxation rather than an Open University course! This is one reason why we welcome integrated circuits as a means of simplifying construction—though we recognize the feelings of those enthusiasts who consider that these devices take the excitement out of designing equipment. What we need to do is to avoid falling into the trap of using modern devices only to provide more sophisticated and more complex designs. There is a genuine need for *modern but simple* equipment.

Tucker Tin Mk 2 ssb phasing transmitter

Ten years after the first appearance of a "Tucker Tin" two-valve ssb transmitter of extreme simplicity (*Break-In*

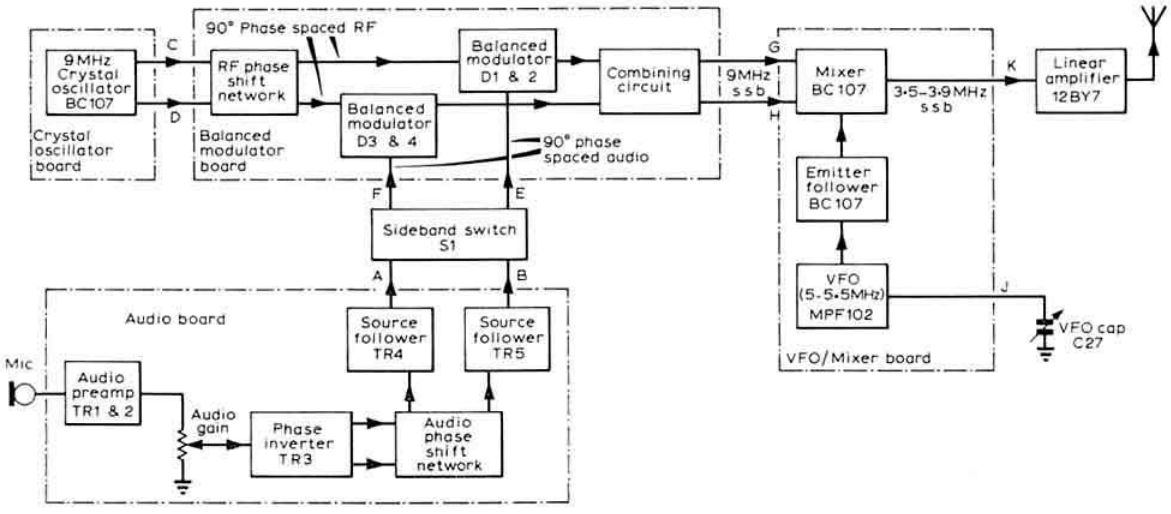

Fig 1. Block diagram of the Tucker Tin Mk 2 simple 3·5MHz phasing type rig using 9MHz generation

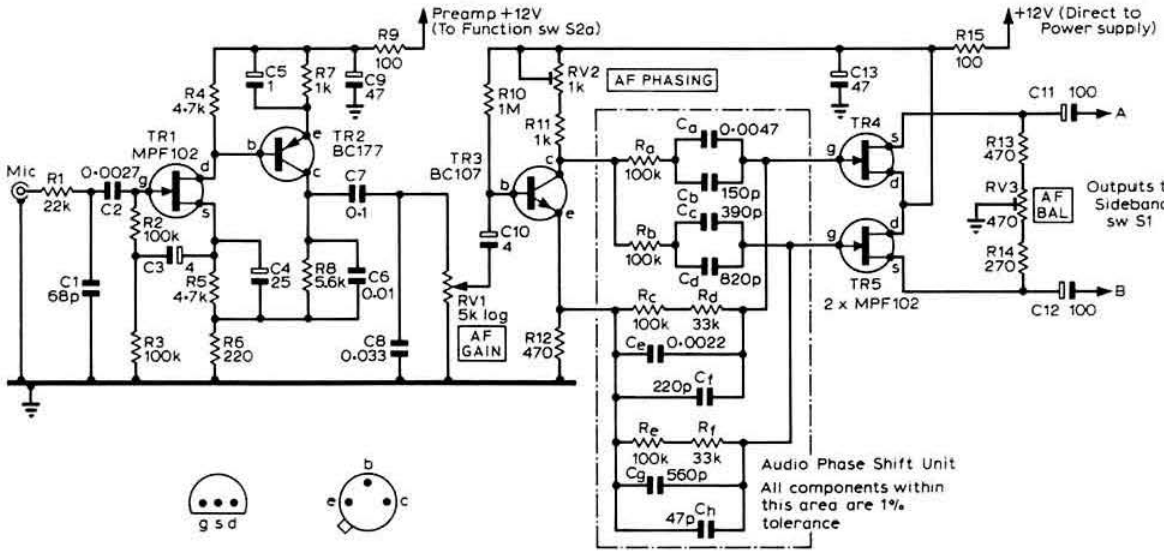

Fig 2. The most complex part of the transmitter, the audio board, with 1 per cent tolerance components in the phase-shift network. The speech bandwidth is filtered to make it suitable for the network

August 1961), Fred Johnson, ZL2AMJ, has re-assessed the whole question of providing a simple, minimum cost, home-constructed ssb transmitter which reflects modern trends yet is suitable for newcomers to ssb, provides virtually fool-proof alignment and uses only readily available components. The result has been the publication of the "Tucker Tin Mk 2" rig, first in *Break-In* (from August 1971) and more recently in *Electronics Australia* (February, March and April 1972). This provides a compact 3·5MHz transmitter, with vfo control, upper and lower sideband selection, and cw facility, 4W p.e.p. output and sideband suppression better than 30dB; it is also capable of forming the basis of an ssb generator for all bands.

ZL2AMJ points out that filter-type ssb generation is now clearly the right approach for factory-built rigs and transceivers and for the amateur seeking the highest sideband and carrier suppression. Nevertheless for reasons of cost and easy availability of components in all countries, the phasing method can still be a preferred choice for a newcomer to ssb. He writes: "For several reasons I am reluctant to see the phasing method perpetuated, but when it is realized that the complete 'Tucker Tin Mk 2' can be constructed for less than the cost of a good commercial ssb filter alone, then perhaps there is a place for such a rig." He uses an audio phase-shift network with common-value 1 per cent tolerance components since such items as "packaged" Millen phase-shift audio networks are not available in New Zealand.

The new design also offers a useful introduction to the use of transistors in ssb generators; only one valve is used—the 12BY7 linear power amplifier. Unlike many of the early phasing rigs no attempt is made to shift the frequency of the generator itself; instead the signal is developed at 9MHz and

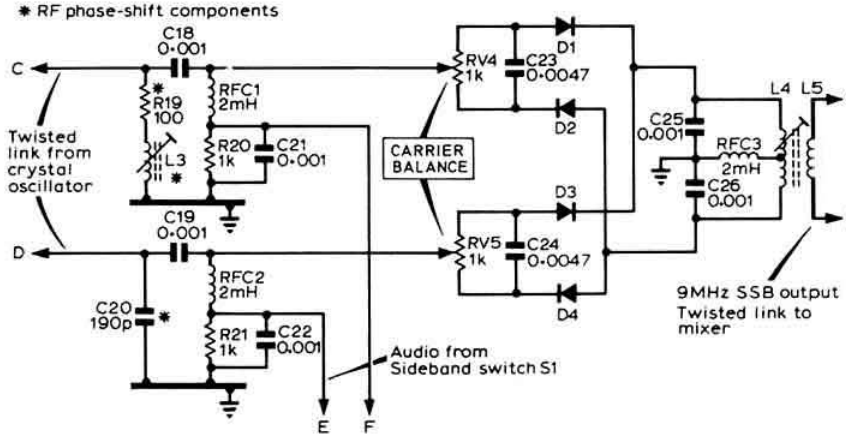

Fig 3. Balanced modulator and rf phase shift network

then heterodyned to the output frequency by means of a 5·0 to 5·2MHz vfo. In the UK one suspects that users might modify the design for 1·8MHz operation.

The transmitter is made up on four printed circuit boards plus the linear and power supply built directly on to the metal chassis: (1) 9MHz oscillator; (2) balanced modulators; (3) audio board (the most complex unit); and (4) vfo/mixer board. Various kits, including one which contains the etched printed circuit boards, transistors and signal diodes, 1 per cent components and coil formers are available from: Tucker Tin Kit Project Secretary, Upper Hutt Branch NZART, PO Box 40-212, Upper Hutt, New Zealand—although it will be appreciated that components tend generally to be more costly in New Zealand than in the UK.

The three articles ran to some 14 pages in *Electronics Australia* to provide detailed constructional notes. ZL2AMJ emphasizes that :"The length of the articles and the various digressions into technicalities must not be taken as an indication that construction of the rig is difficult or that it should not be undertaken by the newcomer. The rig is a simple one—almost as simple as it is possible to make it; some sections could be further simplified but at the possible expense of performance."

Here we can do little more than draw attention to this design. Fig 1 shows the block diagram; Fig 2 is the audio board and Fig 3 shows the balanced modulator.

The complexity of modern ssb circuitry has led more and more amateurs to feel that "rolling their own" is not for them. It seems therefore well worth drawing attention to the continued attraction of phasing type rigs to form the basis of a tutorial project that can provide a useful low-power rig at low cost.

Some thoughts on front-ends

Despite the considerable number of factory hf receivers now using semiconductors throughout, with front-ends mostly based on dual-gate MOSFETS, or variations of this approach, we tend to the feeling that amateurs should still show some caution in throwing out their valves or putting them into museums. To quote a recent BBC paper (brought to our attention by Stan Andrews, G3OGY): "The principal requirement is the re-equipment of the receiving station associated with the BBC Far Eastern relay station at Tebrau near Singapore . . . the aim is to obtain an all-solid-state receiving terminal with adequate performance at reasonable cost. A major difficulty is that although modern solid-state designs provide improved facilities, such as fully synthesized local oscillators with instantaneous switching to preselected frequencies, the rf performance is generally inferior to that of the valved equipment being replaced. Relay stations must be able to receive relatively weak signals in the presence of strong local transmissions on adjacent frequencies. However, currently available receivers have an rf dynamic range at least 10dB worse than that of well designed valve receivers. In co-operation with the receiver manufacturers the BBC has made considerable progress in solving this problem and it is planned to have a completely solid-state receiving installation in service (at Tebrau) during 1972."

This quotation is in line with what we have reported in *TT* many times before: it is now *possible* to obtain a good dynamic range with semiconductors (eg the power FETS described in 1971) but it is still not *easy*. There are, of course, some amateur applications where dynamic range and cross-modulation characteristics are not vitally important; but often it is these factors which make all the difference. As indicated in the recent review of the SB303 (*Radio Communication* May 1972) a considerable improvement can be obtained by fitting an aerial attenuator, although it must be appreciated that the very high dynamic range so achieved can be a little misleading since it refers only to the wanted signal. One continues to hear of amateurs being a little disappointed when they come to use, in practice, receivers with all-semiconductor front-ends.

For all these reasons it was interesting to see a recent experimental design for a 3·5MHz receiver based on valves described by Douglas Blakeslee, W1KLK, in *QST* February 1972. This uses a front-end conceived by the late W2PUL, the designer of the pioneering Squire-Sanders SSR1 which introduced the idea of the 7360 as a first mixer.

The W1KLK receiver has four signal frequency tuned circuits before a 7360 mixer, using a low-gain rf stage to facilitate this arrangement. It has long been evident that rf tuned circuits have a highly important role to play in high-performance receivers. In this case, to reduce the likelihood of cross-modulation in the rf stage; this is based on a grounded grid 7044 computer valve of relatively high power rating and with its two sections paralleled. Fig 4 outlines some details of what is clearly an interesting design for anyone not committed to the view "semiconductors or nothing."

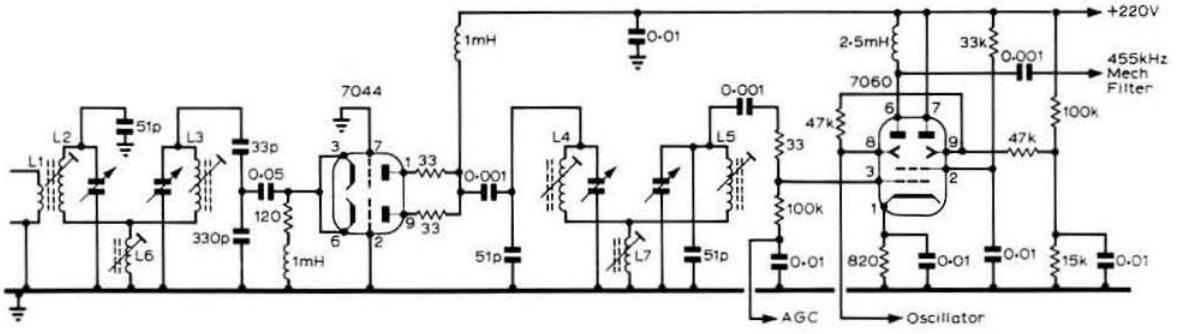

Fig 4. W1KLK's experimental 3·5MHz front-end designed to provide good pre-mixer rf selectivity and so reduce spurious responses without impairing wide dynamic range of the 7360 deflection-beam mixer. L1 5 turns, L2-L5 35μH, L6, L7 0·3μH. Pre-selector tuning with four ganged 25pF capacitors

As a follow-up to the W1KLK article, Dick Smith, W1FTX, (*QST* May 1972) points out one way in which many amateurs can very easily obtain the advantages (particularly on bands such as 3·5MHz and 7MHz) of extra rf tuned circuits without having to build another receiver. A lot of amateurs still have available for standby or other purposes an old receiver, discarded because of possible lack of stability or selectivity, yet including two good rf stages in front of the mixer. He therefore advocates running the incoming signal through these stages, operated at very low gain, and taking the output from the readily available mixer top-cap. The BC342 is only one of many receivers of the 'forties which can still form the basis of a useful way of improving receiver front-end performance, while still retaining the advantages offered by the modern receiver.

Minimum-loss bandpass filters

But what about the amateur who has no locals just down the road to worry about but is still troubled with the cumulative effects of the whole spectrum of high-power broadcast and commercial stations? Could he not just fit a steep-sided bandpass filter in front of the receiver? We have referred before to the idea of using a crystal bandpass filter in this way, although little has been heard recently of this expensive technique.

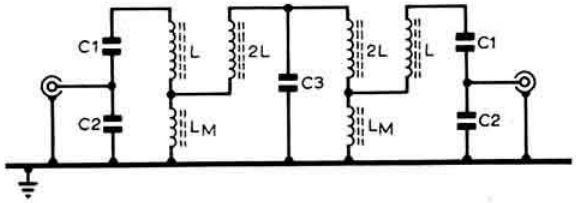

Fig 5. OH2CD's minimum loss bandpass filter. Values for 14MHz: L 2·95μH, 2L 5·9μH, LM 0·27μH, C1 22pF with 25pF trimmer, C2 340pF, C3 10–60pF trimmer (about 34pF). For 3·5MHz L 8μH, 2L 16μH, LM 2·4μH, C1 150pF plus 33pF and 5–25pF trimmer, C2 1nF, C3 150pF and 10–60pF trimmer

V. Aumala, OH2CD, in *Radio-Amatööri* (No 6/1971) has described some interesting Cohn-type minimum-loss filters (see *TT* October 1970) for 3·5MHz and 14MHz. Each filter covers the whole of the amateur band concerned, then the response drops away well, and the insertion loss is low. Clearly one application for such filters would be receiver protection; another possibility would be as an improved form of "harmoniker" band-pass filter for cleaning up the output from a transmitter, for anti-tvi or other reasons. The voltage ratings of the capacitors etc would depend on the application envisaged. As we are unable to follow the original OH2CD text in Finnish, we are not too certain as to the uses he suggested, but the filter values shown in Fig 5 should prove a useful start for anyone wishing to experiment with this type of approach; Siemens ferrite toroids were used in the original.

Vertically phased arrays

Suddenly all the amateur journals seem to be filled with articles on vertically-polarized phased arrays, either to form a fixed beam, or, as in the design given in *TT* (September 1970) using switched delay lines to provide electronic steering. It should not be forgotten that there are some alternatives to the grounded monopole approach: one is the Bobtail (*TT* July 1970); another is resurrected in PA0SE's *Reflecties* (*Electron* April 1972) from a 1934 design by PA0ZN. This is shown in Fig 6 and will be seen to have a close affinity to the Bobtail but is even simpler to try out. The Zepp feeder provides a voltage feed at the centre point of the horizontal span, with cancellation in some directions of the horizontally polarized radiation from the top span. Some people may not like the idea of voltage points down at ground level at the ends of the vertical sections, but it certainly amounts to an easily implemented design. It would presumably work, though rather differently, on all multiples of the fundamental frequency.

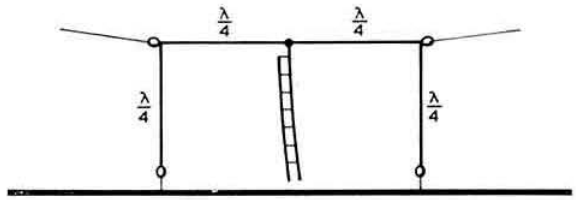

Fig 6. A 1934 aerial by PA0ZN as described by PA0SE in 1972

Modified 300Ω ribbon feeder—Mark II

Harry Habig, K8ANV, who originated the Delta-loop beam with its recognized mechanical advantages over the cubical quad configuration, has sent along a fascinating set of photographs showing simple ways of constructing and erecting these aerials. It is hoped that these can form the basis of a separate item later.

But in the meantime he also comments most usefully on the G3WBT low-loss, wet-weather feeder (*TT* February 1972) formed by cutting "windows" in normal 300Ω ribbon. In doing so he confirms what I implied at the time: that for applications where this is not kept under some degree of tension one has to be careful not to finish up with a floppy feeder which does not hold the correct spacing between the wires.

He recalls that back in 1947 in Dayton, Ohio, he set up a small punch press in his tool shop and made a long run of punching out windows in this type of ribbon for the local amateurs. He believes that the 2⅜in windows recommended by G3WBT are too long for most applications and enclosed a short length of line with the windows about 1in and the cross-struts about ⅛in: see Fig 7. Certainly these dimensions seem to result in a very practical line which should retain its spacing with no problems at all. K8ANV believes that the 1in windows are in fact about the maximum for most applications.

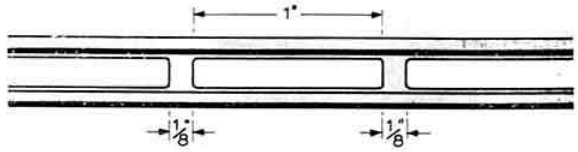

Fig 7. K8ANV's suggested dimensions for modifying 300Ω ribbon feeder without affecting the wire spacing even when not under tension

He also found out at the time that if after finishing the punching out of the ribbon you *flame polish* the work you improve the water-repelling properties of the line.

Certainly from the sample, it would appear that 300Ω ribbon modified in this way would form an extremely useful feeder for both hf and vhf applications.

High-angle "super-gain" dipole

In most of what is written about amateur radio aerials, it is assumed that the prime object is to work long distances, calling for maximum low-angle radiation. But there are exceptions to this requirement: some amateurs want to maintain regular contact with stations at quite modest distances. For this, high-angle radiation and reception not only provides a useful boost to signals, but also discriminates against unwanted signals coming in at the lower angles. High-angle systems are widely used in tropical broadcasting stations, and Paul Sollom described a number of arrays based on this approach some years ago in the *RSGB Bulletin*.

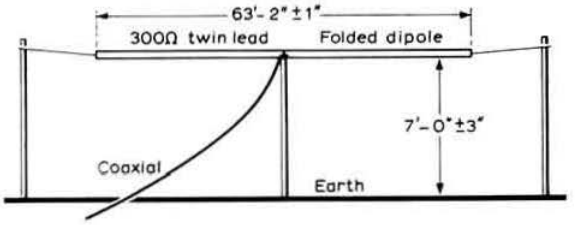

Fig 8. High angle "super-gain" dipole

Old Man (Nr 11/1971) reprints an article by Ed Dusena, W4NVK, on "A super-gain antenna for 40m". In effect this is a folded dipole slung just 7ft above ground and fed by 50Ω coaxial cable to take into account the low feed impedance resulting from the aerial's proximity to ground. The arrangement is intended for working over distances of about 50 to 200 miles, but is said to be reasonably effective at times up to about 1,000 miles. The ground effect is increased by placing three reflecting wires of non-critical length, 65 to 85ft, along the ground directly beneath the aerial.

In *TT* (March 1971) we reprinted the diagram of a three-band vertical aerial ($\frac{5}{8}\lambda$ on 14MHz but effective also on 7 and 3·5MHz) by Peter Brekken, LA1EI, from his original article in *Amator Radio*. At the time we admitted that there was a good deal more to his article than just the diagram. It was, therefore, interesting to find an English translation in the annual antenna issue of *Ham Radio* (May 1972) including a full discussion of the design principles, and adding further confirmation to the initial impression that this is a useful design for dx operation.

Matching mobile whip aerials

Phil Zeid, 9M2CP, whose previous contribution to *TT* was the large Z-beam (August 1971), now comes up with a novel and apparently effective system of feeding mobile whip aerials—or indeed other short aerials. He uses a broad-band ferrite-core transformer, similar to the type found in 4 : 1 bifilar-wound baluns but having taps taken off one of the windings to provide a selection of matching ratios. No details are given of the actual core used, although clearly

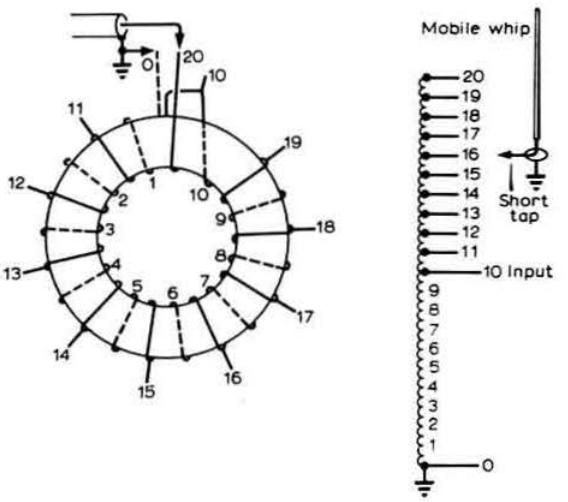

Fig 9. 9M2CP's ferrite broad-band bifilar-wound step-down rf transformer for use with mobile whip aerials. Approximate step-down ratios for the various tap positions: 20, 1·0; 19, 0·90; 18, 0·81; 17, 0·72; 16, 0·64; 15, 0·58; 14, 0·49; 13, 0·42; 12, 0·36; 11, 0·30; 10, 0·25

this could be similar to the type used by G3CDR in his inverted-L aerial (*TT* February 1971) or, of course, a ferrite-core type balun converted to this purpose.

The details given in Fig 9 are largely self-explanatory but 9M2CP adds the following notes: "Keep earth point of the coaxial shield near the base of the whip to a good chassis earth. A 1 : 1 swr can be obtained only at the resonant frequency of the aerial. Adjust aerial to the approximate frequency (or accurately with a noise bridge). Use tap giving lowest swr. Check the frequency giving lowest swr. Re-adjust length of aerial. Repeat if necessary. Tuning is very sharp on low-frequency bands."

Although the principle is a simple one, 9M2CP has not seen it described anywhere and has not come across anyone else using the technique. In practice he finds it gives outstanding results and considers: "It is comforting to ride along and, on your desired frequency, hardly see a movement on the swr meter when pushing out peak power!"

9M2CP does not indicate on which bands he uses the system and we suspect that this may be rather more on hf bands than is usual in mobile operation here; nevertheless the idea is well worth keeping in mind.

The G8AGR fm discriminator

G8AGR's novel inductorless balanced discriminator for nbfm reception at low intermediate frequencies (*TT* May 1972) attracted a good deal of attention—including full mathematical analyses from BRS33548 and G3XJE which (in one case after further manipulation by G8AGR) appear to confirm the equation $R2/R1 = C1/C2 = \sqrt{2}$ as the condition for maximum output.

Barry Priestley, G3JGO, is a little concerned at the suggestion that this arrangement will have intrinsically better performance than the unbalanced arrangement he described in *Radio Communication* in September 1971, but notes some useful features of the circuit. He writes:

"It is true that a balanced discriminator has inherent a.m. rejection by virtue of the balancing, so that in general an unbalanced device depends entirely on its limiter (which is not quite 'throwing away 40dB of the a.m. rejection provided by the limiter'). However, unlike other types of unbalanced discriminator, the pulse count has itself the properties of a limiter, so that G8AGR's circuit may show no advantage in practice.

"Since his circuit is more or less a frequency sensitive bridge should it not be fed with a sine wave and not a square wave? (ie to operate as theory would suggest, there should be some sort of filter between limiter and discriminator). Unfortunately, removing harmonics will tend to show up the deficiencies of the limiter in rejecting a.m., so the a.m. rejection could be worse rather than better than with pulse count techniques.

"However, the point about the generation of high amplitude spikes is a very valid one, and no mention is made of sensitivity in mV/kHz which could be appreciably better than with the pulse-count arrangement, possibly at a trivial expense of degraded linearity and a little more work in setting up.

"Another very interesting feature of G8AGR's circuit is that the arms of the bridge are very elementary high- and low-pass filters; by using more complicated filters it is possible that better linearity/sensitivity can be obtained, rather like 90° phase shift networks for ssb."

Altogether it looks as though Dr Craddock, G8AGR, has given the fm people something to think about!

VXO—the poor man's synthesizer

"A well designed vxo is a poor man's synthesizer," states Doug De Maw, W1CER, in *QST* (May 1972) in an article which provides some useful information on the practical aspects of vxo design for the vhf operator, including a solid-state unit with MPF102 vxo followed by 2N4123 and 2N2102 buffer amplifiers. This operates at about 6·1MHz and typically he achieves solid control over about 12kHz, representing a shift of up to about 300kHz at 146MHz. In his unit he has four switched crystals providing variation over the full 146-147MHz section of the American 2m band.

He notes that no two crystals, even of nominally the same type and style, can be shifted to exactly the same extent; three of his crystals provide 300kHz shift, one about 260kHz. He finds that most crystals can be pulled over much greater ranges than this, but if this is done they tend to lose the solid stability associated with crystal control. Among the useful hints he gives is that FT243 crystals tend to give poor performance in vxo applications, whereas plated HC-6/U types usually work best. Overtone crystals operated at their fundamental frequencies, he finds, often provide remarkable swings in frequency when compared with fundamental-type crystals. Despite his own use of switched crystals, he points out that there is some advantage to be gained, in the reduction of capacitance, by having only a single panel-mounted socket. If a switch is used it should be of the low-capacitance type, preferably with the crystals soldered directly to the lugs of the switch. If a front-panel socket is provided instead, this should be mounted on a plastic sub-panel to reduce capacitance.

Fig 10 shows the basic vxo stage, using a fet. The 1N914 is used as a clamp gate and was found to extend shift by 1.5kHz at the upper end (representing 36kHz at 146MHz).

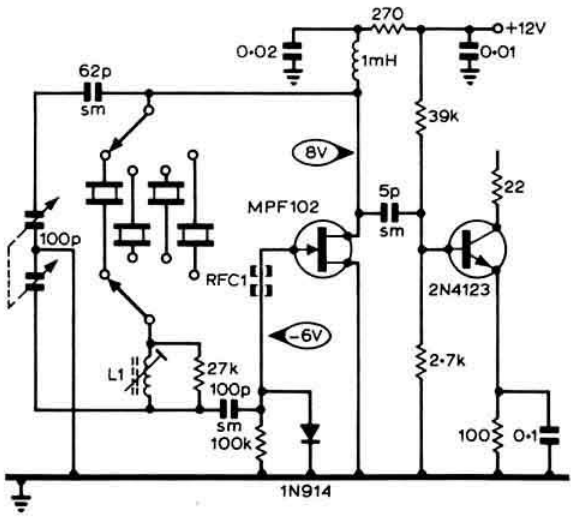

Fig 10. FET oscillator forming heart of the W1CER vxo for 144MHz operation. L1 of medium Q construction (38-85μH slug tuned). Subsequent stages use toroids

TVI, IPs, ABI and all that

The recent discussions on speech processing for ssb continue to have repercussions but are leading to points of general concern.

The view that clipping (even af clipping) can be valuable as an anti-tvi technique receives support from Peter Waters, G3OJV. He has noticed while using a separate receiver to check an ssb transceiver that distortion due to severe overloading of the receiver is appreciably less with a clipper in use than without it, even though the pa current meter appeared to be significantly higher with the clipper in. If one thinks of such a receiver as a local tv receiver the following thoughts emerge:

"Nearly all commercial rigs employ alc but this operates only when the transmitter is fully driven, representing with modern pa stages power in the order of 500W p.e.p. input. Anybody with tvi experience knows that even with harmonics effectively suppressed the fundamental signal can cause severe cross modulation, yet often low-power cw allows operation during tv hours. If one attempts to reduce power on ssb it usually means reducing af gain; since the amplifier is linear and is now operating below the alc level, even a small change in distance between the operator's mouth and microphone can result in dramatic differences in peak output, making it difficult to reduce ssb power by a controlled amount. However, G3OJV points out, the use of a clipper or compressor makes it much easier to do this and should allow low-power operation during tv hours.

On the other hand, Peter Chadwick, G3RZP, strongly disagrees with G3FRB on several points mentioned in the May *TT*. He writes:

"I cannot agree with G3FRB on the subject of intermodulation products: IPs of −10dB may not be noticed by the chap at the other end, but 6kHz away they can be ruining somebody else's contact. It is anti-social—like so many linears one hears!

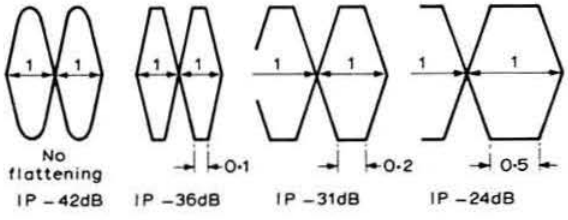

Fig 11. Relationship between flat-topping and intermodulation products noted by G3RZP

"As G3FRB says, harmonics are not necessarily connected with IPs. A Class AB1 stage has a second harmonic component in its anode current 6dB down on that of the fundamental. By Fourier analysis it can be shown that this angle of anode current flow produces predominantly even harmonics. On the other hand, Class C stages with shorter duty angles produce a greater proportion of odd-order harmonics.

"This suggests that driving a pa into Class C, with lots of grid current, may well cause *less* tvi on Channel 1 than if the amplifier is running AB1! It may thus be a vain hope to suggest that Class AB1 is the answer to tvi—it all depends on which harmonic is the troublesome one.

"The figure (Fig 11) shows (roughly) the results of a series of measurements made on a marine transmitter running three 6146B valves in parallel, and provide a measure of IPs relative to various degrees of flat-topping. These have proved repeatable and apply, for example, to my HW101.

"I completely disagree with G3FRB's figures for a valve linear: as indicated above, the second harmonic is −6dB; with a parallel-tuned tank circuit (with Q of 10) this becomes −26dB; with a pi-network this should reduce to about −38 or −40dB. Better than −40dB in the power amplifier itself (without tuned circuits) would require Class A with a total harmonic distortion better than 1 per cent!

"Production of IPs in different specimens of the same basic equipment is an interesting topic—I think that a lot of things add up—a ½dB here and there through several stages may add up in a most disconcerting manner.

"Modern solid-state transmitters using wideband amplifiers and wideband aerials come nowhere near the CCIR recommendations of −43dB or 50mW for harmonics—and personally in this application I would strongly recommend push-pull operation.

"In one recent marine transmitter using a wideband push-pull power amplifier I found that 2nd and 3rd harmonics were both −44dB relative p.e.p. and driving it into Class C made the 2nd harmonic go down.

"Finally, information theory would seem to indicate that it is rate of change of power which gives information; by taking the peaks off is it not possible that we reduce the rate of change of information? But my main complaint about speech clipping is loss of naturalness. Those of us who live in a flat and use only a long wire aerial do not expect to work much dx when there is competition, so we may as well plump for naturalness. While clipping might give me an extra 6dB or so, one really wants, in such circumstances, an extra 16 or 20dB to make a real difference to dx operation!"

I suspect that G3RZP is being deliberately provocative in certain of these remarks—but it is true that a number of readers are concerned lest amateurs be encouraged to seek the communications "intelligibility" of severe clipping without fully appreciating that a voice that is merely intelligible is not necessarily the only criterion for pleasant amateur contacts. Intelligibility comes first—but important also is a degree of fidelity and naturalness.

Tunable twin-T network

The stable twin-T audio oscillator arrangement recommended by G2UJ (April *TT*) reminded Dick Biddulph, G8DPS, of a tunable twin-T network which he has used in the past to form narrow-band audio filters. This particular version of the twin-T (Fig 12) is attributed to Andreev (*Telecommunications USSR* 1960, No 2, p195 English translation Pergamon Press, or see also *Elect. Eng.* December 1964 p849 and February 1965, p120). While G8DPS has not tried this network in an oscillator application, there would seem no reason why it should not be suitable. Andreev taps the "vertical" resistor, taking the tap to earth.

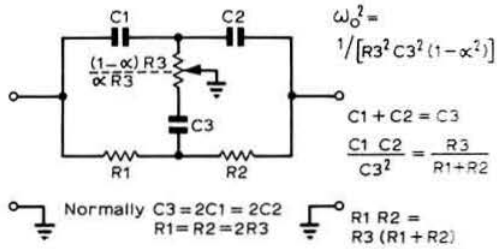

Fig 12. The Andreev tunable parallel-T network

Safety first

In *TT*, January 1970, we noted some of the causes of fatal electrical accidents during 1968. A recent report by the Home Office electrical adviser on the 48 electrical fatalities in 1970 serves as a reminder of the hazards presented by injudicious use of mains-connected portable appliances, incompetent wiring (and not only by do-it-yourself wiremen!) and the like. Although amateur radio does not figure in any of the 1970 cases, constant vigilance should be the order of the day. Though it should hardly be necessary in this day and age to warn readers against the danger (which killed an 18-year-old youth listening to a record player) of *wearing headphones in the bath*. One 14-year-old was also electrocuted in a bath while disconnecting an extension speaker from a television set. Electric drills figured in several cases; a man was killed working on a live "fruit machine", and so on. All cases underline one point—the RSGB's "Safety Recommendations for the Amateur Radio Station" (*Radio Communication Handbook*, *Guide to Amateur Radio* etc) should be taken seriously at all times.

Here and there

I have already owned up to the "clanger" of including in *TT* a so-called NASA ssb audio filter that was apparently a 1971 April-fool joke by *Radio-REF*. Imagine my further embarrassment at finding out (thanks first to VK4OD) that *Electronics Australia* has reprinted my item in apparently all seriousness. Or did they? It came out in their *April 1972* issue! These things have a habit of living on to haunt one, and personally I have sworn off April-fool technical jokes for life!

FOUR METRES AND DOWN

by JACK HUM, G5UM*

"It tolls for thee . . ."

Reports which came in during and after the May 144MHz Contest that there had been interference to professional services from a number of amateur portables which were out that Sunday give added urgency for every intending contestant to take a further long hard look at the Code of Practice for VHF Contest Operation, page 322 of May *Radio Communication*.

Members who have already done this and believe their equipments to be thoroughly cleansed and above reproach for future competitive events may feel that they have adequately looked to their moats. But have they? The doubt may be reasonably expressed in the light of the fact that during the May contest one of the reported cases of interference was in respect of a group of members known to be technically well heeled. When this happens, lesser mortals may well take heed, and this means you and me.

While the contest was still on, the group of members mentioned above was told that interference was being caused to an air traffic control receiver. It did not take them long to discover why their tiny solid-state transmitter feeding no more than 2W of rf to the 8-element Yagi atop a Shropshire hill was clobbering the air traffic control receiver on another hill 15 miles away: a spurious output at a level 20dB down on the carrier (a mere 20mW) but removed from the carrier by 24MHz, which was the vfo frequency, had landed on the 121MHz air traffic control channel.

Although this traumatic experience did not put the group out of the contest (they wisely resorted to crystal control only), it gave them furiously to rethink the whole question of the future organization of RSGB metre-wave contests. Is there, for example, a case for limiting all events (not just VHF NFD) to 25W dc input, both in the interests of reducing in-band cross-modulation and inhibiting out-of-band interference to other services? Or is this progressing backwards? Your thoughts, members. Meanwhile back to page 322, lest the bell should toll for thee.

Points per mode

Further to the May 144MHz event, but on a happier note, we were intrigued to receive from G3NHE of Sheffield a breakdown of his contest contacts by mode, which reads as follows:

Mode	Percentage of total QSOs	Percentage of total points	Average pts/QSO
A1	34	49	7·3
A3J	40	39	4·8
A3	26	12	2·3

Martin Dann remarks: "The last column puts the three modes quite definitely in order of efficiency. I might add that periods of operation on each mode were evenly spread throughout the eight hours of the contest, so conditions bore no part in the result."

Further to the morse facility, on next to . . .

Set a target date, says 'ASM

Everything (and more) which had been advocated in FMD as morse learning aids was pressed into service by G8ERK of Eastleigh; he used records, the RSGB slow morse service from G3IBJ nearby at Southampton and "dit dah-ing" motor car number plates on the way to work. Even a computer played a part: one day it fed letters, figures and random callsigns on to a tape, next day Alan Murphy copied them back.

But above all else, he declares, the great thing is to set yourself a target date by which you will be code-proficient. The date *he* set himself was round about the time the callsign G4ASM would be emerging from the MPT, which told him when it would be available. He got fourteens under the belt with a couple of weeks to spare. Now his new callsign matches his initials.

He adds: "The other method is to arrange the test about one or two months in advance. Because it now costs quite a bit to re-apply, there is a definite date incentive for passing."

* * *

G3ANQ points out that mental reception of morse can be taught from the outset, but correct instruction is vital; the pupil may read the code in one of several ways, which must be discovered and developed. Learning and receiving, he says, should start simultaneously, with constant oral checks to balance the alphabet thoroughly at 6-7w/min before speed practice begins. During this period mental reading of the code is intensified to get the pupil off paper as soon as possible, moving him carefully along with the aid of a sympathetic and expert instructor.

Generously, G3ANQ, who has been involved with morse transmitting and training, and can read up to 40w/min in his head, adds: "Tell them to write to me and I will help them all I can."

The first UK repeater: GB3PI

Before British television broadcasting began all those decades ago, a report was published laying down the parameters to be used. A key phrase which appeared in that report was *solvitur ambulando*, make haste slowly (or in three syllables: "Steady, chaps").

This is how it is going to be with the development of amateur vhf talk-through beacons, popularly repeaters. And this is how it *should* be. For there is some misgiving among UK metre-wave men that repeaters are not necessarily "a good thing", a feeling based on experiences in other countries which already have them. On the other hand, be-

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cause it is accepted that the repeater concept *does* confer certain advantages upon amateur communication, the best thing to do is to set it up and see.

The experimental repeater GB3PI, mentioned elsewhere in this issue, is licensed to continue for 12 months, and it will determine UK repeater policy for the future.

How will it advance the art of amateur vhf communication? By making mobile-to-mobile contacts much easier, by enabling mobiles to work fixed stations which might be out of normal range.

How will it degrade the art of amateur vhf communication? By being taken over for conversation-type QSOs. Natters and repeaters do not mix. Quick-fire finger-on-the-button calls will be the thing to try.

If this repeater station gives new life to 2m mobile communication, which is too often frustrated by poor vehicle aerials, high attenuation and irritating flutter, the experiment will be vindicated. But if ducks and drakes take over, there will be one thing to do: shoot them down.

How others use repeaters

With repeater talk-through systems very much in UK members' minds, how are they used in VK? Here is a note from Brian Gibbs, VK4IC, one time G3OZH of Hertfordshire.

"We have a repeater on a mountain about 60 miles south of Brisbane which enables us to work the stations on the coast. The up channel is 146·1 and the down channel 145·6, copyable at any time here in Brisbane. But much activity is non-repeater: many carphones ex-AWA and Pye are now to be had, all fm with tuning locked either on Channel A, 145·854; Channel B, 146; or Channel C, 146·146. You only have to call 'CQ Channel B' once and you get a QSO if anyone is about."

* * *

Some info on how repeaters are organized in New Zealand comes from ZL2TAR, Doug Ingham of Lower Hutt. A few elderly a.m. talk-throughs are being replaced by fm equipment to cover the whole country in four channel blocks and on, eventually, 30 sites, one per population centre. Channel A accepts on 146·3 and re-radiates on 145·6, Channel B has 146·35 in and 145·65 out, and Channel C takes 146·4 and gives 145·7. In addition, Channel D is planned as a "free for all" national channel to be sited at any location. This will receive on 146·45 and send on 145·75. All utilize the same 700kHz separation as the Australian, which makes the VK and ZL systems compatible.

These talk-throughs complement the existing beacon chain, ZL1VHF on 145·1 at Auckland, ZL2VHF 145·2 at Wellington, ZL3VHF 145·3 at Christchurch, and ZL4VHF on 145·4 at Dunedin. Doug Ingham is beacon keeper at ZL2VHF, from which two broad radiation lobes to north and south are energized continuously with 10W out, callsign every 15s on F1, and carrier off for 2s every 5min.

* * *

Around Nashville in Tennessee there are three repeaters, owned by different radio clubs and delivering 100W out from each down channel. Here, in W4 and as VK4, fm is the mode favoured. Almost all the Nashville radio amateurs have 2m fm talk-boxes with 15W that will trigger the repeaters at 20 miles plus, either from home or via stub aerials mounted on car boot-lids, everything crystal controlled, no VFOs.

Imparting this information, Dr Rob Roy, W4PZA, tells us that one of the Nashville repeaters has facilities for telephone patch, and it stays on the air busy handling traffic, especially as dad heads for home from work and can call up home to see if his wife needs anything from the grocery store.

Special note: "Doc" Roy is now in the UK operating mobile with a reciprocal licence 144·48 and 145·0MHz nbfm, mainly in Zone A and the London area until 18 July. Callsign not known at time of closing for press.

* * *

Back here at home a viewpoint expressed to us by G3REP has been uttered by some other members: that repeaters on 2m in a crowded band on a crowded island can cause a lot of problems, and would they not be better deployed on 70cm, where among many other advantages they would stimulate the design of original equipment?

London's G8AUU (Kris Partridge is also ON8KH, F0DA and "Stroke DL and LX") draws on pleasant memories of new friends made on the air while Continental motoring, and of help given by locals on how to avoid traffic snarl-ups. But visitors who drive to good vhf sites may well pull in three or more DL repeaters, so a knowledge of morse in order to identify them is essential (not to mention a knowledge of the German language).

Super-dx on 4m

Always on the verge of great things: that is an apt description of our 70MHz band. Devotees who remember the Gib openings of the 'sixties monitor 4m methodically in anticipation of further super-dx. One target was Malta. Another right now is Cyprus, activated by G3FET, who is on the island for a 2-3 year stint and licensed as ZC4LR. He and G2DN, Norman Guy of Purley in Surrey, aware that success will never come from random operation, have established the following schedule:

Day 1 0800–0810, 1100–1110, 1500–1510 and 1700–1710.
Day 2 1500–1510, 1700–1710, 1800–1810.
Day 3 1100–1110, 1500–1510, 1700–1710 and 1800–1810.
Day 4 rest day or random searching, then back to Day 1.

Throughout these times ZC4LR, ZC4KJ and members of the club station ZC4LC listen for any UK stations, preferably cw around 70·1 because the QRB is almost 2,000 miles. They will reply on 28·5, 21·25 or 14·15, depending on conditions, and plus or minus a few kilohertz according to the QRM level.

At both the UK and Cyprus ends there will be *a daily watch* as follows: *4 July* Day 1 schedule; *5 July* Day 2 schedule; *6 July* Day 3 schedule; and *7 July* Day 4 schedule. Then on 8 July back to Day 1 schedule and so on throughout the warm weather months when 4m may be expected to open.

Daily bread considerations will bedevil the above sked-times for most 4m men, so a special effort should be made on Saturdays and Sundays, beams to the SE, to try to break down this challenging path.

* * *

That 4m has been well open for long-haul has been very evident to Ron Ham, BRS15744. The equinoctial sporadic-E manifestations of late May and early June were so emphatic

as to fill 4m with Continental fm broadcasters. A noise storm affecting the hf bands on 28 May spread steadily upwards in frequency to envelop 4m by 1 June.

Glamorgan group

A dozen operators in Glamorgan are regularly active on 2m sideband and telegraphy, and in spite of the notorious difficulties of the terrain many of them regularly notch contacts up to 250 miles QRB. Look for them any Monday activity night, and on Sundays from 0900gmt onwards.

And a chance to look for them in person too, if you happen to live within the county; there is a proposal to form a vhf/uhf group to canalize the metre-wave interest in the region. Regular meetings at an agreed central venue are envisaged. A line to GW3ZTH, Joe Ludlow, at "Maes Glas", Cefn Cribbwr, Bridgend, Glam, will help to get things moving.

Long haul reports wanted

Several long-haul 2m contacts across Europe by sporadic-E which have occurred this year underline the need to canalize and document information on this subject.

Particularly, on 4 April I3PFR near Venice was worked by G, F, ON and PA operators and widely heard in the UK, an Italian swl at Rimini heard F, G and ON, and traces of YU3TVD were detected in France. The E-clump which caused these reflections seems to have been over SW Germany.

On 19 February CT1AI was penetrating into Germany and Denmark.

Operators who can provide further accurate information on the events of these two dates are asked to send it to F8SH, who is in effect the focal point for IARU Region 1 propagation studies. Reports on similar occurrences should also go to him (S. Canivenc, 6 Rue de Pont Hélé, Perros-Guirec, France). Reports on auroral propagation should go to RSGB headquarters, marked for the attention of the vhf manager.

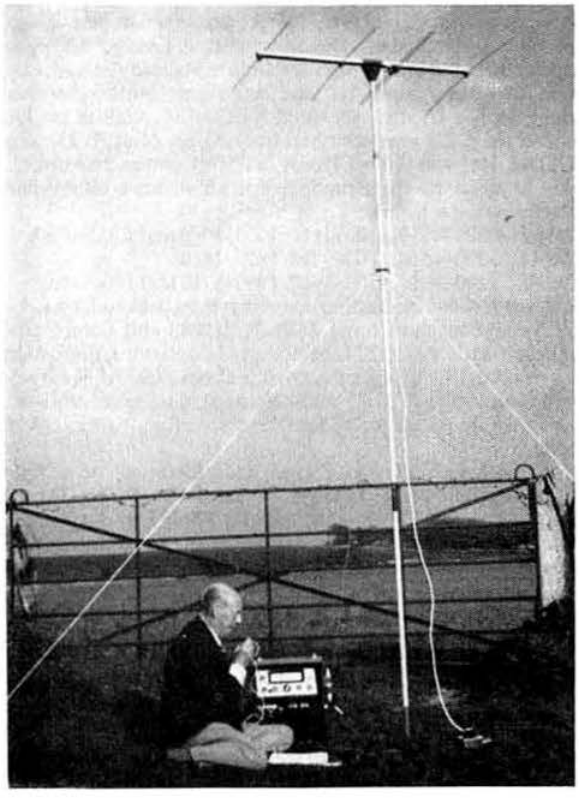
In all cases it is of great importance to state time and beam heading accurately, and signal levels in decibels above noise.

BATC convention '72

This year's BATC Convention will be held at the ITA headquarters at 70 Brompton Road, London, on Saturday 16 September. There will be much to see, hear and do, and many like-minded "/T" men to meet between 1030 and 1830.

Details are given in the May number of *CQ-TV*, which adds the information that there will be a convention dinner in the evening if sufficient members write in quickly to Don Reid, 59 Weald Rd, Brentwood, Essex,—and our guess is that plenty will, remembering the highly successful BATC convention dinners held in previous years.

The new BATC president is a distinguished old-timer, Bob Roberts, G6NR, who succeeds Ivan James, G5IJ, on the latter's appointment as scientific adviser to EMI's Central Research Laboratory on television systems. Congratulations to both.



Members who did not have the good fortune to work the special activity stations which were operative in the Bristol Channel area during the "Marconi 75th Anniversary" will have another chance soon. The pictures show the person (Bill Scarr) and the equipment they will talk to: the all-transistor 2m transceiver (above) was built specially for the May commemoration. The collapsible 4-element aerial is carried in a fishing-rod bag. Bill Scarr hopes to take his vehicle to the top of Brean Down and put G2WS/P on 70cm and 23cm as well as on 2m. Dates on GB2RS and in *FMD* when notified

Straight through on 4m

People using the now available 70MHz overtone crystals in straight-through 4m transmitters report an improvement in the tvi situation as compared with transmitters using the conventional chain of multipliers. Why this should be is not entirely clear: if the multiplier chain is leak-proof (how many are?) then the remaining culprit is the output stage and the selectivity built into it, or not built into it. This means keeping 70MHz output clear of 66·75 and 61·75, those sensitive Channel 5 and 4 frequencies.

Derby's G2FRO, in a Channel 4 area, switches a bank of 70MHz overtone crystals in a Robert Dollar circuit using the triode section of a 6U8 bandpass coupled to a 6CH6 running at 5W input and neutralized by short lengths of wire from grid and anode in proximity. For satisfactory overtone operation the 470pF capacity of the circuit diagram on page 6.6 of the *Radio Communication Handbook* was reduced to 47pF.

While the family watch Channel 4 television G2FRO can happily operate on 70MHz with a "clean" transmitter. He wishes others would join him on weekday evenings to increase the QSO rate. Perhaps encouraged by this note they will do so, with the aid of just two valves and a 70MHz crystal.

G2FRO is one of several tvi-proofed stations in the Midlands which are on 4m every Wednesday activity night between 9 and 10 pm, listening on 2m for cross-band contacts.

Expeditionaries

Noted for activating rare countries, the March and District Radio Amateur Society will have G3PMH/P in Huntingdonshire on 19-20 August. On the Saturday they will use 145·2MHz a.m., 1700-2300gmt, with the first 10min of each hour devoted to cw. They will move to 433·0MHz by arrangement on 2m. Here is the schedule for Sunday 20 August: 0800-1000gmt: 145·41 ssb; 1000-1200gmt 70.26 a.m., but first 10min in the hour A1; 1200-1400gmt 433·0MHz (again first 10min each hour cw); 1400-1500gmt, a.m. Frequencies are nominal: vfo control will permit QSY.

Another rarity is GC on 4m. Between 21 July–5 August look for GC3FSN/M on 70·26 upwards. Alan Butcher hopes to activate Jersey most nights. Book a sked by sending him an sae at 70 Hughenden Av, High Wycombe, Bucks.

And 4m from another island—Arran in the county of Bute. Dates 7-12 September. Ops: the famous GM3JFG/GM8AGU team. They will also have 2m ssb, am/fm and cw.

Certificates on the way to . . .

. . . Alan Williams of Ryde in the Isle of Wight, two of them, in fact, and both for 70MHz. For the home station G3KSU he collects No 92, and for his portable activity in G and GM he has obtained that rarity, a 4m Senior. His is only the 10th to be awarded. And as for Seniors for 2m . . .

. . . Keith Fisher, G3WSN, of Chelmsford, collects No 38. Some nifty key work brought him the more remote of the needful 15 plus 60.

. . . Bob Eva, G8COG, of Birmingham, is involved with cinematics most evenings and misses out on peak periods of activity on 2m. So he was well pleased to be able to make a claim for the 144MHz Standard Award; Certificate No 259 now hangs above the rig.

. . . Bill Hodgson, G3BW, of Whitehaven, submitted some almost historical cards in his five plus 30, including one from G3EHY, who gained the first ever 144MHz Transmitting Certificate No 1 back in 1963. Bill's recent return to the band helped him quickly collect the remaining cards he needed to make the claim. To him Certificate No 260.

How to claim an FMD parchment

So many people have taken to the metre wavelengths since we last published the FMD certificate rules here, and so many ask us to print them, that we now give them below:

You can claim a Four Metres and Down Certificate either from your **fixed** QTH, as a **portable** from anywhere in the UK (so the prefix you use is immaterial) or as a **mobile**. Fourthly, if you operate from an **alternative address**, you can claim for "Stroke A". But categories cannot be mixed. Submit QSLs as follows:

70MHz	20 counties, three countries;
70MHz Senior	60 counties, six countries;
144MHz	30 counties, five countries;
144MHz Senior	60 counties, 15 countries;
432MHz	20 counties, three countries;
432MHz Senior	40 counties, 9 countries;
1,296MHz	20 counties, three countries;
Supreme Award	For fixed stations only; make a claim if you hold *three* Senior awards, or *two* Seniors plus one 1,296MHz.

Microwave Awards

Available for the *first* contact which a member makes on any of the following bands, as substantiated by QSL card:

13cm over 500km; 9cm over 400km; 6cm over 300km; 3cm over 150km, and 15mm over 150km.

How to claim: arrange cards in alphabetical country-and-county order, complete with check list, and send, preferably by recorded delivery, to G5UM, hon vhf certificates manager.

Listeners: the same rules apply to BRS and A-men in all categories.

380 equals "Two"

Using the first-ever GB prefix to go to a Class B station, GB8NGS will operate every evening this month and most lunch times as part of the celebrations of the 380th anniversary of Normanton Grammar School. Centred on 145·6 but QSY on request, it will keep these sked-times: first 30min of each hour, tuning the whole band but not listening co-channel; next 15min listening co-channel only; last 15min listening co-channel, then 145·41 for ssb calls.

Although the station is now in operation from its south Yorkshire site, skeds will be accepted if a swift sae is sent to G8FSO, Dave Lockwood, 7 Northfield Road, Sharlston Common, Wakefield.

For something even more rare over now to . . .

Elba on 2m

More than 3,000ft above Med level will be IA5SVA during VHF NFD weekend; in fact, they will be operative from 1200gmt on the Saturday until 1800gmt on 3 September, and with a 22-element aerial to boot, from the highest peak on the island of Elba.

A high spot (literally) of the Northern Radio Societies Association Convention in Manchester was the live television demonstration by G6AGI/T whose video beamed down to Belle Vue from Mellor Moor 10 miles away was of excellent quality and brought a continuous swarm of visitors to the monitors. Pictured here is G3YGL, hand on video tape player, explaining technicalities to two of them

They will be on the 2m sideband channel plus 144·7MHz a.m., with perhaps cw thrown in. Anyone writing to them for skeds might suggest they try the bottom end of 2m for A1; they are unlikely to break through the G-QRM on 144·7. Address for skeds is I2SVA, Box 144, 22100, Como, Italy.

. . . and another island

Now radiating from Orkney (until 8 July) is GM3GIZ/P, the dxpedition by the Chester & District ARS, from 10pm to midnight in Zone D phone and down at the cw end of 2m.

One for the microwave men

An offer to radiate from Dartmoor on 70cm, 23cm, 13cm and 3cm comes from G3WDG, C. W. Suckling, 31 Oakwood Road, Chandler's Ford, Hants, who will be in Devon and Cornwall from 5–19 August. Requests for skeds to him before 5 August.

From home he is active on 21GHz (15mm). It should be placed on record that on this band on 21 April he worked G8DEK over a 3-mile path.

Contest commentary

Inevitably, the big turnout for the 432MHz event on 6–7 May will provoke the comment "Where do they all go when there's no contest on?" This contest proved, as other 70cm events have done before, that a marvellous all-Britain link could be forged between the established pockets of activity from the Home Counties to 200 miles or more northwards. It proved something else: that weak signal contacts on the key rake in the points where phone fails—just like 2m. Many of the Class A portables which were around during this contest did have keying facilities. Others which did not will put themselves at a disadvantage if nothing has been done about it by VHF NFD.

Another reminder to all intending VHF NFD participants —and indeed to *all* metre-wave contest men: absorb the six point Code of Practice for VHF Contest Operation which was printed on page 322 in the May issue. When G3FZL read it over to the assembled multitude at the Whitton Convention there were numerous "Hear hears". Take a copy now, and have it inwardly marked and learned by all in your group concerned with vhf/uhf contest activity.

Are you an Old Boy, OM?

Many university and college radio societies—and there *are* many of them (see RSGB *Callbook*)—become famous through their enthusiastic participation in Society contests. Propelled by their virility to mountain tops and rare counties, they earn the gratitude of the rest of the vhf fraternity for operating there often under quite arduous conditions.

Then when the protagonists pass out into industry and commerce all this collective enthusiasm is dispersed. Which is a pity, for many of those involved in past endeavours would like to keep in touch with one another if this could be arranged.

It can be, if the initiative of the Southampton University Radio Club is followed. Everyone on the metre waves must have heard their callsign G3KMI (often G3KMI/P) at some time or another. Now there is a move to form a KMI-Veterans' Society. Old members are asked to write to the society c/o A. Cross, The University, Highfield, Southampton, and give their views about organizing reunions and vhf schedules between ex-alumni.

Tech Corner

From G3ZXN (E. W. Earnshaw of Newcastle on Tyne)

Choice of a suitable i.f. for a vhf converter is a matter of compromise. Try a low one and you get chronic i.f. breakthrough. Try a high one and you get images. And to get a 28–30MHz bandspread coil for an HRO can be expensive: it cost me £3.50.

A friend suggested using a lower i.f. When 4–2MHz (not 2–4MHz) was tried the i.f. breakthrough disappeared like magic, and a little consideration of the crystal oscillator values used will show why. With a tunable i.f. of 22–24MHz the injection frequency will be 122MHz. But 22–24MHz *below* 122MHz gives 98–100MHz, that is, the fm broadcast band. Point made!

By having backward tuning i.f. the injection frequency is *above* the 2m band, where there are rather fewer spurii than below it. I now use the HRO on an i.f. of 4–2MHz. It is very sensitive, very stable and quite lacking in images and i.f. breakthrough. Trying the same converter on an AR88, normally bad for i.f. breakthrough, gave the same encouraging results. The converter is of course rf leakproof with supplies fed via 0·01 feedthroughs.

From G8CPS (Nigel Williams, London SW16)

The comments by Tim England, A7929, (*FMD* May p313) about vertical aerials might help to persuade the vhf fraternity to realise that, for example, a $\frac{5}{8}\lambda$ whip with a loading coil to remove its capacitance has a gain of the order of 3dB. Many professional base stations use ground planes with their $\frac{5}{8}\lambda$ whips when installing them in elevated positions. From the amateur's point of view an advantage of the whip is that it

gives omni-directivity, thus enabling stations to hold a true net without the chore of beam turning.

In the London area there must be almost 50 vertically-polarized home and mobile stations in the 2m band, where 10-mile contacts through heavily-built-up areas are commonplace from 10W fm transmitters, and up to 40 miles out in the country.

Further to the use of fm, whatever opprobium it has attracted to itself comes from operators' lack of knowledge about the correct setting up of the deviation. Using a deviation of 3kHz and a maximum modulating frequency of 3kHz, frequency modulation is superior to an a.m. signal of similar power because all of the fm signal carries voice information whereas with a.m. most of the power goes into generating an unused carrier.

Skedspots

Check 70cm Sunday nights at 9pm. You might hear G8BCG of Manchester and G6GN of Bristol. They look for other contacts after their schedule.

Do you run a school station? If so, G3SCP/A would welcome skeds from Luton to initiate a schools net on 2m. They are on 144·7 1200-1300 and 1530bst onwards. Suggestions to G3SCP, QTHR.

When the balloon went up

Few startling results appeared from the flight of Anjou 1 last month, the F-men's transponder balloon. Even as far south as Basingstoke fleeting signals only were heard (three a.m., one ssb) from French stations between 145·6 and 145·8MHz by G8CCH over a period of no more than 15min. "Greater publicity is a must if these transponders are to be successful," adds Andrew Blockley, and he is right.

Here and there

Exit and enter "triple-B". Roger Taylor transfers from G8BBB to G4BEL, so look for some 4m erp from that noted Cambridge hilltop. At Great Malvern Geoff Edwards has G4BBB in place of G8CRA, active nightly on 70cm.

* * *

Two crystals for 16.0995 type HC18U producing output near the 2m mobile channel are offered by G8DLQ along with 16·083 B7G and 36·450 on HC18U, all OK for 2m. He will exchange for any crystals dropping into Zones A and B. He also seeks 14·4MHz ". . . as it seems possible to obtain stable 72MHz output from these in a transistor Hartley despite their not functioning in the usual base-earth mode." Letters to R. Berkolds, 73 Bardberry Av, Davis Estate, Chatham, Kent.

* * *

Next meeting of West Midlands VHF Group: "Mobile equipment forum", 8pm Thursday 6 July, Heart of England Social Club, Berkswell Road, Meriden. All vhf-ers welcome. Pay on arrival.

* * *

Two more old-timers return to 2m: back after 18 years is G8LY, although Constance Hall's activity on 4m has long been appreciated by many. Way up north, G3BW of Whitehaven activating 145·41 as from last November says ". . . back again chasing counties, thanks wholly to my good friend G3BA who has initiated me into the sideband spectrum".

* * *

A nice after-Sunday-dinner Ar opening on 18 June, bottom end of 2m really on the boil, and sounded like it, GM3EOJ especially in demand with the South of England and the Continent—all beams north, of course.

* * *

Granted that one of the pleasures of portable working is going out on the spur of the moment when the weather smiles, but if you *can* give advance notice do so. Already this season reports have arrived of teams claiming the same site, with resultant bad feeling. Where possible, notify in advance via GB2RS and FMD.

* * *

All material for *Four Metres and Down* direct to G5UM, please OMs! Sending any to HQ means re-addressing, expense and delay. The same remarks apply to FMD Certificate claims.

What they say

"It is worth pointing out to G8CCV/M and others that a great deal more is likely to go 'boom' than the pa system if he tries transmitting while refuelling. Never in any circumstances emit r.f. when having petrol pumped into the car"—G3UML.

* * *

"Never mind rf-sensitive Muzak pa systems: what about elementary safety procedures? No transmitting while taking on fuel. Is there any legislation about this, or advice particularly from the aviation scene?"—G3XYX.

* * *

"A growing craze round Bristol is not to give the callsign of the station you are working. So all one hears on 2m is 'From G8XYZ' all the time. Fair enough for breaks, but for long overs it seems both confusing and discourteous to listening stations"—from a Class B man in Bristol.

"So many contestants gabble off their calls in such frantic haste that I just can't be bothered to take a serious interest in them. If only they would give their callsigns just once or twice slowly and distinctly as if they were something that really mattered. . . but it has all been said before, so many times"—from a Class A man in Hampshire.

* * *

"The radio staff at GNF, North Foreland, could not have been more courteous when I took my morse test. They went to a lot of trouble to make me feel at ease"—G4AXS.

* * *

"One good point about the VHF Convention: it allows the collection of outstanding QSLs for the FMD awards!"—G3KSU.

25 YEARS BACK

"Those who expected big things from the 5-metre band this summer have been far from disappointed, as conditions have exceeded anything previously experienced in the history of amateur work on these frequencies . . . Outstanding were the Algerian pair FA8IH and FA9BG . . . G6DH and G5BD were among the first to work FA8IH early in June . . . The Italians came up at the end of May . . ." from "The Month on Five" by G2WS (*RSGB Bulletin* July 1947)

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

TUNING around the bands your scribe is often prompted to wonder just how much thought many of today's amateurs give to the type of equipment they will find best suited to their needs before committing themselves to spending a deal of hard-earned cash. Listening to the average pile-up indicates that there are many who have transceivers and who are unable to transmit or listen to any other frequency than that of the station they are calling. While this is ideal for routine contacts it is an impossible situation for the potentially serious dx worker, and ownership of a separate receiver is an absolute must for him or her. The appearance of A51KV on 14MHz was accompanied by complaints that a 20kHz section of the band was occupied by stations calling off his frequency—but the complainants had not calculated how much of the band may have been in use by the several hundred callers had they been spread across the entire band talking to each other!

JOTA

The 14th Jamboree-on-the-Air, which took place on 16-17 October 1971, appears to have seen an increase in participation from the UK, with the number of stations joining in numbering about 250, compared with the 1970 total of 231. These stations were in contact with Scout stations in 53 countries, and overseas activity showed a very large increase indeed—over 400 overseas stations were heard compared with 254 the year before. It is estimated that between 5,000 and 10,000 Scouts and Guides were involved in JOTA in the UK—an excellent introduction to amateur radio. The 1972 event will take place on the weekend of 21-22 October and the national organizer in the UK is L. R. Mitchell, G3BHK, 28 Darwall Drive, Ascot, Berks.

There are a number of Scout nets which meet regularly. There is a UK net at 0900 (*local time*) every Saturday on 3,740kHz; a European net at 0930 on Saturdays on 14,290-kHz; a world (USA organized) net at 1800 on Saturday on 21,360kHz; a Scandinavian at 0830 on the first Sunday in every month on 7,090kHz; an Australian at 2300 on the fourth Sunday in the month on 14,120kHz; and a Norwegian net at 1430 every Saturday on 3,740kHz.

News from overseas

General information concerning amateur radio in Czechoslovakia has been received from OK3BG. Novice licences are issued at 15 and are held until the age of 18, these are "OL" stations and are limited to 10W input on Top Band and 2m. They need to pass a morse test at 10 w/min, as do Class C licensees who are permitted to use 10W on 160 and 25 on 80m as well as on 2m and 70cm. Class B licences require morse at 15 w/min and permit 75W on all bands and modes. Class A licence holders have to pass a 20w/min test and may use 300W on all bands. In special cases 1kW licences are issued. The power limit is 10W on 160m for all classes of licence. There are about 3,500 amateur stations and about 500 are club stations, and portable/mobile operation is allowed anywhere. Licensed foreign citizens are permitted to operate Czechoslovak stations or obtain a temporary licence—anyone operating in the former category gives the call of the station he is operating/his own call (eg OK1AA/G3FKM).

W2MUM wishes readers to know that he is no longer acting as QSL manager for ZD8CW. He will answer all QSLs sent to him *direct* for the period 3 June to 22 October 1971—those enclosing IRCs will receive their cards direct, the others via the bureaux. No QSLs for ZD8CW can be accepted via bureaux.

G3SGK, Dr B. King, will be working in a small mission hospital in Lesotho for about two years, commencing in October. He has been given the callsign 7P8AM, and will take an FT101 with him. His aerial will probably be a vertical, but as his electricity supply will depend on the hospital generators he is not able to make advance skeds.

9M6BA is now back on the air from Kota Kinabula, Sabah, and is working on all bands 10 to 80m. Barney points out that his callsign was being pirated about a year ago, but all contacts with the genuine 9M6BA will be confirmed.

G3KEF, Tom Fishpool, is at present in New Guinea and has been given the callsign VK9KE. He was using a temporary dipole at the time of writing but managing to get out quite well on 14MHz. Tom was formerly 9J2TF, and BRS32669 (who is QSL manager for both calls) has some cards left for those who still need 9J2TF confirmations (see *QTH Corner*).

Martii Laine, OH2BH (left), visited G3XYP during his recent stay in the UK

* 10 Knightlow Road, Birmingham B17 8QB.

Joe Dempster, G3OAK (formerly VS9AC/5A2TQ), is now in Malta and has been given the callsign 9H1DK. He may be reached at the address in *QTH Corner*.

DX news

It is reported that the weather crew on Willis Is (VK4) will be changed at the end of June and that there will be a licensed VK3 amateur among the new crew. This should lead to regular activity from this very rare spot.

There seems to be some doubt concerning the authenticity of BV2AA with some reports saying that there may be two stations using the call, one of which is located in Japan. Another rumour suggests that the BV2AA on Taiwan is not licensed.

C29EB was heard on the air from Nauru on the island's Constitution Day and this prefix may be used on other national holidays. C20ED has operated on a previous occasion but it is believed that his QSL cards will show his callsign as the more correct C29ED.

The many amateurs who have contacted Darleen, WA6FSC, from various locations all over the world will be interested to hear that she is to marry HC2OM and hopes to become HC2YL. The writer is sure that readers would like to join him in wishing Darleen and her new husband a very happy life together.

American amateurs in Okinawa who formerly used the KR6 prefix have been heard using the KA6 prefix since the Ryuku Is reverted to Japanese sovereignty on 15 May.

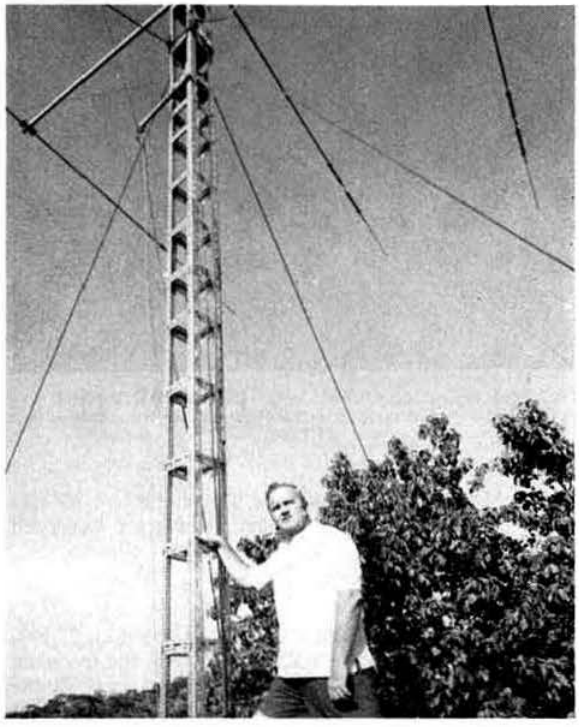
WA2BAV and WB2AQC seem to have had a most successful trip around West Africa. They have been heard using the callsigns TU4AB/AC, WA2BAV/9G1, WB2AQC 9G1, 5VZAA, 5VZBB, EL2AU etc, and QSLs for all these calls should be sent to the address in *QTH Corner*.

The ITU has now issued the prefix block S2A—S3Z to Bangladesh. The special XQ prefixes used by Chilean stations during May were celebrating the holding of a UN conference on trade and development in the country. Anyone who has contacted one of the XQ stations should send *two* QSLs for the contact—one will be sent to the Chilean authorities who in turn will send out a special certificate.

More special prefix stations scheduled to appear on the air from the USA include those from the National Political Conventions which will be held in Miami Beach, Fla, during July and August. WD4USA will be on from the Democratic party convention from 10 to 13 July, and WR4USA from the Republican event from 21 to 24 August. Both stations will use 7,072 and 14,072kHz when on cw, and 7,272 and 14,317kHz when using ssb. QSLs go to the address in *QTH Corner*. The special call 4U4ITU was used by 4U1ITU to celebrate the fourth World Telecommunication Day.

In the *DXers Magazine* ZK1CD reports that there are now four active amateurs on Rarotonga—Stewart, ZK1AA; John, ZK1AJ; Sven, ZK1CF (who has a 15W crystal controlled transmitter on 21MHz), and himself. There are others with licences who have no equipment. Barry will be there for another two years and operates on all bands 3·5 to 28MHz.

JH1OTD recently operated as JD1ADK and should be QSLd via JA1KSO. All JD1ABX QSLs are believed to have been sent out but all are to be sent second cards via the world bureaux. JD1ABO logs are now all with JA1KSO and those needing QSLs are asked to apply with sae and IRCs. JA1KSO also acts as QSL manager for JD1ABS and YK1AA. JA2KLT is acting as QSL manager for KG6RA, KG6SH, VK9JV, VS5AP, VS5PW, 5W1AB, 9M6AB and 9M8RY. He will shortly add YJ8GH to his list. JD1ACF cards are sent out by JA1OAF but may be sent with any going to JA1KSO as 1OAF and 1KSO work together.



James Pershouse, 9M2DQ, a life member of RSGB, often to be found on the British Commonwealth Net on 21,350kHz at 1430. His home-made tower supports a TH3 beam which puts out an excellent signal from Penang

The recent activity from Bhutan by VU2KV (A51KV) resulted in 880 contacts and the short duration of the expedition seems to have been due to bad weather in Bhutan. During his stay VU2KV gave some needed attention to A51TY's SR150 transceiver (the incremental tuning on which will seemingly only tune downwards from its fundamental frequency) and Yonten may now have a better signal.

KC6BK has left the Eastern for the Western Caroline Is and is reported to be active at 0800 on 14,305kHz ssb quite frequently. ZK1AJ should have received an HW101 from INDXA by now with consequent improvement of his signals. It is understood that New Zealand stations are to be allowed to use the ZM prefix again between 3 June 1972 and 2 July 1974—this time to celebrate the 1974 Commonwealth Games which are being held in their country.

Top Band news

EL2CB is active on 1,828kHz, and LU8BAJ on 1,804 and 1,827kHz. ZS4PB will be looking for UK contacts during July on 1,860kHz ssb at 0200, and it is reported that ZS6KO will also be on the band. EP2BQ has worked into the UK a

The neat layout at CR7H1, with Cesar, CR7H1 (left) and G2FKO on a recent visit to Mozambique. The transceiver is a FT200

number of times between 2400 and 0310 and is on 1,804kHz (mainly at weekends) at this time looking for European contacts.

Beacons

G3DME reports that 3B8MS has now appeared on 28,200-kHz and is audible in the UK quite early in the morning. It will move to 28,190kHz later in accordance with the RSGB proposal on beacons which was accepted by the recent IARU Region 1 Conference. The tentative allocation of existing and proposed beacons suggested was as follows:

VE3RMR	28,175kHz	Awaiting official permission.
ZC4CY	28,180kHz	Proposed.
GB3SX	28,185kHz	Already operating.
3B8MS	28,190kHz	Already operating.
DL0IGI	28,195kHz	Awaiting re-installation.

28,200kHz is reserved as a common frequency (as in the original DARC WAB proposal).

Contests

The Independence of Colombia Contest

0001 15 July to 2359 16 July.

All bands 80 to 10m, phone and cw, but no cross-mode contacts allowed. Stations outside the American continent score five points for contacts with HK stations and one point for contacts with others and the multiplier is the number of HK zones and DXCC countries worked on each band totalled together. Contest exchanges consist of RS/T plus three figure serial QSO numbers. Logs should be sent (before 30 September) to LCRA, PO Box 584, Bogota, Colombia. (Note that HK0 counts as a zone and a DXCC country).

The WAE Contest

0000 12 August to 2400 13 August (cw)

0000 9 September to 2400 10 September (phone)

All bands 3·5 to 28MHz. Single and multi-operator sections; the former must take a compulsory total of 12 hours' rest during the contest period—this may be in up to three periods and should be clearly indicated in the log. Exchanges consist of RS/T plus serial number of contact (starting from 001), and each contact counts one point. Multipliers for European entrants are ARRL DXCC countries plus JA, PY, VE, VO, VK, W/K, ZL and ZS call areas, UA9 and UA0. 3·5MHz multipliers should be multiplied by four, 7MHz by three, and 14, 21 and 28MHz by two before arriving at the total final multiplier. Additional points are derived from receiving "QTCs" from non-European participants. These consist of the times, callsigns, and serial numbers received from European stations worked previously and up to 10 may be passed at any one time. Full details of contest rules and official DARC log forms may be obtained from EUDC Committee, D-895 Kaufbeuren, Postbox 262, Germany. It is hoped that some of these may be available from G3FKM (sae, please). Deadline date for logs is 15 September (cw) and 15 October (phone).

The 13th All Asian DX Contest

1000 26 August to 1600 27 August.

All bands, cw only. Non-Asians call "CQ AA", and endeavour to contact as many stations in Asia as possible. Each contact counts one point and a five-figure number consisting of RST plus age should be exchanged (ladies give RST followed by 00!). The multiplier is the number of different Asian *prefixes* worked on each band, and the total score is the total of prefixes multiplied by QSO points on each band added together. Note that JD1 stations on Minamitorishima Is (formerly Marcus) are not in Asia. Logs should indicate new prefixes worked and a separate sheet should be used for each band. They should reach the JARL Contest Committee, Central Post Office Box 377, Tokyo, before 30 November.

In the 1971 event UK scores were as follows: **G3FXB** (27,692 points), **GM3CFS** (18,678), **G4CP** (16,506), **G3KWK** (14,685), **G2DC** (7,620). G3ESF (7,375), G3KMA (7,102)—all multiband entries. On 14MHz **G3TXF** scored 966 points and on 7MHz **G3OCA** scored 54.

Awards

The Worked All Bermuda Award

This is available to those who have contacted all nine Bermuda parishes. There is no charge and applicants should send their QSL cards to the Award Manager, Radio Society of Bermuda, PO Box 275, Hamilton, Bermuda. Contacts made during the annual Bermuda Contest may be claimed for credit without the production of QSL cards if such a claim is submitted within one year of the contest and if the applicant has himself submitted a valid log for that event. Only one portable or mobile station may be counted towards the award.

The Arabian Knights Certificate

New rules for this award require that applicants must have contacted at least 10 Arab countries and that one contact must have been with JY1, JY1/B or JY2. QSL cards and 10 IRCs should be sent to JY1, Box 1055, Amman, Jordan. All contacts must have been since 31 December 1970.

The Alaskan DX Club Award

Since the notice concerning this award appeared in April *MOTA*, a certificate has been received bearing the address of origin as the Kiwanis Club of Anchorage, PO Box 644, Anchorage, Alaska, 99510.

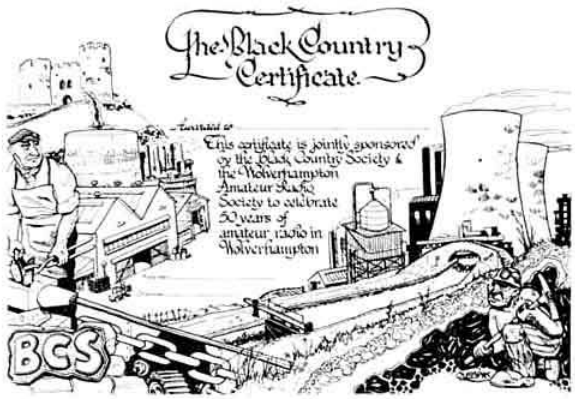
The Swedish Communes Award (SCA)

This is awarded for contacting as many of the 272 commune blocks as possible after 31 December 1971, and is issued in

six classes—SCA-50, SCA-100, SCA-150, SCA-200, SCA-250 and SCA-272. A record book is available from SK5AJ, Award Manager, Box 46, S-591 01 Motala 1, Sweden, in exchange for three IRCs, and this is used for the application. The award costs 12 IRCs.

The Worked All Florida Counties Award
This requires confirmed contact with all 67 Florida counties since the second world war. A certified list of QSLs held (signed by two other amateurs) should be sent to Dade Radio Club Awards Committee, PO Box 73, Biscayne Annex, Miami, Fla, 33159, USA. There is no charge. The application should include a signed statement that the station was operated in accordance with licence regulations.

The Black Country Certificate
This is being awarded by the Wolverhampton ARS and the Black Country Society to celebrate 50 years of society activity in Wolverhampton. Requirements are: (1) For UK stations to contact eight stations having Wolverhampton, Walsall, Warley, West Bromwich, or Dudley postal addresses; (2) Others need only four stations similarly located. There is a vhf award for contact with four Black Country stations. Applications, accompanied by 3 IRCs or 10p in stamps, should be sent to the secretary, G3UBX, 28 Coalway Road, Wolverhampton, Staffs.



Your scribe will be pleased to hear from readers who have applied for any award and have not received a reply. The times taken to process applications vary widely but it seems that a number of sponsors do not answer correspondence at all and it is hoped to publicise these in *MOTA*.

Odds and ends

D. R. Powell, G3ZXK, is hf contests manager of Southampton University Radio Club and is interested in forming a list of ex-G3KMI members. He would like to hear from old members and to learn their views with regard to possible reunions and "skeds". Please write to the University of Southampton ARC, The University, Southampton.

Readers who find themselves in Finland between 22 and 30 July may be interested to know that a radio camp and foxhunt will be held in Kuopio at that time. Leaflets giving full details of registration etc are available from G3FKM.

George Boothroyd, G4AWT, runs this neat station on the hf bands and has specialized on cw working since coming on the air in February

Reciprocal licensing facilities are now available between the UK and San Salvador, and Dr Andy Goens, YS1AG, who is working in the UK, may soon be on the air with his call G5AYU.

GW3UNH would like readers to know that his callsign is being pirated. He has received QSL cards for ssb contacts on 3·5 and 7MHz, but in fact operates only on cw.

Ken Bishop, G3LQB, is closing down for a while and would like to deal with any outstanding requests for QSL cards for his OK8AAA operation before 30 September. He points out that he is receiving requests for QSL cards for contacts with 5X5NA—this would seem to be due to confusion of his call with that of G3LQP who is 5X5NA's QSL manager. Ken lives at 12 Oakfield Drive, Kempsey, Worcs.

Stephen Widdett, A7785, 32 Huntlands Road, Halesowen, Worcs, is interested in finding an overseas pen pal.

Band reports

The change to summer conditions on 28MHz has meant that openings into the USA have been very scarce. GW3NNF in *QUAX*, mentions an apparently freak opening into the west coast of the USA immediately following the Apollo launching on 16 April, and wonders whether there could be any connection between the two events. Signals have been reported on 21 and 14MHz throughout the whole 24 hours of the day but 7MHz is now beginning to suffer from summer static, as is 3·5MHz.

Very many thanks to the following for data incorporated in the lists below: G2HKU, G3HB, G3UYM, G5JL, G6GH, G8VG, BRS2098, BRS17567, BRS25901, BRS31301, A7056, A7545, A7555 and A7785.

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

3·5MHz. 0000 CX1AA, ZD8RR, ZS6MP, 9G1DY. **2100** OH1JN/OH0, TN8BK. **2200** ZS1MH, 5R8AZ. **2300** ZD8CS, 9H1C, 9X5MS.

7MHz. 0000 TR8VE. **0100** YV6JB. **0500** *PT2AAA* (Brazilian club station). **0600** *HB0XJL. VP9s EJ, GD.* **0700** *VP2DAJ.* **2200** CR6TP, EL8I, PYs, PZ1AK, TJ2CW, 5Z4KL, ZS6MP, 9G1DY. **2300** *KP4CRT*, 9G1DY, 9Y4T.

14MHz. 0000 *VP9BY*, ZD3M. **0400** *OA4J*, WB6BJT/AM/W7. **0500** *FO0RV*, HC2DX/HC8, DL2CI/HC8, VP1BH.

QTH Corner

A51KV	W6KNH, 42 Donald Drive, Orinda, Calif. 94563, USA. (enclose irc/sae).
CT2BG	(wef 5/5/72) WA2BCK, 96 Fairhaven Drive, Cheektowga, NY, 14225, USA.
ET3JH	(wef 1/5/72) WB8CIV, 545 Spring Lane, Flushing, Mich, 48433, USA.
FB8WW	(wef 1/1/72) via F6BFH, A. Duchauchoy, 21 Rue de la Republique, F-76, Bihorel, France.
FO0RV	via G5RV.
FO0WR	via DJ5RT, Alpenweg 20, 82 Rosenheim, Germany.
HC2GG/8	via DL2GG, Wilhelm-Wisser-Strasse 2, 242 Eutin, Germany.
GB2IOS	G3TBS, 52 West Mead, Windsor, Berks.
KC6WS, KC6YL	W. Sendore, 3224 Bob-O-Link Lane, Denton, Texas, 76201, USA.
KD6USA	W6ANN, Bill Adams, Star Route 2, Box 241, Twenty Nine Palms, Calif, 92777, USA.
KE4ITU	K4ZA, 102 Hickory Rd, Sterling Park, Va, 22170, USA.
HB0XIW	via DJ5CD, Endemannstr. 1, 69 Heidelburg, Germany.
HB0XIZ	via WB8FGZ, 1230 Westmoorland, Ypsilanti, Mich, 48197, USA.
HB0XJG	via WA4WME, Vandegrift, MATCOM-DSO, APO, NY, 09052, USA.
HB0XJJ	via DL7HZ, Menzelstr. 1, 1 Berlin 33, Germany.
HB0XJK, HB0XJL	via DJ2BW, Eugenstr 22, Mariahof, 55 Trier, Germany.
OJ0SUF	Box 1, Mariehavn, Finland.
PJ9BB	via W2VIA, 80 Garden Rd, Scarsdale, NY, 10583, USA.
PJ9JR	via W3ZKH, 2141ndian Spring Drive, Silver Spring, Md, 20901, USA.
PT0MI	PO Box 19073, Sao Paulo, Brazil.
PT0WH	PO Box 19094, Sao Paulo, Brazil.
SX0E/72	SV1EN, POB 1442, Athens, Greece.
TU4AB	George Pataki, 34-24 76th St, Jackson Heights, NY, 11372, USA.
TY6ATE	Ted Schultz, BP 107, Natitingou, Dahomey.
VB1AA	via VO1FX, PO Box 1462, St Johns, Nfld, Canada.
VB2KOC	via VO2AI, ARC of W Labrador, PO Box 368, Wabush, Lab, Canada.
VK9KE, 9J2KE	Allan Whitmore, 7 Fair Isle Drive, Glendale, Nuneaton, Warwicks.
VS5AA, VS5JA	via K3RLY, PO Box 125, Simpsonville, Md, 21159, USA.
WD4USA, WR4USA	Special event station (Call), PO Box 501, Miami Springs, Fla, 33166, USA.
9H1DK	C. J. Dempster, International Aeradio Ltd, Luqa Airport, Malta.
9M6BA	A. B. Avery, POB 1197, Kota Kinabalu, Sabah, E. Malaysia.

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

0600 *A31FX*, *C31BC* (QSL via F9IE), *JT1AH*, KC4DX, *UK1ZFI*, *UK1OAH/1* (Solvetski Is), *VK9KE*. **0700** C21TL, WA9FAB/KC4, KH6s, KS6s, DU, DY, M1D, VP2MZ, VR6TC, ZK1AJ, 4YA51/MM, 5VZBB. **0800** *OX3BU* (QSL via OZ8KW), VR4BS, *5W1AB*. **0900** KL7HBT. **1000** 4U4ITU. **1400** *KH6IJ*. **1500** KA6PD (New prefix used by USA Forces in Okinawa). **1600** OJ0SUF, VS9MZ. **1700** CR8AK, KH6BB. **1800** A51KV, 9G1HC (QSL via G3PQN). **1900** VQ9MC, XT2AC, XU1AA, YA1KY, 9V1QQ. **2000** 7P8AD, 8R1Q (PO Box 449, Georgetown, Guyana), 9L1MF. **2100** CT2BG, JX2HK, VP2SBH, VP8KV (S Shetlands), 3V8AR. **2200** EA9AQ, HM0C, JY9VO, TU2DO, VKs, VP2ME, XT2AF, 5VZGE (Box 2, Bassari, Togo), 5VZYH/9G1. **2300** VP2VJ, ZF1WE, 8R1Z.

21MHz. 0000 HR1KS, YN4JAB. **0600** *JT0AE*, *JT1AN*. **0800** *VQ9R*, *4S7NG*. **0900** *KX6EB*, **1000** ET3ZU, MP4MBB. **1100** KC6BK, VK9MH, 5N2AAF, 9L1JT. **1200** DU1CM, FB8XX, VP8ME, VUs, YB3AAY. **1300** CP1HG/6, *CR4AG*, FG7XT, OJ0SUF, 4W1AF. **1400** *KE4ITU*, KG6SW, VS6BE, 5U7AN, 9M2BQ. **1500** JY4IA, TJ1BF, UK1ZFI, *VP2DAJ*, 9M2CJ. **1600** CR3VV, *HB0XJL*, VS9MB, VUs. **1700** *CE3YO*, *FL8MM*, TY1ABE, W7TNA/MM (Chamaru nearing Seattle), XU1AA, ZD3M, 9M2s. **1800** A2CAP, C31BC, 1M0BGJ (QSL to I1BGJ), ZD7BB, ZD9BM, 9Q5PF (QSL to W4WHF). **1900** CP1JV, JW1EE, TN8AU, VP8MM (Box 179, Stanley, Falkland Is), ZD3D. **2000** KC4DX, VR6TC, ZD8RT. **2100** CE7DK. **2200** *HP1AC*, KC4DX, *PZ1AV*, *VP2LAW*. **2300** YS1JC.

28MHz. 1100 9G1DY, 9J2DT. **1200** OD5CS. **1400** DL8NU/OH0. **1500** VQ9R, 5X5NK (QSL via DJ3JV). **1700** Ws, 5Z4NG, 9Q5SF. **1800** CR6LW, *CR7FM*, *GI3WWM/OE*. LU7KAU. **1900** *9L1GC*, **2000** CE3ARR, G3MUL/CE3, 7Q7LZ.

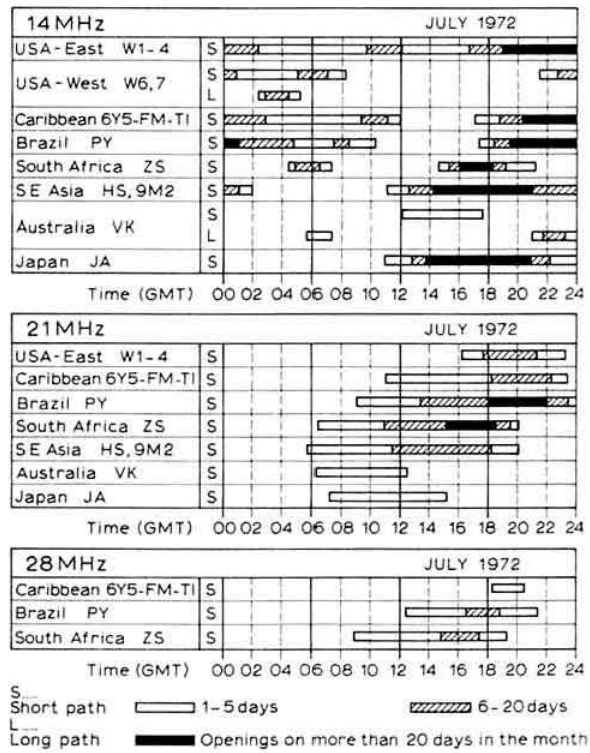
Propagation Predictions

Propagation conditions this month will differ little from those given last month. DX conditions on the hf bands are still not favourable, particularly on **21** and **28MHz**. A small compensation will be more frequent short-skip conditions over distances of about 500–2,000km.

14MHz will remain the main dx band, especially at night. The possibility of dx contacts via the indirect path is once again indicated. As it is now winter in the southern hemisphere, traffic with South Africa (ZS) will cease early. Central African stations such as those in Zambia and Rhodesia will be heard longer than ZS. The same applies to corresponding conditions on 21MHz.

There will be no noticeable change on **7** and **35**·MHz compared with last month.

The provisional sunspot number for May 1972 was 78·1 with the period of greatest solar activity appearing between 9 and 21 May. The daily figure for 17 May was 140. The predicted smoothed sunspot numbers from the Swiss Federal Observatory for September, October and November 1972 are 52, 49 and 47 respectively. This shows an upward revision of figures previously supplied and would indicate that the decline of the present solar cycle is less rapid than anticipated.



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

Please send all items for **August** issue **to reach G3FKM** not later than **5 July,** for **September** issue by **5 August,** and for **October** issue by **8 September.**

1971 success story

by C. E. GODSMARK, G3IWL*

AROUND 18 months or so ago, the author's attention was drawn to an item in the "personal" column of the local press, which stated that a blind person wished to have instruction in order to obtain an amateur licence. After a lapse of a few days to enable the host of local enthusiasts to offer their services, the author telephoned the number quoted in the advertisement and discovered that no worthwhile reply had been received.

A visit to survey the situation seemed necessary and this was duly arranged. The advertiser had had promise of employment which had not materialized and therefore he had time on his hands; was keen to embark on a new interest; he could operate, albeit slowly, a braille machine; and he had a comfortable workshop at the bottom of his garden. It was obvious that assistance should be offered and the author agreed to go to his QTH for two or three hours each Monday. "He" then became George and the author began to think about the problems: regulations; calculations; harmful interference and its solutions; practical issues like tuning the transmitter, aerial tuner unit and receiver; log-keeping; taking morse without writing it down, etc.

At the back of the author's mind was the feeling that not only was it necessary to impart sufficient information to enable the examinations to be passed, but that a sense of enthusiasm for the amateur spirit of fraternity should be aroused. It was felt that the first task should be to get George listening on the bands, so by arrangement with a surplus stores and the services of a local amateur who was willing to accommodate about half a ton of deadweight in his car, the ubiquitous B40 was obtained and set up in George's shack. Secondly, that the "hard-rock" instruction should be interspersed with information such as the history of amateur radio, the existence and purpose of the RSGB, and the advantage of becoming a good and respected brass-pounder.

Obviously, the first essential was to grasp the terms and conditions of the licence, which was tedious but straightforward. George's performance on the braille machine was slower than handwriting speed at first, but as time went by he made good progress on "brailling" and on reading back. The author was impressed by the fact that regulations imparted on one Monday were, by the following Monday, repeated from memory almost word-for-word. This, as we all know, is the only sure way to win! However, nagging at the back of both George's and the author's mind was the main problem of communication. How to get over to him the block diagrams, ohms law, propagation data, various circuitry, and controlling elements of transmitters and receivers.

After discussing the problem with family and friends it was decided that the best way was to obtain from George some of his braille cards (these are of thin card about 12in by 10in) and to glue string on to a card to represent wiring, coils, etc, and to affix cut-outs of thick cardboard to represent items like capacitors and crystals. These charts could then be felt quite successfully with the fingertips.

Once much of the regulatory aspect had been assimilated, work commenced on drawing diagrams. Memory aids were used as much as possible, ie the triangle system for calculating voltage, current, and resistance; and wattage, voltage and current. George was also introduced to the usual amateur contractions and slang and provided with a list of the more common country prefixes.

After a while our lessons worked out to a consistent pattern. On arrival the author would take the easy chair in the shack and there would be perhaps 10 minutes' chat on events of the past week, domestic and radio, a recounting by George of stations heard and subjects that they had discussed. Then, straight into a new subject with, firstly, an uninterrupted oral description and explanation of it, followed by George's questions to get it firmly into his mind. This was followed by manhandling the new drawing, and finally dictation to record the data on a braille card.

At this point it must be said that after the ice was broken, instructor and pupil got on very well as a team. George has a good sense of humour and has come to terms with his blindness; and the author found himself unconsciously pointing at items in the shack when attempting to explain a tricky point, prompting George to say he could not see what he was getting at; and both enjoyed the humour of such incidents.

After about six months' work revision was included in the sessions and during any week George would try to anticipate the likely subject to be revised and to have his answers ready. The author, on the other hand, would attempt to give him a thin time by concentrating on his weaker subjects. Eventually the Monday a week before his exam arrived, and both worked harder on that evening than on any other. George was apprehensive, of course, but his instructor felt that he would be able to give a good account of himself. Also at about this time George was interviewed by the local press and got a full-page spread, resulting in three persons coming forward to help him with his morse.

It is a pleasure to report that he was successful in both his techical and his morse examinations, and he felt his examiners were agreeably surprised at the way in which he had assimilated the necessary knowledge from scratch. After almost exactly 12 months' hard work he received his ticket and he

SWL Fred Rooke looks on as G4AWI makes a contact

* 40 Mill Lane, Shoreham-by-Sea, Sussex.

has recently been able to replace loaned gear with his own ssb rig and operates mainly cw on 80m and 20m.

It is worth recording that the St Dunstan's organization, of which George is a member, has been very helpful on the material side of his needs and has provided the long bench necessary for his transmitter, receiver, braille-writer (log), typewriter (QSLs), and tape-recorder. The knowledge that that organization was behind him in this project has been a source of encouragement to him. Mention must also be made of the assistance with hardware given by SWL Fred Rooke; the author's gratitude for the regular refreshment (most necessary for oiling the vocal chords) provided by George's wife; and for the morse tuition provided by G2DPY and by a certain gentleman who lives nearby, whose name I never discovered, but who, if he reads this article, will readily recognize himself.

That then, has been a 1971 success story but it does not really end there. George has applied to join the RSGB; has bought himself a solder-gun and is learning the gentle art of soldering (first task accomplished—key-click filter), and is gradually becoming more self-reliant around the shack.

The author hopes that this account will encourage not only other blind persons to try their hand, but those with the necessary knowledge to give help. If you hear G4AWI (A Witty Individual) give him a contact; you will then know that your callsign has been recorded in braille and that you will certainly be QSLd.

YOUR OPINION

The Editor
Radio Communication

Sir—The letter in the June *Radio Communication* from G3KBN brings to light an ever increasingly mentioned topic, both in this country and abroad—QRP operation both fone and cw.

While attending the IARU Region 1 Conference in Scheveningen as an observer, I had a very interesting discussion with Bob Dennis-ton, W0DX, from the IARU headquarters team, on both this topic and on the matter of introducing amateur radio into countries of the "Third World"—a matter of much importance to judge from the reception given to the amateur radio lobby at the Space Conference in Geneva in 1971 (The reader is referred to G2BVN's reports in *Radio Communication* September and October '71, with particular note on the last item, "Future Conferences").

From our discussion the view came that if low-powered, low-cost equipment was available both in kit and built form, a fair chance of amateur radio having an appeal both to the administration and to the indigenous population of the country might exist.

At the time of discussion only one manufacturer in the USA was known to produce products in this field, Ten-Tec Inc, with their Power Mites both built and in ckd (complete knock down) form. Now with the Japanese beginning to enter the QRP market, maybe things in many ways will take a turn for the better.

Yours faithfully,
C. Partridge, G8AUU

The Editor
Radio Communication

Sir—I would like to comment on the recent criticism of amateurs who use 160m and I would especially like to reply to the comment made by A. Brook, G3XYM, *Radio Communication*, May, to the effect that "Top Band is just a noise band from one end to the other".

I have to agree that there are some amateurs who make a nuisance of themselves to other amateurs and to shipping stations. However, the same criticism is equally true on 80m. I believe that allegations of bad manners, and equally bad operating, should be placed at the door of the amateur fraternity as a whole and should not be showered on to the users of any one particular band.

I turn now to the point of my letter, which is to show that there are many amateurs who gain a great deal of satisfaction from 160m of a sort which could not be gained on any other band. There can be no doubt that 160m intercontinental dx is by far the most difficult of all dx achievements. As opposed to the hf bands, the difficulty on 160m is not overcoming a pile-up but is actually managing to establish communication over a very difficult path.

In the spirit of the pre-war dx pioneers, series of test transmissions are arranged on 160m to try and establish new and more difficult paths. I cite as examples the EU-JA tests last year, G-VK tests last Christmas and the trans-equatorial propagation tests this June. On no other band below vhf can it be said that work of an original experimental nature is taking place. To lose Top Band and thereby stop these people conducting their worthwhile experiments would be a great pity.

As a final note to those who still maintain that there is no joy to be found in operating Top Band; the most exciting QSO of my amateur radio career, so far, has been my first transatlantic QSO on 160m.

Yours faithfully,
R. Wainwright, G3YMH

The Editor
Radio Communication

Sir—May I through your columns appeal to my clients to keep me supplied with stamped addressed envelopes, as a number are causing me no small measure of embarrassment in the quantity of QSL cards I hold and for which I have no envelopes. In some cases these amount to several pounds in weight.

Storage space is very limited and in the very near future my dustman's little boy is going to be the recipient of a large number of cards, many of which I would like myself to boost my DXCC score!

A 2½p stamp on a postcard to say QSLs are not required would suffice as I am very loath to destroy without instructions.

Yours faithfully,
J. W. Russell, G2ZR,
RSGB QSL Bureau "G2" Sub-Manager

The Editor
Radio Communication

Sir—I was very interested in G8BI's article in the April *Radio Communication*. I have had a KW E-Z match now for approximately three years, and have been using two aerials connected permanently to the unit at the same time (without any alteration to the E-Z match). My aerial for 10–15–20m is a commercially designed mini quad, and my aerial for 80–40m a KW trap dipole, which is designed to operate on 10–15–20m also. I can switch my transceiver right from 10m to 80m without changing any connections and have found that both the transceiver and the atu behave perfectly. Hoping this will be of interest to you and to E-Z match users.

Yours faithfully,
M. G. McIntyre, GI3YDH

The Editor
Radio Communication

Sir—I wonder whether any of your readers can help me in my search for information on the use of the international language Esperanto by radio amateurs, especially during the early days of amateur radio? I am hoping to write a short history of the subject, and have also promised to give a talk about it in September to the London Esperanto Club.

I first began using Esperanto on the amateur bands soon after the end of the second world war and had frequent contacts using cw and a.m. on the 40 and 80m bands. Since then I have met several Esperantist radio amateurs personally and corresponded with many more, and have supplied information about ILERA (The International League of Esperantist Radio Amateurs) to many British and foreign radio amateurs.

I shall be very pleased to make skeds with any amateur interested in the use of Esperanto (using English or Esperanto, cw or 'phone) on any of the bands from 10 to 80m. Unfortunately I have only an old Geloso running 30W A1/A3, but can receive ssb and hope to obtain a modern ssb transceiver soon.

Yours faithfully,
Ken Sly, G4MR
Hon sec, ILERA

CROSS-TALK

by G. SLAUGHTER, G3PAO*

In the beginning

Every year a number of people qualify as licensed amateurs, and every year a high proportion of them are soon experiencing positive and irate feedback from television viewers in the vicinity.

Bearing in mind that the brightest of radio amateurs usually needed at least 12 months of preparation to gain a licence, and that unpleasant repercussions from the neighbours are usually being felt with some force within the first four or five weeks of operating, it seems that prior thought might well be devoted to potential problems *before* actually going on the air.

In other terms, prepare your neighbours. After all, they have been enjoying their viewing for years before your intrusion on the screen. Unless the way is well prepared in advance of your debut, it is natural and logical from their point of view to regard you as a bête noire or even worse!

One of the best ways of gaining a person's interest and friendship is by being a good listener—after all, most radio amateurs started off their hobby by being just that.

You should be able to attract the neighbourly interest of a contemporary—a father, a son or even a daughter—firstly by observing their hobbies and pastimes and then by showing a personal interest in their activities. Having thus broken the ice, you could eventually mention your hobby and perhaps invite them to listen-in to the amateur bands. Perhaps even include them from the start, so that they may appreciate the effort and application needed for an operator's licence.

Often enough when one is known to be a radio amateur, people say: "Do you *still play about* with radio?" And in tones which suggest that only the most juvenile do so. This uninformed image of the art and science must be corrected so that they understand that it is an adult pursuit which demands just as much knowledge and skill as is probably required for their particular hobby.

A step to be recommended is to get the aerial up long before (months if possible) starting to transmit so that the physically outward evidence of your activity is not immediately seized upon as the prime cause of any breakthrough it inadvertently causes them.

It is unlikely that an amateur station can be operated at any really significant power without causing tvi to some types of tv receiver now in use unless they have prior protection. It is, therefore, prudent to make oneself well acquainted with the causes and the methods of affording such protection and to have some devices at the ready. Although much material on this subject has already been published, if in difficulty write to the Interference Committee, c/o RSGB HQ, when advice will readily be forthcoming.

It is suggested that when the newly-licensed amateur is ready to transmit, he makes the 160m band his first choice. It has the advantage of remoteness from Band 1, and the low permitted power should enable the newcomer to master the art of transmitter tuning and aerial loading with minimum risk to equipment and humanity. He should make sure that he has the appropriate equipment for coupling transmitter and aerial (swr bridge, dummy load, low-pass filter and atu) and get an experienced operator to guide him through the process of loading and adjustment. An oscilloscope is a useful instrument to have on hand.

START OFF OUTSIDE PEAK VIEWING PERIODS

The ground being properly prepared, a schedule might be arranged and a neighbour invited in to enjoy the fun; a mention of his presence and name during the QSO might secure his pleasure and perhaps his later favourable involvement.

All being well on 160m, and having become experienced in transmitting and procedural routine over a reasonable period, one might then try out the next higher frequency and power for effect on one's own receiver, choosing the time with circumspection as before. And so on.

Remember we are the strangers within the gate and that our credentials must be impeccable.

* 6 Leggats Wood Avenue, Watford, Herts.

RAYNET

by S. W. LAW, G3PAZ*

As a small and highly specialized organization we can rarely count on any extensive publicity for our activities. It is gratifying when local newspapers record the work of individual groups and a good controller will naturally attend to this. Even more worthy of note are the reports which are becoming more frequent in publications often unconnected with radio as such. House magazines such as that of the Atomic Weapons Establishment have given space to Raynet, and we now note with pleasure a two-page article with an excellent photograph presented in the latest issue of *The Vauxhall Motorist* featuring the installation of G8CCS/M; which gives Raynet a welcome boost. An interesting point in the text relates to the matter of urgent requests for drugs. As all radio amateurs including Raynet members should know, any such information should be passed to the police or the British Red Cross to deal with immediately and no other action taken. This point cannot be stressed too strongly as a life may well depend upon instant action by those most qualified.

Raynet Committee

The last meeting at RSGB HQ had to be brought forward to 3 June but despite the unfortunate clash with NFD, only one apology for absence was received. Two subsidiary items were added to the agenda and a late sitting ensued. Members will understand that certain matters discussed cannot yet be reported until a solid basis has been established at official level, but they may rest assured that progress is being made.

Kent controller G3GJW reported that an extensive exercise is to take place on the last Sunday in July in conjunction with the user services concerned with possible flood danger over a 20-mile length of the Thames. It is hoped that the co-operation of all groups in the area will be obtained and that from 20 to 40 mobiles will be engaged. Both Radio London and Radio Medway are understood to have expressed a desire for news coverage and this will no doubt result in a number of press reports. The official "Flood 1" to "Flood 25" stations will be involved on their allotted frequencies and liaison will take place via our user services.

A report was also read on the success of the Suffolk exercise "Tarentella Two" in which the 28-member group received praise from the user services involved, and also from the local authorities who expressed great interest in the operation and its civic implications.

The Raynet exhibit at the Anglia rally at Ipswich was also covered, together with the participation of the Suffolk group. The Woburn Rally arrangements were finalized, G3MBQ agreeing to attend to the 4m talk-in system. The rota for the Raynet stand was tentatively agreed, only one offer of assistance from outside the committee having been received to date. Hope was expressed that further offers would shortly be forthcoming to relieve the pressure on the few.

Controllers were ratified for groups in Derbyshire (G3ZYC), NE Lancashire (G8CME) and Deeside (GW3LAI). New members to 1 April were reported as 97 with 118 re-registrations, it being obvious that many had overlooked the necessity for renewing their cards to the current format. Registration correspondence this year amounted to 400 letters, and over 215 manuals had been sold to date. Letters of thanks have gone to Ted Bowden, of Cornwall, and Ron Vaughan, formerly of Sussex, for services rendered.

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

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

Northern Radio Societies Association Convention

The Eighth Annual Convention of the Northern Radio Societies Association was held on 7 May at Belle Vue Zoological Gardens, Manchester, and drew the usual large attendance of radio amateurs with many YLs, XYLs and junior ops also in evidence.

The convention was officially opened for the second successive year by Mr Fred Ward, G2CVV, Immediate Past President of the RSGB, who made reference to the Society's Diamond Jubilee next year and appealed for 100 per cent membership to strengthen the voice of radio amateurs in the constant struggle to retain the allotted amateur frequencies.

Club stands presenting various aspects of amateur radio were organized by the following member societies competing for the G8AYD Trophy: Eccles Radio Society, Lancaster University Radio Society, Liverpool & District Radio Society, Manchester & District Radio Society, South Manchester Radio Club, and Stockport Radio Society.

Additional stands were also organized by Raynet and No 2087 Squadron ATC, not forgetting the usual bookstall run this year by Barry Langfield, G31OA.

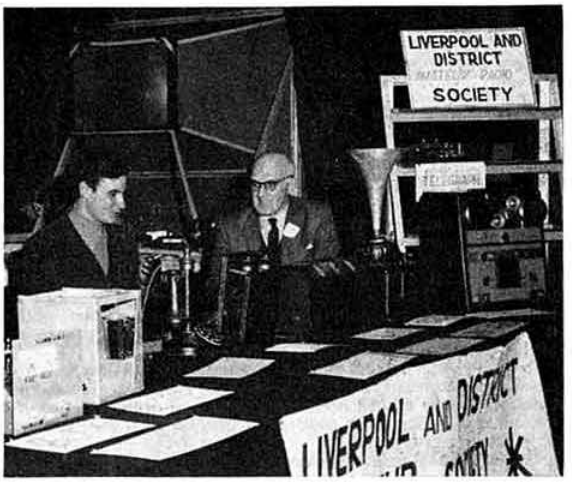
The trophy was carried off for the third successive year by the South Manchester Radio Club with a stand depicting the use of modern techniques in amateur radio, with particular reference to the use of transistors and integrated circuits, both of the linear and digital type. A variety of equipment was on show made by members of the club, including a wholly-transistorized receiver for 2m, 70cm and 23cm constructed by G3SMT. Other items included a digital frequency meter, a transistorized cathode ray oscilloscope, automatic morse senders, digital keyers, etc.

A new feature of this year's convention was the Home Construction Competition, with senior and junior sections competing respectively for the G8BMW trophy and the NRSA trophy in the shape of engraved pewter tankards (Senior, one pint—Junior, half pint). The senior trophy was awarded to Peter Torry, G3SMT, for his transistorized vhf-uhf receiver, already referred to, and the junior trophy went to M. I. Wood, G3ZZJ, for a portable solid-state vhf transceiver.

Live amateur tv was on show, and some excellent pictures were received from G6AGV/T working portable on Mellor Moor (some 25 miles line of sight from Belle Vue) with Frank Smith, G3YGL, in charge of the receiving end.

Turning to radio, there were four operational stations covering the amateur bands from Top Band to 2m, all using the special call-sign GB2BVC and manned by the following clubs:

HF, South Manchester Radio Club; 2m talk-in, South Manchester Radio Club (VHF group); 4m talk-in, Raynet; 160m talk-in GPO Dial House Radio Club. All QSOs will be confirmed.



Liverpool and District Amateur Radio Society's stand with a display of vintage equipment

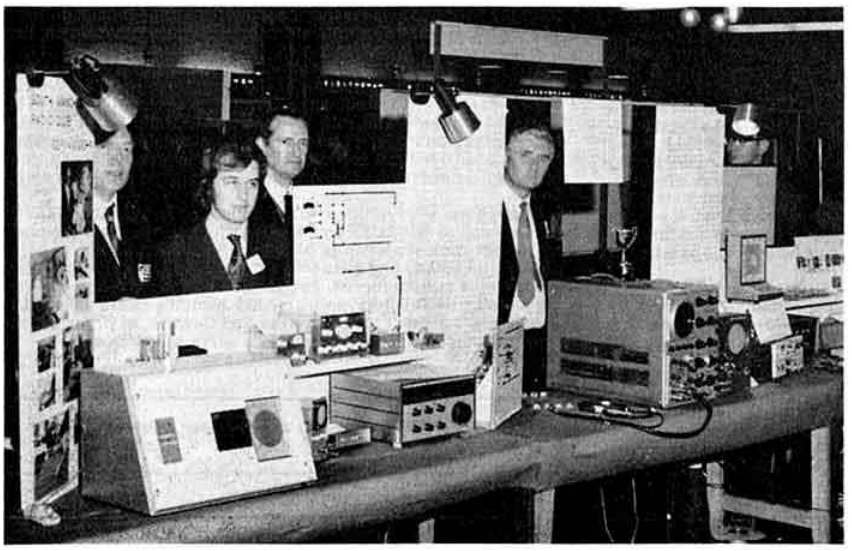
Other features of the convention were the cinema which operated during the afternoon showing some very informative films on radio communication and no doubt providing a welcome break for some very tired feet, and of course the ubiquitous and ever popular raffle.

Excellent support came once again from the trade, so much so that the cinema had to be accommodated outside the main hall to provide the extra space required.

The organizers would like to take this opportunity of thanking everyone who helped to make this year's convention such a great success, and they would particularly like to mention the following:

Mr Fred Ward, G2CVV, Immediate Past President of the RSGB, for performing the opening ceremony;

Mr Basil O'Brien, G2AMV, Regional 1 Representative RSGB, for his usual helping hand.



A general view of the South Manchester Radio Club's winning stand

Irv Ritcher, G5AVA, taking a close look at the winning exhibit in the senior Home Construction Competition

Mr Irv Richter, G5AVA, for judging the club stands and the Home Construction Competition.

Strumech Ltd for the loan of their telescopic tower.

The traders (space prevents individual mention) without whom the convention would not be possible.

And last, but certainly not least, **the ladies** who looked after the reception area and did their usual good job on the sale of raffle tickets.

One final note—the date of next year's convention has been provisionally fixed for Sunday 6 May at the same venue. All northern clubs are eligible for membership of the NRSA for an annual subscription of £1, which qualifies them to enter for the club competition and their members to enter for the Home Construction Competition. Club secretaries—what about it? If you are interested, please contact . . .

S. Potter, G3YKJ, QTHR,
Northern Radio Societies Association,
Chairman.

OBITUARIES

Mr W. A. Allwright, G2AON
"Will" Allwright of Eastbourne died on 21 March aged 70. First licensed in the mid-twenties, he was very interested in the early days of television. During recent years he concentrated on the hf bands on ssb, together with regular appearances on 160m.

Mr P. H. Askew, G8TP
"Bob" Askew died at the age of 62 at his Sedbergh, Yorks, home on 6 May. Licensed since 1937 he was active on the hf bands, fixed and mobile, and was best known as a cw operator and a member of FOC. He was one of many amateurs who served in Special Communications during the war.

Mr A. A. R. Knight, G2HKJ
G2HKJ of Canterbury, who had been an amateur for over 40 years, died recently. He used SU6RN in the early 'thirties.

Mr R. D. J. Leslie, G3EMW/ex ZC6JL
Mr Leslie of Ickenham, a stalwart of the construction side of amateur radio, died on 9 May.

Mr D. L. Richmond, BSc, GM3XVJ
David Richmond died in his early twenties on 12 May. One of amateur radio's young stalwarts, he was a staunch supporter of NFD and interested in vhf.

CONTEST NEWS

DF Qualifying Round—Rugby

Date: 3 September 1972.
Map: OS Sheet 132 (Coventry and Rugby)
Assembly: 1300bst for start at 1320bst.
Location: Layby on A445 approximately 4½ miles SE of Coventry, NGR 373728. Frequencies and callsigns will be announced at the start.

Intending competitors are asked to notify Mr D. E. Newman, Haynes House, 78 High Street, Whittlebury, Northamptonshire, of the numbers in their parties requiring tea as soon as possible and in any case not later than 19 August.

DF Qualifying Round—Stratford-on-Avon

Date: 30 July 1972.
Map: OS Sheet 157 (Swindon).
Assembly: 1300bst for start at 1320bst.
Location: Disused railway bridge 1 mile SE of South Cerney, NGR 063962. There is a new road from 065965 to 072978 and this is the easiest route to the start.

Intending competitors are asked to notify Mr J. R. Vickers, Wrekin Cottage, Great Coxwell, Faringdon, Berks. of the numbers in their parties requiring tea as soon as possible and in any case not later than 21 July.

Contests calendar

8–9 July—SSB Field Day (Rules in March issue)
16 July—DF Qualifying Round—Salisbury
22–23 July—Colombian
23 July—432MHz (Rules in June issue)
30 July—DF Qualifying Round—Stratford
5–6 August—WAE CW
13 August—70MHz (Rules in June issue)
20 August—144MHz SSB (Rules in June issue)
2–3 September—VHF NFD (Rules in March issue)
2–3 September—IARU VHF (Rules in April issue)
3 September—DF Qualifying Round—Rugby
9–10 September—WAE Phone
10 September—80m Field Day
17 September—DF Final Round—Oxford
7–8 October—21/28MHz (Rules in May issue)
7–8 October—IARU UHF (Rules in April issue)
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
11–12 November—Second 1·8MHz
25–26 November—CQ WW DX CW
November-December—70MHz Cumulative

SPECIAL EVENT STATIONS

Normanton Grammar School 380th Anniversary, 1–31 July 1972
The Normanton Grammar School ARS will operate a special station, GB8NGS, in conjunction with this event. Operation will be in the 144MHz band on phone only, as this is a Class B licence, the first of its kind to be issued. The proposed frequency is 145·6, but there may be some change to this to avoid interference problems. Full details, skeds (please!), etc, from D. J. Lockwood, G8FSO, Sharlston Common, Wakefield, Yorks. Please enclose an sae.

Yorkshire Philosophical Society Anniversary Science Fair, 5–6 July
York Amateur Radio Society will be operating special station GB3YPS in conjunction with the above event. Operation will be on all bands 160m to 2m a.m./ssb.

Finchley Carnival, 6–8 July
Southgate Radio Club will operate a special station at the Victoria Park, Ballards Lane, Finchley, London N3, on 160/2m; other bands depending on equipment available and conditions.

Sheffield Scout Camp, 8–9 July
Mexborough and District ARS will activate GB3MEX from the Scout Association camp site at Hesley Wood, Chapeltown, Sheffield, in connection with an activity week-end.

Dagenham Town Show, 8–9 July
The Barking Radio and Electronic Society will be operating an exhibition station at this show and a hearty welcome is extended to all who care to come along. All bands will be covered from Top Band to 70cm. Any licensed amateur wishing to operate at the show, in Central Park, Dagenham, should have his licence available for inspection. There will be talk-in facilities on Top Band and 2m.

Display '72, 12–15 July
The annual "shop window" of the Royal Marines will be held this year at the Royal Marine Barracks, Eastney, Portsmouth. Price of admission: 20p for adults and 10p for children under 14. Car parking facilities in the barracks. In addition to massed bands, drill squads, unarmed combat, static exhibitions etc, GB3RM will be activated. Mostly on 80m, 3,720kHz, 1300 to 1400, 10th and 11th; 1430 to 1650, 12th; 1930 to 2130, 13th, 14th and 15th; 1430 to 1650 15th. Two stations active, one on 80m the other on vhf.

Rossall School, Fleetwood, 15 July
Charity fete on behalf of the National Society for Mentally Handicapped Children. Stations, manned by members of the Rossall School ARS and the Thornton Cleveleys ARS, will be active on all bands, including talk-in stations on 160 and 2m.

Cheadle Hume, 15–16 July
Summer fete of Cheadle-Moseley Grammar School, North Downs Road, Cheadle Hulme, Cheadle, Ches. GB3CMG operating round the clock on 80m, 2m, 70cm and hf bands. Visitors, and skeds for 70cm, very welcome. Information from G3ZOD, QTHR.

Cheshire Home, Liss, Hants, 22 July
G3TCR/P will be operating on hf and 2m, and possibly 4m, from the annual fete at the Cheshire Home, Le Court, near Liss, Hants.

Oldham Sheep and Dog Trials, 5 August
Special station GB3OST manned by Manchester and District ARS will be operational on 160m (a.m. only), 80 to 10m (ssb), 2m (a.m. only) and 70cm (a.m. only). Venue: Alexandra Park, Oldham.

Berkshire Scout Camp, 5–12 August
In connection with this international scout camp in Windsor Great Park, GB3BIC will operate on 10 to 80 and 2m. Special QSL cards will confirm all contacts. G3BHK, 28 Darwall Drive, Ascot, Berks.

Oslo Scout Camp, 3–9 August
From the Norwegian National Scout Camp near Oslo LA1SS will operate on all bands. Special QSL cards will confirm all contacts. LA4LN—Victor Segalstad, Heggeliviein 44, Oslo 3, Norway.

Wycombe Show, 2 September
Chiltern Amateur Radio Club will activate G3CAR from this show to be held at The Rye, High Wycombe, Bucks. Operation will be on all bands 80–10m, a.m., cw, ssb. Skeds welcome. Special QSL cards. Further details from A. C. Butcher, G3FSN, 70 Hughenden Avenue, High Wycombe, Bucks. Tel 24835.

MOBILE RALLY NEWS

Cornish RAC Mobile Rally, 9 July
Organized by the Cornish Radio Amateur Club, this rally will take place at the Truro Rugby Football Ground. Talk-in stations will be in operation, using the callsign GB3CRC, from 10am to 3pm on 1,873, 3,720, 70·375 and 145/144·3. Usual trade stands, raffles, side shows etc. Marconi Poldhu 70th anniversary film will be shown.

Torbay ARS Mobile Rally, 13 August
This will be held at the Newton Abbot Rugby ground opposite the Newton Abbot race-course on the Newton Abbot to Exeter Road. Talk-in station G3NJA/A on 1,865MHz from 1030am. Other stations on 2m and GB3TMR on other bands. Usual attractions.

Saltash & D ARC Mobile Rally, 20 August
At the Saltash Grammar School. Talk-in on 160, 4 and 2m from an early hour. Ample signposting and plenty of car space at the school where radio silence is requested. Doors open at 11am, official opening by the Mayor of Saltash at 2pm. Light refreshments, side-shows, trade stands and a draw. Further details from G4AJU.

East Kent Mobile Rally, 20 August
Organized by the East Kent Radio Society, this will take place at the Westgate Hall, St Peter's Lane, Canterbury. There will be trade stands and other attractions. Car parking facilities adjacent to the hall, and talk-in stations on 160m and 2m using callsigns G3LTY/A and G3UKC. Further details from G3MDO QTHR tel Canterbury 66586.

Five old-timers met at the Spalding Tuliptime Rally (l to r): G6UF, G5CX, G4OO, G5DD and G8DD. They are examining an army transceiver used in the trenches during the First World War, dated 1916, from G3KPO's Vintage Wireless Museum

Mobile Rallies Calendar

9 July	Cornish RAC at Truro Rugby Football Ground.
9 July	Exeter ARS informal mobile get-together, 2pm, Woodbury Castle, Woodbury, Nr Exeter.
16 July	Worcester & DARC, at Hill County Secondary School, Upton-on-Severn, Worcs.
16 July	Scarborough ARS at Burniston Road Barracks, Scarborough.
6 August	RSGB Woburn Abbey Rally
13 August	Torbay ARS at Newton Abbot Rugby Ground
13 August	Derby & DARS at Rykneld Schools, Bedford St, Derby
20 August	Saltash & DARC at Saltash Grammar Schoo!.
20 August	East Kent at Westgate Hall, Canterbury.
27 August	Preston ARS at Kimberley Barracks, Preston.
26-27 August	Stratford upon Avon RC and Mid-Warwickshire ARS combined in conjunction with National Town & County Festival, Royal Show Ground, Kenilworth, Warwicks.
24 September	Harlow & DARS.

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

These slow morse practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent to the honorary organizer, Mr M. A. C. MacBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

Clock time	Callsign	MHz	Town
Sundays			
0900	G3KEP	1·910	Bingley, Yorks
0930	G3YZZ	3·590	Maidenhead, Berks
0930	G3HZL	1·940	Isleworth, Middlesex
0945	G3YRO	1·860	Fareham, Hants
0945	G3USK	1·975	Mablethorpe, Lincs
1000	G2FXA	437·000 to north	Stockton-on-Tees
1015	G3CGD	1·875	Cheltenham
1030	G2FXA	437·000 to south	Stockton-on-Tees
1030	G3NPB	1·875	St Ives, Cornwall
1030	G3ZNW	144·520 to east	West Molesey, Surrey
1100	G2FXA	1·900	Stockton-on-Tees
1100	GW3UMB	1·880	Colwyn Bay
1115	G3ZNW	144·520 to north	West Molesey
1200	G3HVI	1·890	Stoke-on-Trent
1200	G3GNS	1·910	Weston-super-Mare
1330	G3FWW	1·880	Burnham-on-Sea, Soms
1330	G3XDV	1·190	Canterbury, Kent
1400	G3XWQ	1·975	Canterbury, Kent
1400	G3XGJ	1·830	Huddersfield, Yorks
1930	G3YFO	144·19 to south	Burnham, Bucks
†Alternately			
Mondays			
1800	G3SWR	1·980	Birmingham
1830	G3NCZ	145·800 omni-directional	Blackburn, Lancs
1830	G3RXH	1·910	Skipton, Yorks
1900	G3WGU	1·880	Bispham, Lancs
1900	GC2FMV	3·600	Jersey, CI
1900	G3YJA	1·920	Coventry, Warks
1900 †	G3ZBO		Preston, Lancs
	G3WFY	1·850	Thornton Cleveleys
	G3YEI		Fleetwood, Lancs
1900 †	G3YED	145·640	Leeds, Yorks
	G3YEE		Bradford, Yorks
1930	G2ABC	144·050 omni-directional	Woodford, Essex
2000	G3YQB	1·980	Aylesbury, Bucks
2000	G3XWZ	1·910	Mansfield, Notts
2000	G3KAN	1·990	Northampton
2000	G3IBJ	1·910	Southampton, Hants
2030 †	G3YEB	1·915	Harlow, Essex
	G3PRN		
2030	G3JHM	70·050	Worthing, Sussex
†Alternately			
Tuesdays			
1100	G3EBU	1·952	South Woodham, Essex
1800	G3XDV	1·910	Canterbury, Kent
1900 †	G3UFO	1·980	Wirral, Cheshire
	G3XAM		
1900	G3XWQ	1·975	Canterbury, Kent
1930	G3SWP	1·850	Doncaster, Yorks
1930	G3WGU	433·500 to south-east	Bispham, Lancs
1930 †	G3XUD	1·910	Leeds, Yorks
	G3YEE		Bradford, Yorks
1930	G3XGY	144·240 omni-directional	Weston-super-Mare
2000	G3ZFE	144·896 omni-directional	Hailsham, Sussex
2000	G3TUW	145·200 to south-east	Banbury, Oxon
2000	G3UPA	1·850	Meriden, Warks
2000 †	G3TIK	1·980	Stevenage, Herts
	G3KSS		
	G3OVT		
2000	G3FWW	1·880	Burnham-on-Sea, Soms
2000	G3WGD	1·860	Leicester
2000	GM3PIP	3·590	Mintlaw, Aberdeen
2030	G3HZL	1·845	Isleworth, Middlesex
2030	G3ROE	1·915	Harlow, Essex
2030	G3RB	1·975	Whitley Bay, Nth'land
2045	GM3CRY	3·590	St. Andrews, Fife
2100	G4RS	1·865	Blandford, Dorset
2200	G3HZM	1·925	Manchester
†Alternately			

Clock time	Callsign	MHz	Town
Wednesdays			
1830	G2FXA	1·900	Stockton-on-Tees
1900	G3YPZ	28·700	Harlow, Essex
1930	G3WGU	433·500 to south-east	Bispham, Lancs
1930	G3YFO	144·19 to north	Burnham, Bucks
2000 †	G3AJX	1·925	Winchester, Hants
	G3TWP		
	G3YSK		
2000	G8QU	1·970	London, N22
2000	G3JHM	70·050	Worthing, Sussex
2000	G3VCV	145·020 to north-east	Wyton, Hunts.
2030	G3KGU	1·915	Theydon Bois, Essex
2100	G3HVI	1·890	Stoke-on-Trent
†Alternately			
Thursdays			
1800	G3SWR	1·980	Birmingham
1830	GW3VBP	3·590	Barry, Glam
1830	GW3UMB	1·880	Colwyn Bay
1830	G3NC	1·968	Swindon, Wilts
1900 †	G3ZBO		Preston, Lancs.
	G3WFY	1·850	Thornton Cleveleys
	G3YEI		Fleetwood, Lancs
1900	G3WGU	1·880	Bispham, Lancs
1915	G3ZNW	144·520 to north	West Molesey, Surrey
1930	G3GNS	1·910	Weston-super-Mare
1930	G2ABC	145·500 omni-directional	Woodford, Essex
2030 †	G3SJE	1·875	Harrow, Middlesex
	G3GC		
2030	G3YMJ	1.915	Harlow, Essex
2100	G4RS	1·865	Blandford, Dorset
2100	GW3XNI	1·930	Crosskeys, Mon
†Alternately			
Fridays			
1800	G3XDV	1·910	Canterbury, Kent
1830	G3NCZ	145·800 omni-directional	Blackburn, Lancs
1900	G3IQF	1·980	Marlow, Bucks
1900	G3NPB	1·875	St Ives, Cornwall
1930	G3PQF	1·825	Farnborough, Hants
2000	G3EEL	1·980	Peterborough
2000	G3WGD	1·860	Leicester
2000	G3ZOD	1·925	Stockport, Cheshire
2015	G3SAZ	1·845	Ashford, Middlesex
2030	G3JHM	70·050	Worthing, Sussex
†Alternately			
Saturdays			
1000	G3PLE	1·820	Stourbridge, Worcs
1100†	G3ZOQ	28·350	Leyland, Lancs
	G3ZRE		
1300	G2FXA	1·900	Stockton-on-Tees
1400	GC2FMV	3·600	Jersey, CI
1600	G3ZOD	1·925	Stockport, Cheshire
1730	G3TNF	1·980	Gateshead
2000	G3KPO	1·980	Peterborough
†Alternately			

G3BZU morse proficiency transmissions at 20, 25, 30, 35 and 40wpm are made at 1900 gmt on the first Tuesday of each month on a frequency of 3·520MHz. For 100 per cent copy at 20wpm a certificate is awarded, and endorsement stickers are available for 100 per cent copy at the higher speeds. A charge of 10p or two IRCs is made for the basic certificate, and 2½p or one IRC for each endorsement sticker claimed. All claims should be sent to—The QRQ Manager, RNARS, HMS *Mercury*, Leydene, Petersfield, Hants.

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 Sept in Lancaster

Ainsdale (ARC)—Members should contact N. Horrocks, G2CUZ, for details of meetings.
Blackburn (ELARC)—First Thursday each month, 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Secretary: W. E. Baxendale, G8FDG, "Juverna", Westland Avenue, Darwen, Lancs.
Blackpool (B & FARS)—Mondays 8pm, Pontins Holiday Camp, Squires Gate. Morse tuition 7.30pm.
Bolton (B & DARS)—1st & 3rd Wednesdays, Bolton Recreation Club, Kensington Place. 5 July (More about 2m), 19 July (Certificate hunting). There is now a permanent station—callsign G8WY. Morse tuition is included at every meeting. Further details from G3XUM.
Bury (B & RRS)—2nd Tuesday each month at 8pm. George Hotel, Market Street, Bury. 11 July ("Slow-scan tv", by G3RTW). Secretary: G3RSM, 13 Rhiwlas Drive, Bury BL9 9DD.
Carlisle (C & DARS)—Mondays 7.30pm, Currock House, Lediard Avenue, Currock. Secretary: A. R. Harper, 23 Roman Way, Stanwix.
Cheshire (Mid-Cheshire ARC)—Wednesdays 7pm, Technical Activities Centre, Winsford Verdin Comprehensive School, Grange Lane, Winsford. Morse from 1900 to 2000bst—also on the air working on 160, 80 and 2m. 2000 to 2130bst main activity. Monday is net night on 160m at 1900bst. Tuesdays 2m—same time. Details from G3JWK.
Chester (C & DARS)—Tuesdays 8pm except first 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, Bridgwater School, Worsley, Manchester. Club 2m net channel is 145·7MHz. Secretary: G4AEQ.
Lancaster University (UOLARS)—Arrangements for the convention scheduled for 23–24 September are now getting well on the way. Prospective members should write to Phil Jones, Department of Environmental Sciences.
Leyland Hundred Amateur Radio Group—Second 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)—Radio G3OUL will cease operating during the summer vacation. Members of "Lid Net" will, however, be active on 80m. The society would be interested in hearing from any amateurs or SWLs joining the University. Contact can be made via Mr N. Pope, G4AXA, 234 Derby Road, Chesterfield, Derby S40 2EP, or by visiting the freshers week stall.
Manchester (M & DARS)—Wednesdays 7.30pm. 19 July ("Slow-scan television," by Keith Kahn, G3RTU). All meetings include morse classes. Secretary: G3IOA.
Manchester (SMRC)—Meets on Fridays at the Sale Moor Community Centre, Norris Road, Sale, Cheshire, at 8pm. The vhf section meets on Mondays at 8pm at the club shack at "Greeba", Shady Lane, Manchester 23. 7 July (Activity night and setting up the special event station at North Cheshire Technical College, Timperley), 14 July ("Aircraft navigation", by D. Leighton, G3UKM), 21 July (The club will meet at the special event station at the Manchester Flower Show, Platt Fields, Manchester), 28 July ("Integrated circuit receiver," by P. F. Lee, G3ZKO). Visitors welcome on both nights. Hon sec: G3WFT QTHR.
Manchester University (ARS)—At the AGM held on 11 May the following were elected for 1972–3: president Prof F. C. Williams; chairman, J. H. Quarmby, G3XDY; secretary, R. A. Mortimer, G3ZNS; treasurer S. Brain; PRO, R. F. Winkworth, G4AZA; business man, T. S. Smith, G3ZPY. For details of activities contact any of the above at University Union, Oxford Road, M13 9PR.
Preston (PARS)—6 & 20 July and 3 August, 7.30pm, Windsor Castle (private room), St Paul's Square, Preston. Secretary: G. Earnshaw, G3ZXC. Morse practice 7.30pm; main feature 8pm.
Stockport (SRS)—Second Wednesday each month is a discussion night, fourth Wednesday is a lecture night. 8pm, Blossoms Hotel, Buxton Road, Stockport. Secretary: G8BCG.
Thornton Cleveleys (ARS)—St John Ambulance Brigade HQ. Fleetwood Road North, (behind the police station), Thornton. First and third Wednesdays at 8pm Construction Group meets Mondays 7.15pm at Rossall School. Book through G4APP. 5 July (Radioactivity and lasers, Part 2, G3ZYE), 19 July (Visit to HMS *Inskip*. Limited to 20 members. Book through G3OFQ).
Warrington (W & DARS)—First and third Tuesdays, 8pm, Thames Board Mills Social Club, Alford Hall, Manchester Road, Warrington. 4 July ("Mobiling", by P. J. Himsworth, G4AUX), 18 July (Subject to be announced, M. Swinton), 1 August (Surplus equipment sale).
Westmorland (WRS)—First Monday each month at the New Allen Technical College. Acting Secretary is N. Stanley, G3UEC, 9 Castle View, Sedgwick, Westmorland.
Wirral (WARS)—First and third Wednesdays each month 7.45pm. Sports and Recreation Centre (Old Drill Hall), Grange Road West, Claughton, Birkenhead, Secretary: G3WSD.
Wirral (Wirral DX Association)—Last Thursday of each month at members' homes. Secretary: M. Davidson, G3YSM, 43 Stuart Avenue, Moreton, Wirral. Visitors welcome, please inform secretary beforehand.

Crewe—Local RSGB members should contact R. Owen, 10 Circle Avenue, Willaston, Nantwich.

Merseyside members meet for lunch on the first Monday in each month on HMS *Landfall* 12.30 for 12.45. Please advise G3VQT or G2AMV if you wish to attend.

REGION 2

RR J. E. Agar, G8AZA

Barnsley (B & DRC)—14 July ("The Intruder Watch", by G3PSM). Summer recess until the AGM on 8 September, 7.30pm, King George Hotel, Peel St, Barnsley. AR: Peter Ackley, "Camelot", Greenside, Havercroft, Wakefield. *G3LRP* QTHR.
Bradford (BRS)—4 July (Visit to Rank-Leak-Wharfdale Ltd, Idle, Bradford), 18 July ("The Harmonious Blacksmith", by H. Moore, G3WVD, and Fred). 7.30pm, HQ, 10 Southbrook Terr, Great Horton Rd, Bradford 7. Hon sec: R. Harker, A7585, Bdfd 43971, 65 Whitby Rd, Bradford BD8 9JN.
Fulford (FARS)—Tuesdays, 7.30pm, Scout HQ, 31 George St, York. Hon sec: G5KC QTHR.
Halifax (NHARS)—5 July, (Visit to Halifax Police HQ stn), 12 July (Committee meeting). 19 July (Ragchew). Hon sec: G3MDW QTHR.
Harrogate & Knaresborough—Meets second and third Mondays each month. Details from hon sec R. Troughton, QTHR.
Hull (H & DRS)—7 July ("HPX ladders" by P. Dunham), 14 July (DF receivers), 21 July (Receiver comparison), 28 July (Fault finding). Hon sec: Mary Longson, 4 Chester Rd, Hull.
North Riding (NRARG)—Meets at "Alma Inn", Scarborough, and "White House Hotel", Whitby, on alternate fortnights. Details from hon sec, J. E. Agar, G8AZA, QTHR.
Northumberland (Morpeth) (NRC)—"Northumbria Radio Club" meets at 3 Wheatsheaf Yard, Morpeth. Details from G3XAI QTHR.
Otley (ORS)—ORS is holding an open construction competition. Details from D. G. Mott, G8BZY, 17 Newall Carr Rd, Otley.
Scarborough (SARS)—Meets Fridays, 7.30pm, Technical College, Scalby Rd, Scarborough. *G3VAN* QTHR. AR G8KU QTHR.

South Shields (SS & DARC)—Fridays 8pm, Trinity House Social Centre, Laygate, South Shields.
Spen Valley (SVARS)—HQ Grammar School, High St, Heckmondwike. 7.30pm. Hon sec: *G8DSB* QTHR.
Sunderland (SARS)—Meetings first and third Tuesdays each month, 7pm, Sunderland Polytechnic. *G3XID* QTHR.
Tyneside (TARS)—Meets at Community Centre, Vine St, Wallsend. Details from hon sec, George Lowden, 21 Winefred Gdns, Wallsend NE28 6EF. Phone: Wallsend 627878.
Wakefield (WRS)—Meets alternate Tuesdays, 7.30pm, Wakefield Youth Centre, Ings Rd, Wakefield. Details from *G3XVU* QTHR.
York (YARS)—Thursdays, 7.30pm, British Legion HQ, 61 Micklegate, York. Hon sec: J. A. Rainbow, 14 Temple Rd, Bishopthorpe, York.

Hon secs and PROs. Please get your programmes in as early as possible to ensure your publicity in "Club News". 73 to all. *G8AZA*.

REGION 3 — RR R. W. Fisher, G3PWJ

If club secretaries have late information for inclusion in "Club News", to save time please telephone me at home on Kingswinford 77778.

Birmingham (MARS)—18 July, 7.30pm, The Birmingham & Midland Institute, Margaret Street, Birmingham 2. *G8BHE*.
(Slade)—14, 28 July, 8pm, The Church House, High Street, Erdington. *G8EYL*.
(South)—5 July ("How to get that QSO-VHF", by T. Douglas G3BA). 8pm, Hampstead House Fairfax Road, West Heath. The society will be operating GB3QE from the Queen Elizabeth Hospital on 15 July, their Open Day.
Bromsgrove (B & DARC)—14 July (Stereo demonstration by G4AAL), Royal Oak, Barley Mow Lane, Catshill.
Coventry (CARS)—No set programme but will continue to meet each Friday), 8pm, City of Coventry Scout HQ, 121 St Nicholas St, Radford Road, Coventry.
Dudley (DARC)—4, 18 July, 8pm, Central Library, St James's Road, Dudley. *G3PWJ*.
Redditch (RARG)—13, 27 July, 8pm, Old People's Centre, Park Road. *G3EVT*.
Solihull (SARS)—18 July ("Getting going on Top Band and Two, Part 2", a discussion led by G3PYR), 7.30pm, Manor House, High Street. 1 August (Informal meeting), 9pm, Malt Shovel High Street. *G3XPY*.
Stourbridge (S & DARS)—4 July (Informal, "Shrubbery Cottage") 8pm. 9 July (Using the callsign GB3SVR, we will operate a special event station in connection with the Severn Valley Line). Hon sec: Mr B. Powell, 17 Mill Road, Cradley Heath, Warley, Worcs.
Telford (WARS)—5 July (Walker Tech meeting), 12 July (Discussion and committee meeting), 19 July (External visit), 2 August (Walker Tech meeting, films), 7.30pm, HQ, Ketley Bank, Youth Club Main Road. *G3UKV*.
Wolverhampton (WARS)—14 July (Slide and talk, "History of wireless in Wolverhampton 1913–1972"), 7.30pm, Ounsdale School, Wombourne. *G3CAQ*.
Worcester (W & DARC)—3 July, 15 July (Preparations for the rally), 8pm, Commercial Room, Crown Hotel, Broad Street. *G8ASO*.

REGION 4 — RR T. Darn, G3FGY

Chesterfield (CDRS)—This club meets at the Zion Methodist Chapel, Chatsworth Rd, Chesterfield, on Wednesdays at 7.30pm. The second Wednesday in the month is a formal meeting.
Derby (DADARS)—5 July (Surplus sale), 7 July (Midsummer dance and buffet, Ilkeston), 12 July ("Medium wave and Top Band propagation" by R. Buckby, G3VGW), 12 July (Film show), 26 July (DF practice night). Club meets in Room No 4, 119 Green Lane, Derby, at 7.30pm.
Grimsby (GARS)—6 July (Talk on computing), 20 July (Visit to computer centre), 3 August (2m Foxhunt). Meetings at 8pm at the Red Cross Rooms, Rowston St, Cleethorpes. *G8EDK*.
Lincoln (LSWC)—The club meets every Tuesday at the Club Headquarters, No 2 Guardroom, Sabraon Barracks, Lincoln. Visitors welcome.
Loughborough (LARC)—The club meets each Friday at 8pm, Bleach Yard, Wards End, Loughborough. *G8FER*.
Mansfield (MARS)—Meetings are held on the first Friday of the month at the New Inn, Westgate, Mansfield, at 7.45pm. *G3XWZ*.
Nottingham (ARCON)—6 July (Forum), 13 July (2m activity night from G3EKW), 20 July (G3TFA, talk and slide show, "The full inside story") 27 July ("Using the oscilloscope in amateur radio", by Bev Sutton, G3TVY). All meetings are held at the Sherwood Community Centre, Mansfield Rd, Nottingham, at 7.30pm. The new hon sec is Frank Claringburn, 49 Ferliegh Av, Nottingham NG3 6FN. *G4AFJ*.

REGION 5 — RR P. J. Simpson, G3GGK

Bedford (B & DARC)—6 July ("Transmission lines", by G2CLP), 13 July ("Delta het rx", by Bob Woodhouse), 17 July (Committee meeting at club room,) 20 July ("Transistors at work", by G4AHE), 27 July ("Quiz", by G3FWA). Meetings, 7.30pm, The Dolphin, Broadway, Bedford. Hon sec: John Bennett, G3FWA, 47 Ibbett Close, Kempston, Beds.
Cambridge (C & DARC)—7 July (SSB Field Day prep), 14 July (2m Foxhunt), 21 July (Informal), 28 July (Informal). All August meetings informal. 7.30pm, club HQ, Corporation Yard, Victoria Rd, Cambridge. Hon sec: J. Hern, G3NAC, 5 Acheson Rd, Brampton, Hunts.
Dunstable Downs (DDRC)—7 July (Between week), 9 July (2m df hunt, Map 147 1in OS. Fox will sign G8DDC on 145·05MHz. Starting at 1400 clock time). 14 July (A/TV demonstration), 21 July (between week), 28 July (2m df hunt. Map 147 1in OS. Fox will sign G4ARD. Commencing 2000 clock time). 8pm, Chews House, 77 High St Sth, Dunstable. Hon sec: C. G. Powell, G8BPK, 1 Wenwell Close, Buckland Wharf, Aston Clinton, Aylesbury, Bucks.
Ely (EARS)—Meetings alternate Thursdays, 7.30pm. Ely Adult Education Centre, St Mary's St, Ely. Hon sec: P. Brown, A6775, 59 Fieldside, Ely.
March (M & DARS)—Tuesdays, 7.30pm, The Old Police HQ, High St, March. Hon sec: K. C. Smith, G8BEN, 26 New Rd, Whittlesey, Peterborough, Northants.
Shefford (S & DRS)—6 July ("Valve development", by G2DGF), 13 July ("How to give a talk", by Jim), 20 July ("VHF Field Day planning", by Chris Davies), 27 July (DF hunt—G2AUA). Meetings at Church Hall, Ampthill Rd, Shefford, Beds. Hon sec: A. Sullivan, G2DGF, 12 Glebe Rd, Letchworth, Herts.

"Early arrivals" at the dinner on 19 May to mark the Wolverhampton Amateur Radio Society's Golden Jubilee Year

Stevenage (S & DARS)—6 July ("Semi-conductors", by G3TIK), 20 July (On the air—G3SAD). RAE classes now under way, organized by G3SJR. Meetings in the Senior Staff Canteen, Hawker Siddeley Dynamics Ltd, Gunnels Rd, Stevenage, Herts.

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

Many thanks for your newsletters.

Acton, Brentford & Chiswick (ABCRC)—18 July ("The FTDX401 Transceiver", by G5KD), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick. Hon sec: W. G. Dyer, G3GEH, QTHR.
Addiscombe (AARC)—No information received. Club meets at Prince George's Hotel, High St, Thornton Heath. Details from hon sec, c/o 32 Nursery Rd, Thornton Heath, Surrey.
Ashford, Middlesex (Echelford ARS)—10 July ("Satellite communication", by G3NPA. This talk includes film and slides of the Goonhilly Down satellite tracking station). 27 July (Being arranged). 7.30pm for 8pm, St Martins Court, Kingston Crescent, Ashford, Middlesex. Hon sec: Vic Higgs, G3WVJ, QTHR.
Barking (BR & ES)—8-9 July, Exhibition station at Dagenham Town Show. All bands covered from 160m to 70cm. Any licensed amateur wishing to operate at the show should have licence available for inspection. Talk-in facilities on 160m and 2m. Hearty welcome extended to all who wish to come along to Central Park, Dagenham. Nearest stations: Dagenham, East Heathway, Romford. Buses 23, 25, 87, 103, 139, 175, Greenline 722. Hon sec: H. Davidson. G3FZP, QTHR. (01-594 7874).
Bexley Heath (North Kent RS)—13 July (Club project evening, crystal calibrator), 27 July (Junk sale). 7.30pm, Congregational Church Hall, Chapel Rd, Bexley Heath. Hon sec: Maurice Lee, G4BAZ, QTHR.
Burnham Beeches (BBARC)—6 July ("Stereo broadcasts", by Ray Clark), 20 July (To be announced). 8pm, Hedgerley Scout Hut, Hedgerley, Nr Slough, Bucks. On 15–16 July a club exhibition will be operating on 2m from Anglesey and skeds can be arranged for any time on the 15th (Saturday). Further details from hon sec, Nina Appleby, G8ENX, QTHR.
Cheshunt (CDRC)—7 July (Talk on integrated circuits and their use on instrumentation). 8pm, Methodist Church Hall, opp. Theobalds Station, Cheshunt. 9 July (Annual field day held at Goffs Oak Playing Fields. Station operative on 80m–10m ssb). Hon sec: Richard Ludwell, G3ZZQ, QTHR.
Chingford (Silverthorn RC)—Every Friday, 7.30pm, Friday Hill House, Simmonds Lane, Chingford E4. Hon sec: A. P. Mitchell, G3YJZ, QTHR.
Cray Valley (CVRS)—6 July ("Satellite communication", by G. W. Anderson, G3NPA), 20 July (Natter nite). 8pm, Congregational Church Hall, Court Rd, Eltham, SE9. Hon sec: P. F. Vella, G3WVP, QTHR.
Croydon (Surrey Radio Contact Club)—18 July (A talk and demonstration by the UK FM Group; speakers G8AMG & G5AGX). 8pm, "Swan and Sugar Loaf", 1 Brighton Road, Croydon. New committee: chairman, B. Wynn, G8TB; vice-chairman, D. Tilcock, G8DWM; secretary, S. Morley, G3FWR; treasurer, E. Jones, G3EUE; members, P. Burton, G3ZPB, M. Fagg, BRS30520, A. Naylor, G3GHI, and A. Smith, G3IAS. *G3FWR*, QTHR.
Crystal Palace (CP & DRC)—15 July ("Microwave operation", by Dain Evans, G3RPE). 8pm, Emmanuel Church Hall, Barry Rd, SE22. Hon sec: Geoff Stone, G3FZL, QTHR.
Dartford Heath (DF Club)—16 July (DF qualifying event, Salisbury) 23 July (Club hunt, details later), 30 July (DF qualifying event, Stratford). Hon sec: Maureen Worbey, G3XVC, QTHR.
Ealing (E & DRS)—Every Tuesday, 7.30pm, Northfields Community Centre, Northcroft Rd, W13. Further details from hon sec, J. E. Alban, G3JEA, QTHR.
East London RSGB Group—Meets at Wanstead House, The Green, Wanstead, E11. Details from Ron Ledgerton, G2ABC, QTHR.
Edgware (E & DRS)—10 July (Talk on "Raynet", by G3NGK and G3ERO), 24 July (Informal). 8pm, St George's Hall, 51 Flower Lane, Mill Hill, NW7. Hon sec: Alan Masson, G3PSP, QTHR.
Gravesend RSGB Group. Every Monday 7.30pm, "Windmill Tavern", Shrubbery Road, Gravesend. Area representative, from whom further details may be obtained, P. F. Jobson, G3HLF QTHR.
Greenford (GARS)—14/28 July, (No details received) 8pm, Greenford Community Centre, Oldfield Lane, Greenford. Hon sec: John Hedges, G3MMQ, QTHR.
Guildford (G & DRS)—14/28 July (No details received). 8pm, Guildford Engineering Society, Stoke Park, Guildford, Surrey. Hon sec: Peter Hopwood, G8CQM, QTHR.
Hampton Court (Thames Valley ARTS)—5 July (No details received). 8pm, "The Three Pigeons", Portsmouth Rd, Long Ditton. PRO: Rob Muir, G3LHN, QTHR.
Harlow (DRS)—Every Thursday, 8pm, Mark Hall Barn, First Ave, Harlow. Further details from hon sec, V. Heard, 108 Vicarage Wood, Harlow, Essex.
Harrow (RSH)—Every Friday, 8pm, Harrow County School for Boys, Sheepcote Road, Harrow. Further details from hon sec, Les Light, G3KDL, QTHR.
Havering (H & DARC)—12 July (VHF NFD discussion), 26 July ("Transistorized stabilized power supplies", by G3TPJ). 8pm, British Legion House, Western Road, Romford. Hon sec: S. J. Hobday, G3SKV, QTHR.
Holloway (Grafton RS)—Mondays (RAE) 7pm, Fridays (Morse and club), 7.30pm, Archway School Annex, Whittington School, Highgate Hill, N19. Hon sec: Tom Coleman, G8EEI, QTHR.
Kingston (K & DARS)—12 July (No details received). 8pm, "Penguin Lounge" 37 Brighton Road, Surbiton. Hon sec: R. S. Babbs, 28 Grove Lane, Kingston.
Loughton (L & DRS)—7 July ("Using an oscilloscope", by G3TUC) 21 July (Informal). 8pm, Loughton Hall, Rectory Lane, near Debden Station. Hon sec: Dave Bowers, 12 Theydon Park Road, Theydon Bois, Epping, Essex.
New Cross (Clifton ARS)—Every Friday, 8pm, 225 New Cross Road, London SE14. Further details from hon sec, R. A. Hinton, 58 Camilla Road, Bermondsey SE18.
Northolt (BEAARS)—First Wednesday of month. BEA Trident Club, Western Ave, Northolt, Middlesex. (This club is open to non-BEA employees by invitation. Contact David Evans, G3OUF, tel Amersham 3237 for details.
Paddington (P & DRS)—Every Wednesday, 8pm, Beauchamp Lodge, 2 Warwick Cres, W2. Further details from hon sec, Mike Pawley, G8AWV, QTHR.
Purley (P & DRS)—11 July (Natter nite), 25 July (Talk, slides etc on the trip to GD by the committee). 8pm, Lansdowne Hall, Lansdowne Road, Purley. Hon sec: Alan Frost, G3FTQ, QTHR.
Reigate (RATS)—First Wednesday (Club night). 8pm, "Nutley Hall", Nutley Lane, Reigate. Third Wednesday (Ragchew). 8pm, "Marquis of Granby", Hooley Lane, Redhill. Hon sec: F. Mundy, G3XSX, QTHR.
Scouts (Baden Powell House ARG)—20 July (A visit, details later). New committee: chairman, V. Sedgley, G3YIC; treasurer, S. Nelson; secretary, A. Watts, G3FXC; members, J. Bottom, G3SDG, K. Dorrell, G4AZO, and S. A. Bauer, G3FXC, QTHR.
Southall (UK FM Group, London)—20 July (Demonstration of 3cm equipment by G3ZGO). 7.30 for 8pm, Scout Hut, Hayes Road, Southall, Middlesex. PRO: M. Tooley, G8CKT, QTHR.
Southgate (SRC)—13 July (No details). 7.30 for 8pm. Civil Defence Hut, Bowes Road (opp Arnos Grove Underground station), London N11. 6–8 July, GB3SFG in operation at Finchley Carnival, Victoria Park, Ballards Lane, Finchley N3. For further information contact PRO Steve White, G3ZVW, QTHR.
St Albans (Verulam ARC)—19 July (Talk and demonstration on rtty by R. C. Marshall, G3SBA). 7.30 for 8pm, Town Hall, St Albans. Hon sec: Hugh Young, G3YHY, QTHR. All visitors welcome.
Sutton & Cheam (SCRS)—18 July ("Communications" films by Alan Keech). 8pm, "The Harrow", Cheam. Hon sec: J. Korndorffer, G2DMR, QTHR.
Welwyn (Mid-Herts ARS)—No information received. Club meets at 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)—14 July (No details), 7.30 for 8pm, St John's Hall, 124 Kingston Road, Merton, SW19.
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)—20 July ("IC of the month", by G3JIX, and "Printed circuits", by G3EMU), 20 August (Mobile rally and trade stands at Westgate Hall, Canterbury). Alternate meetings in conjunction with UKC at Electronics Building. Further details of meeting etc from G3MDO, QTHR.
Horsham (HARC)—4 July (Joint meeting with another club), 18 July (Informal meeting at the Star Roffey).
Eastbourne (SARS)—3 July (Outdoor event), 22 July (First mobile rally at the Polgate Steam Engine Rally site).
Tunbridge Wells (WKARS)—7 July (Talk on vhf by Bert Allen, G2UJ), 21 July ("The RSGB", by Tim Hughes, G3GVV, President, RSGB). Details from H. Reynolds, 17 Reynolds Lane, Tunbridge Wells.
Brighton (BTCARC)—Club meetings on alternate Mondays. Details from hon sec G2CMH, 35 Wilington Way, Brighton.
Crawley (CARC)—Monthly meetings held at Trinity Congregational Hall, Ifield, Crawley.
Maidstone (MYMCAARS)—Meetings held every Friday at Y Sports Centre, the first and third Fridays being devoted primarily to the beginners.
Mid-Sussex (M-SARS)—All meetings held at Marle Place, Leylands Road, Burgess Hill.
Thanet (TRS)—Meetings held every Friday at Hilderstone House, Broadstairs.
Worthing (W & DARC)—Meetings held every Tuesday at Rose Wilmot Youth Centre, Littlehampton Road, Worthing. Details of future meetings from G6KFH/T.

REGION 9 — RR H. W. Leonard, G4UZ

Bristol (City & County RSGB Group)—24 July (Home constructed equipment). 7.30pm, Becket Hall, St Thomas Street, Bristol 1. *G3ULJ.*
Bristol (BARC)—Now meets every Tuesday at 24 Bright Street, Bristol 5. 7.30pm.
Bristol (University ARS)—Every Saturday, 2.30pm, Dept of Physics, Royal Fort, Tyndalls Park Road, Bristol 8. *G8ADP.*
Burnham on Sea (BoSRC)—Contact J. Robertson, G3ZOR, for details. Burnham 2333.
Cornish (CRAC)—6 July ("VHF propagation", by G3XC), 9 July CRAC Mobile Rally at Truro Rugby Ground. 3 August ("Colour TV", by G3HFS) and question and answer session. Club meets first Thursday of month at 7.30pm, SWEB Social Centre, Pool, Camborne. Amateurs visiting Cornwall on holiday or business very welcome. Contacts with mobiles a speciality. Contact the PRO, G3NKE QTHR, or phone Camborne 2419. *G3WKP.*
Newquay Group (CRAC)—Fortnightly 7.30pm, Treviglas School, Newquay. Dates from G3THT. Further details of Cornish and Newquay Group from G3NKE.
Exeter (EARS)—Every Tuesday, 9 July (Informal Mobile Picnic at Woodbury Castle, Nr Exeter, 2pm). 11 July (Talk). 7.30pm, Community Centre, St David's Hill, Exeter.
North Devon (NDRC)—Second and fourth Wednesday of month, 12 July (talk), 26 July (Ragchew). G4CG can arrange skeds with mobiles in North Devon. 7.30pm, "Grinnis", High Wall, Sticklepath, Barnstable. *G4CG.*
Plymouth (PRC)—First and third Tuesdays of month. 7.30pm, Virginia House, Bretonside, Plymouth. Hon sec: S. E. Martin, 32 East Park Ave, Plymouth PL4 6PF.
Saltash (S & DARC)—First and third Fridays of month. 7 July (Visit to gas plant, Breakwater Works, Plymstock), 21 July (Fox hunt. Meet outside Toc H at 7.30pm). 7.30pm, Burraton Toc H, Saltash. Hon sec: G4AJU, 302 St Peter's Road, Plymouth PL5 3DU.
South Dorset (SDRS)—Society is still active and meets on first Friday of month. 7 July ("Test equipment", by G3JRL). 7.30pm, Alma Road section of Weymouth Tech College. Chairman: G3RYE, secretary, G3VPF; treasurer, G8FEL. *G3VPF.*
Taunton (T & DARS)—Fridays, 7.30pm, Jelalabad Barracks, The Mount, Taunton. No news of programme.
Torbay (TARS)—Every Tuesday and last Friday and Saturday of month. 29 July (Question and answer session led by G3ABU). 7.30pm, rear of 94 Belgrave Road, Torquay. Visitors most welcome. *G3NQD.*
Weston-super-Mare (WsMRS)—Second Friday each month. Contact G8FNL at WsM 29327 for details. Visitors and holiday-makers very welcome. *G3GNS.*
Yeovil (YARS)—Every Thursday, 7.30pm, Youth Centre, The Park, Yeovil. No details of programme. *G3NOF.*

REGION 10 — RR D. M. Thomas, GW3RWX

Blackwood (ARC)—Fridays, 7.30pm, during school terms. Oakdale Community Centre, Oakdale, Mon.

The club suffered a severe loss recently in the death of its president, Frank Mudford, G6BK. Frank was almost unique inasmuch as he had only once been on phone during his long career on the air. He was a superb operator and a really gentle man, and will be sadly missed not only by the club members but also by all members in Region 10.

Barry College of Further Education (ARS)—Thursdays, 7pm at the College, Colcot Road, Barry, Glam.

The highlight of the closing stage of the 75th Marconi-Kemp commemoration was the luncheon, on 19 May when the chief guest was Mr Huw Wheldon, OBE, MC, managing director of BBC television. The event was indeed memorable, and was attended by Council members George Jessop, G6JP, Bill Scarr, G2WS, and Cyril Parsons, GW8NP. The society president, Alderman Mrs Dorothy Rees, in an impressive speech, paid tribute not only to the work of Marconi and Kemp, but also to the BBC and praised the initiative and hard work of the society members who had made the commemoration possible.

A social at the Lavernock Point Holiday Camp on the evening of the 20th, attended by over 80 South Wales amateurs, suitably terminated the proceedings.

Cardiff (RSGB Group)—Monday 10 July, 7.30pm. BBC Club, Llandaff nr Cardiff. GW3GHC. The visit to the Royal Radar Establishment, Malvern, on 22 May was highly successful and provided much food for thought to the members attending.
Glamorgan Raynet Group—Details available 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. Sec: Mr F. E. Tribe.
Pembroke & District (RSGB Group)—Last Friday of each month, 7.30pm, at the Defensible Barracks, Pembroke Dock, Pembs. *GW3LXI.*
Sully & District Short-wave Club—Tuesdays, 7pm, at The Annexe, Sully Bowls & Social Club, 59 South Road, Sully, Glam. *GW3ZSV.*
Rhondda (ARS)—Meets at Rhondda Transport Employees Club and Institute, Porth, Rhondda, Glam. *GW3PHH.*
Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Swansea. Sec: Mr D. E. Connor, 7 Glanmon Road, Sketty, Swansea.
University College, Cardiff (ARS)—Students entering for the 1972-3 session interested in the society should communicate with the secretary, Mr Simon Northeast, c/o Students Union, Dumfries Place, Cardiff, as soon as possible.
University College of Wales Aberystwyth Radio & Electronics Society—Miss Ruth Bury, secretary of the society, will be interested to hear from new entrants for the 1972-3 session. c/o Students Union, University College of Wales, Aberystwyth, Cards.

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 15 July. Cameron Highlander's Memorial Youth Club, Planefield Road, Inverness. Mr L. Bell, 114 Glenurquhart Road, Inverness.
Lhanbryde (MFARS)—Wednesdays, 7.45pm, St Andrew's 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 St, 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. Horne, GM3YBQ, 14 Liss Way, Kirkcaldy.

REGION 14 **RR M. A. Comrie, GM3YRK**

Ayrshire (AARG)—2 July, 7.30pm, YMCA, Howard Street, Kilmarnock.

Glasgow University (GURC)—The club will not be holding any formal meetings over the summer months, although the club room in George Service House may be open on some occasions to members wishing to use the club station. The first formal meeting in the new session will be held on Thursday 12 October, and thereafter on alternate Thursdays—the other Thursdays being morse classes and club station activity nights. The AGM will be held on 9 November, and the annual junk sale on 14 December.

West of Scotland (ARS)—7, 14, 21, 28 July, 7.30pm in the club rooms at 81 Virginia Street, Glasgow. Slow morse is run prior to the meeting by GM3HLQ, and the meeting is conducted by the recently elected chairman, Jim Stirling. GM3UWX.

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, second and fourth Wednesdays, 7.30pm, at Handford House, corner of Handford Road/London Road, Ipswich. July—only one meeting—12th ("Computers", by G3TNE). Details of meetings from G3YWM.

Norfolk (NARC)—Every Wednesday, 7.45pm, at Crome Community Centre, Telegraph Lane East, Norwich. 5 July (Informal evening and morse practice), 12 July (Business meeting), 19 and 26 July—both meetings will be used for work on clearing and re-decorating the new shack at the community centre. Details of meetings 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—13 and 27 July. Details from G3AXN.

REGION 17 **RR L. Hawkyard, G3ZKR**

Basingstoke (BARC)—Meetings first and third Saturday each month. 15 July ("Oscillators", by Peter Sterry, G3CBU), 22 July (at Le Court House Cheshire Home, Liss, annual fete). Chineham House, Popley, 7.30pm. *G3CBU.*

Maidenhead (M & DARC)—Monday 3 July (Informal meeting), Tuesday 18 July (Informal meeting). 7.30pm, at Victory Hall, Cox Green, Maidenhead.

Southampton (RSGB Group)—7 and 8 July. Southampton Show. Amateur Radio Exhibition. Talk-in station on 2 and 4m, hf bands ssb station. Home constructed equipment and museum items. Club meetings every Wednesday at Kent Road Clubroom. G3ZKR, tel 73378.

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

Pye Cambridge, unmodded gd cond, unused since purchased, £15. G2NR, QTHR. Tel. Linstead 294.

/P gear 30ft sctnl alloy mast, guyring, baseplate, £5; 2m tx, 2 xtals, metered, £8; 4m tx, 1 xtal, £5, both 6 or 12V heaters mod & cw; 160m tx/rx, 12V +ve or —ve earth, separate psu, £20. G3THX, QTHR.

Creed 71D/3 triple headed auto tx (5 unit tape reader), PO type 3A, magnetic clutches, mains moter, perfect wrkng order, £15. Creed 54, needs attntn to perforator, £10, pref buyer coll. G3YKB, QTHR.

Pye Cambridge dash mount high band, unmodded, in gd cond; exch for gd typewriter, electric or mech. QQVO3-10, 3 for 55p, Pye manuals, many and varied. Wanted: pr of 6146Bs. G3MOU, QTHR. Tel 01-570-6181.

Sig gnrtr TF390G, 8-100MHz, £12, 250W mains isolation trnsfmr in case, £3, 70cm 14 ele Yagi, used, £2; Cossor fm tx, no valves, £1. power mtr, 50p, buyer coll. G8ACE. Tel Royston 41164.

Londex coaxial relays, £2.20. New 832, 75p, 6J6, 20p, 6AK5, 30p, 1A rf mtrs, 2 for £1.20. 866, 50p, Avo sig gnrtr, Avo valve characteristic mtr, Beamec crt tester, 1475 psu, offers pse. G3FQH, QTHR. Tel Skelmanthorpe 2390.

Unused tv valves, original boxes, 51 for £11 or 30p ea. Xtals 51, 52, 325, 327, 25p. New MC mic, £3, Eddystone sloping ft, £1.25. Pr 80Ω hd loads, £1.20. G3VQH, QTHR. Tel Skelmanthorpe 2390.

Inoue IC 700 tx/rx (80-10m), comprising rx (12/240V) solid state, noise lim, cw fltr irt; tx, 2X6146B, VOX, alc; psu (240V) for tx with spkr, ideal /M /fixed, £110 ono. Rhodes, 28 Darby Green Lane, Blackwater, Camberley, Surrey. Tel Cricket Hill 5722.

Collins mech fltrs type F455.F.05, 455kHz 500 cps, 6dB down, also type No F455Z-19 lsb 455kHz, 2·8kHz at 2dB down, £7 ea., two 4-125 tetrodes for G2DAF hf linear, £4 ea. G3WZT, Kings Down, Church Rd, Partridge Green, Horsham, Sussex. Tel Partridge Green 565.

Powerful Monarch communication rx for hf amateur bands. £20, motor cycle batt and charger suitable for powering amateur eqpmnt, also spares and dry batts, send sae for list. G8ACK, "The Chestnuts" Branch Hill, Hampstead, London NW3. Tel 01-435 1717.

No 19 set with mains psu + control box connectors, hdgear assembly, No 38 set, afv complete, vgc. Asdic test mtr, vgc, £20 the lot ono. M. B. Worvill, 40 The Leys, Chipping Norton, Oxon. Tel 2724.

Pr Pye six channel boot mounted Rangers comp with control boxes, cnvtrd to 2m, xtalled for transmit and receive on 4 channels, 145·9, 145·8, 145·7, 145·0, £25 ea incl xtals. Barker, 8 Strathmore Rd, Worthing, Sussex. Tel Worthing 40513.

DX100U and SBIOU, £50 or exch for aerial and rotator or domestic vhf tuner unit. G3YSO, QTHR. Tel 0643-3306.

KW vanguard tx 160–10m, £15, Pye reporter, lo and hi band tx/rxs, 0·5W input, £5 ea, will del Chelmsford area. G3YCH, QTHR. Tel Derby 25581.

Property of late G2TP: KW1000, £100, Drake R2B, £60, KW204, £100, Parkair 2m tx, £30, Vanguard, £25, sae with enquiries, carr extra or buyer coll. G3BZO, QTHR, Tel Horley 6322.

Eddystone 750 with mtchg spkr, gd cond, £35, pcr int spkr, £5, 4CX250B, 50p + base, 50p. D. S. Green, 5 Parklands, Surbiton, Tel 01-399-7855.

Various 2m beams, Stoll rotator, GEC Miniscope, AR88D, Unica UR1A, microwave mods, 2m cnvtr (28/20MHz), Multiminor MK4, 160m a.m./cw tx. Wanted: all band ssb tx/rx. G8EGI, QTHR. Tel 0632-814688.

Two ex GPO aerial tower sctns, ea 12ft 6in long with joining pieces, £10 the lot, buyer coll, G3TRB, 48 Newland Rd, Droitwich, Worcs. Tel Droitwich 4806.

Heathkit RF-IU, AO-IU, £14 ea, GDO-IU, £11, BC221m psu, £15, mtrs micro-A 1009, 500-0-500, £1.25 ea; valves 2, qvo3–20A, £1.25, qvo3–10, £1, 2 Electrolytic 15000mfd, £1.25 ea, swr bridge, £2.75, rf imp bridge £3, comp, charts inst bks etc. G8BI, QTHR. Tel Welwyn Garden City 23676.

B40/c fitted extra slow motion drive with circ diag, vgc, £20, Philco cassette recorder + 4 c-60 tapes, complete as new, £18. Alistair Dunsmore, 2 Glenmavis Dr, Bathgate, West Lothian.

DX100U tx + SBIOU both in exc cond + wrkng order, £45, 19in rack 5ft high on trolley, £6. G3YPS, QTHR.

Vhf amps transistorized for /M or fixed operation, 90W out, £66 ea, 50W out, £40, all need 10 to 12W drive, not for ssb or a.m., fm/cw only. G5AGX, QTHR. Tel 01-894 6880.

KW Victor tx, exch tape or cassette recorder or £25; TCS12 tx, £4.50 G3UNV, QTHR. Tel Ashford, Mdx, 59628.

Bird load/Wmtr 0-600M, 0-15-60W, precision istr in case, £12, rare 1Kw linear HA14 with ac.psu, £85, TS510, remote vfo, cw fltr + spares, £160, all superb cond. GW3DZJ, QTHR. Tel St Asaph 3333.

Hallicrafter sx-101 ham band rx, gd cond, offers; Heathkit HW-32A, hndbk, orig carton, mint cond, £55, Heathkit Q multi qf-1, £6.50, Heathkit Mohican with manual, exc cond, £25, Trio jr-310, as new, 3 mths, £68. GI3ZIA, QTHR. Tel Enniskillen 2188.

FT–DX–400 + SP400 spkr and YD844 mic as new with orig packing, £155. Appleton, 3 Boyne Rise, Kingsworthy, Nr Winchester, Hants. Tel Chilbolton 391, business hrs.

Johnson Z-mtch capacitors, £2.50. UM2 modulation trnsfmr, £2.50. Two BC221 with p/s, £10. £15, xtals, mtrs, trans, HRO dial and gearbox, £2.50. New KW2000A mtr, £1.50. Extra xtals, 75p. All plus carr. G3IDW. Tel Stratton St Margaret 2055.

/M outfit, topband 280 AT5 tx, homebrew transistor rx, control box, invrtr, mic, base loaded whip for topband, exc cond, £22.50. Buyer tests and coll. G2HKA, QTHR.

UM2 DT2 trnsfmrs. Geloso 4/104 vfo command rx, 7–9MHz, early radio books pre 1914 to 1939, offers? Wanted; Heathkit tx/rx. G3DRA, QTHR.

Cambridge a.m. boot mounting with cradle. Spkr control box, mic and all cables on 145MHz with xtals, £26. You coll. J. Dobie, QTHR. Tel 01-397 5552.

Hudson am108 /M rx/tx, £5. AM105 base stn, £10. AM200 qro base stn, £15. Pye Rangers, £5. Pye base stn, £15. All units 70–85MHz, gd cond, unmodded, suitable 4m cnvrtble 2m. G3ANK, QTHR. Tel 302-0865.

G2DAF rx, £39 swop EC10; 2m ranger with xtal, £15, am/fm ranger tx, £6, 4m cnvrtr, transistorized, 2·8–3·5MHz, £7, QQVO6-40A, new, £2, B44s + xtals, £5 ea, AT5 + 12V psu, £10. G8CUB, Flat 2, Springfield Ave, Brentwood, Essex.

Trio JR310, immac cond, used only 5 hrs, + hndbk, £75. Cleaver, 86 Main Rd, Dovercourt, Harwich, Essex.

Rack fitting 2m vhf GEC exciter, ample space for pa on same unit, £6. Airflow base for 4X150A, £4. Wavemtr W1646 18-87MHz, ac power, £6. G3KH, 133 Station Rd, Cropston, Leicester LE7 7HH.

27ft 2in aluminium mast, 3 sctns, low-band Pye reporter, G3RKK rx, inc 898 dial, QP166 needs attention, Woden UM1, 2, *Bulletin* 1964–71, psu 350V 150mA + 6·3V, 150V stab metered, offers? Miles, 28 Milton Dr, Shepperton, Middx. Tel Chertsey 62277.

500 pf variable capacitors from 19 set, 50p ea. 12SH7 valves, 15p ea. Philips food mixer and stand, £8.50. Various books for the jnr op, sae for details pse. Mr D. Johnson, 29 Chatburn Rd, Clitheroe, Lancs. BB7 2AW.

Trio JR310, extra fltr and calibtr, exc cond, £60. Trio 9R-59DS, exc cond, £35. Parkair 2m tx, 10W output, 4 switched xtals with manual and Shure 444 mic, first class order, £60. G8AGZ, 4 Westmore Cres, Burnham-on-Sea, Somerset, Tel Burnham 4635.

Lafayette HA600 rx, mint cond, realigned with orig packing, £35. Minimitter 150W am/cw, 80-10m tx, vgc, £15. 10m tuner i.f. 3MHz, works well, £3.50. G3YMH, QTHR. Tel Staines 53765.

Electroniques gen cov transistor Qoilpax Mk2, and 1·6MHz ssb i.f. strip. Both as new. Offers? GM8BKE, QTHR. Tel 041-942-1406.

Furzehill 2½ scope, gd cond, £8. Mohican rx gd cond, £20. Buyer coll G8CKM, QTHR. Tel Shrewsbury 57149.

500W linear 80-10m int psu, int aerial, c/o relay, Philpotts style case with spare trnsfmr & valves, £35 ono. G3MGW, QTHR. Tel Brightlingsea 2382.

Stn control unit, mains and 12V switching facilities, tx, rx and ptt switching, 5 indicators, substantial steel box, £2.50. 36:1 slow motion drive calibrted 144-146, very smooth, £2, 13 EF91, £1. P. Wood, 68 Lakeside Rise, Blundeston, Lowestoft, Suffolk.

G2DAF rx, Philpot cab, 898 dial, xtal fltrs, MK2 front end, electroniques ifts, almost comp, partly wkng, few hrs work only to finish, £18. Buyer coll, G6AEM/T, QTHR. Tel Brentwood 1653.

B4OC rx gd cond except int xtal calib, £15. Furzehill freq standard (valve), wkng, £2. Pse write. G3ZXK, QTHR.

Frdx 400 rx, fitted cw fltr, mtchg spkr, £80, Kuokusai vtvm model 107A, £13, Sanwa sig gen 100kHz-30MHz, £9, all boxed rx, vgc, instruments mint. G8FOC, 2 Willow Close, Tasburgh, Norwich, NOR 66W. Tel Swainsthorpe 365.

DX400 with vfiu, £20 ono, B40 and manual, £18 ono, VCR97s, 50p, 100W modulator and psu, £5 ono, 510A, £5 ono will del rsnble dist Winchester. G3JIZ, QTHR. Tel Bramdean 263.

AR88D, £35, R216 vhf rx + pr, £50, Variac 8A, £6, buyer coll. Wanted: ssb rx. H. Earnshaw, 12 Clarke Brow, Middleton, Manchester.

Topband Cannonball, £20 or exch rotator with indicator. Would del and coll rsnble dist. G3BN, QTHR.

Kokusai mech fltr 455kHz + usb xtal (qcc), both almost new, £10 ono. G8EQG, QTHR.

Boot mount high power ranger, 25W output on two, 6 channel, concours cond, control box, 9ft cable. PTC2 2207 transistor modltr invrt, hdbk, £25. G8CNP, 31 Copse Hill, Brighton BN1 5GA. Tel Brighton 0273 503980.

G3KAN clearing shack, has qnty of electronic and electrical comps to dispose of, state needs with sae for reply. A. T. Shrewsbury, 36 Winchester Rd, Delapre, Northampton. Tel Northampton 61698.

Pye record maker, £3, petrol gnrtr 28V 11A, £10. Wanted: 14 AVQ or sim. GW8AIB, Brown, Pendraf, Caersws, Montgshire. Tel Caersws 288.

B40c rx, £20. marine tx/rx, Marconi cny2, £10, Heathkit ssb monitor scope /2TGEN, £15, all with circs etc, many hv chokes, paper Cs, mtrs, valves etc, sae, all items carr extra. GM3NEF, Rosebank Cottage Greenburn, Fauldhouse, West Lothian, Scotland.

Exch Heathkit scope O.S2, mint cond, for 14AVQ with 80m coil. Must have "High Gain" instrctns. Lewis, 2 Agar Meadows. Carnon Downs, Nr Truro, Cornwall, tel Devoran 863198.

Inoue 700 transistorised rx/tx, 10/80m, 150W, plus psu/spkr mic, £120 ono, Deliver rsnble dist. G3JKS QTHR, Tel Doncaster 841786.

Danish high band fm 10W base stn, with remote control box 6 channels, hndbk, £22 will del via Securicor up to 150 miles. G3JMJ QTHR, 073-271-3467.

Hallicrafters SX28 rx £27. 19 set £3. UM3 £2. UMI £1. Wanted: Eddystone EC10. Will del 30 miles. G8CRP QTHR. 01-654 1761.

Lafayette KT320 rx £15. Class D wavemeter, mains powered, phones manual, £5. Buyer coll or carr extra. 13cm Paramp cost £1000's any offers? 97·3kHz xtals 30p, L-band hybrids 40p, pp. GW3UPK QTHR.

Advance rf gnrtr Type E1 £12.50. Advance J1 audio £12.50. Marshall dual 0-30V stab psu £18. BC221AF c/w stblzd psu £18.50. Wavemeter W1191, Mains psu £10. Offers. B. Thrussell, 58 Cove Rd, Fleet, Hants. Tel Fleet 6483.

Burns 144MHz mosfet cnvtr, i.f. 28MHz–30MHz, £13 ono. G8DDW QTHR. 01-858-3921.

FTDX400, superb cond, extra crystal channels, £160. G3VGO QTHR, Tel Newquay 2912.

Pye Ranger bargains 4m 2207V £10, 4m 2007V £5, 2m 2202V £12, all vgc and wkg. Buyers col. 2N3632 new £5 ea. Ex-equip £2.50 ea. 2N4427 new 50 p ea. All guaranteed. J. R. Ambrose, 4 Bathurst Rd, Staplehurst, Tonbridge, Kent. Staplehurst 891399,

Sig gnrtrs—Marconi TF3909, 10MHz–150MHz. Four bands with calibn charts £10. Also Triplett 1632 110V 100kHz-120MHz. o/p mtr, xtal calibrt, £6. Buyer coll. G8EBQ QTHR. 01-542 5811.

FV 101 vfo and SP101P Landliner phone patch spkr, mint cond, £35 the pair or will split. Wanted: BC1031 Panadaptor hndbk, rsnble costs refunded. G3NGK QTHR. Beaconsfield 3109.

Collins 75A4 rx 1·5–30MHz amateur bands 800 3·1, 6kHz fltrs, mtchg spkr, vernier dial, passband, rejection tuning, NL, Spare valves, manual, mint £165. G. Twist, 80 Bell Barn Rd, Bristol BS92DG.

Ten-Tec Powermite PM2 QRP 80/40m cw tx/rx, receives ssb as well, as new, £20 ono. G4AOK QTHR AS G8DLD.¶

RSGB mags vols 44, 45, 46, 47; also *SWM* 26, 27, 28, 29; ARRL 1967 Hndbk. Price £1.20 each vol. Buyer coll. G8BNA QTHR, Harrogate 3802.

2m 20W tx basically Plessey fm base stn + psu £15. Four stroke Petrol gnrtr J. A. P. 12V 10A dc £45. 60ft Andrews ¾in Heliax coaxial 3dB/100ft at 23cm £10. 3cm waveguide. SAE list. T. C. Jones, 13 Sheppard Way, Minchinhampton, Stroud, Gloucs. Brimscombe 3541.

DX100U nice cond, £40. Cavity wavemeter with rev-counter dial 875 to 1,330MHz brand new in orig sealed container, calibn chart £8. Wavemeter with micromtr dial 8 to 11·5cm £5. G3IUD QTHR.

Eddystone 770U £95. Marconi TF104IC vv £20 ono. Marconi TR886B, Q-meter £50. Wayne Kerr 022D video oscillator, 10kHz 10MHz £40. All with manuals. Send sae for list of other clear out gear. G6AEN/T G8CTJ QTHR. Millwood 8275.

Techtronix curve tracer, offers. AR77 £20. 9R59 modified £15. Complete homebrew 2m stn 60W rf £30. Omni-Vee 60ft coaxial. Two 5ft racks £10. Or will exch in part for Top Band equipt. G8CKZ QTHR.

KW2000A + ac psu in exc co o, re-valved recently, £150 ono. Also AVO8 Mk 4 brand new AVO sig gnrtr. 550kHz 80MHz, offers. G3TAW QTHR, Kidderminster 5628

Elliott 420MHz fm base rx, as new, £20 ono. Prof vhf tripler amp 2 × 4X150s in pa, suit 70cm, unused, £30 ono. Also BCC 68, boot Ranger, for 4m BC453, AR88LF, B44, etc. sae details. C. J. Horswell, 8 St Andrews Rd, Henley on Thames, Oxon.

FT 100B tx/rx 80-10m ac/dc built-in vox, calib complete with power leads and hndbk in orig packing, very little used £135. P. F. Barry, 47 Gerald Rd, Wollaston, Stourbridge, Worcs.

Sommerkamp FRDX500 in mint cond with ssm 2m cnvtr plus 160m and cw fltr just overhauled by distributor £100. Plus Securicor dely charge of £1.75. G8CYY, QTHR. Shipley 52096.

Marconi sig gnrtr TF144G, £12.50. AVO7 testmeter £12.50. Wanted: compact modern scope. C. A. Cooper, 45 Nightingale Crescent, Harmans Water, Bracknell, Berks RG12 3PY Bracknell 4168.

TRIO JR310 with SP5D £65. Absolutely perfect cond. Buyer coll. Satoshi Aoki, 120A Highlands Heath, Putney, London SW15. 01-789-7851.

G2DAF rx comps set of QCC B7G type xtals for fltr and carrier osc. Set of FT243 conversion xtals with holders. Eddystone 898 dial assembly. Various switches, IFs, coils etc. G3KNA QTHR. 097-62-3122.

SB1OU with manual plus 120W cw tx with Geloso vfo and parts to build psu, £25. *Bulletins* 1950-60 5p ea. G. Stoppard, 67 Loweswater Drive, Loughborough, Leics.

Eddystone S640 £20, HRO with psu, 6-coils B/S 10, 15, 20, 40 £22. Both good. Add half carr. GM2HCZ QTHR, Tel Moniaive 345.

TW nuvistor 2m cnvtr with int psu 24-26MHz i.f. £5. G3MWT, 9 Levett Close, Grain, Kent.

2m Sentinel mosfet cnvtr 28-20 i.f. £10. J-Beam slot fed 4 over 4 £3. 2007 hndbk £1. Jackson capacitor and case for 3HBW GDO £1, all new, unused, post extra. G3RB QTHR, Whitley Bay 30504.

Tx hf bands 150W am/cw, £15, Geloso vfo 4/120 with dial, £5, Woden um3 modulation trnsfmr, £2, Pye Ranger, unmoulded, £4. GM3RHR, QTHR. Tel 041-772-3085.

TA33JR 3 ele beam, £18, Marconi std sig gnrtr TF144G, needs a little attention. £6, Kodak retinette camera with case, £14. G3SWX, QTHR. Tel Woodhouse Eaves 890491.

Galvanized 30ft Heathkit tower with vertically stacked pr phase mtchd 6/6 2m aerials turned by cdr rotator, comp with all cables, £40, in situ and will dismantle. G8BJP, QTHR. Tel Thanet 31069.

WANTED

Grundig Yacht Boy £15 offered. Must be perfect. H. S. Sharp, 1 Linnell Close, Hampstead, London NW11. Tel 01-458 3937.

SB1OU reqd by club, £15 to £25 depending on cond, carr paid if necessary. N. Tate, USt ARRES, Physics Dept, University of St Andrews, Fife.

Pair bases for 4CX25OB valves, one good QQVO6-40A, a UM3 modulation trnsfmr, and a Trio 9R-59DE/DS in gd cond. K. Basterfield, 51 Ruskin Crescent, Crownhill, Plymouth, Devon.

Manual or circ for Pye Ranger (Transistor psu) to buy or borrow. S. Hannah, 443 Chesterfield Rd, Pleasley Hill, Mansfield, Notts.

Integrated circ info for morse keyer for proposed 2m beacon stn located S-E Ireland. also *WW* Nov 1970, *Rad Comm* May 1969 and American mags. Des Walsh, E15CD, Ballylynch, Carrick-on-Suir, Tipperary, Ireland. Carrick-on-Suir 54.

Bases for 4CX300A, Eimac SK700 series. Tysoe, 11 Newfields, Welwyn Garden City, Herts. Tel Welwyn Garden 24930.

Orig mic insert for handset of Cossor CC301 radiotelephone. Your fair price paid. G8BSX QTHR.

PCR communications rx dial with ranges lw, mw & sw (6-18MHz) best price offered. D. E. Keable, Woodbine Cottage, Lower Earley, Reading, Berks.

Rx R216 reqd by penurious operator. G3XNL, 68 Lyndhurst Rd, Barnehurst, Kent. Tel Crayford 22776.

Info for BC792A 8 batt valve communications rx, loan or purchase, slow motion drive and dial from KW2000 or similar, cheap as poss. C. R. Smithers, 16 Derby Rd, Cheam, Surrey. Tel 01-642 5179.

Hire, borrow or buy circ diag etc for coastal radio tx type 91/m rx 91/mk and gnrtr unit type 84/24. GI3OAU, D. B. McCutcheon, 38 Killyglen Rd, Larne, Co Antrim, N. Ireland. Tel Larne 3826.

Urgently reqd by University of Kent radio club, Versatower and /or rotator. G3UKC, QTHR. Tel Chestfield 2872.

Mu-metal screen to fit 3bpi scope tube, 8MHz xtals for 2 zone A. G8GBX, R. Good, 15 Cleveland Rd, Southsea, Hants, PO5 1SF.

Codar AT5 tx with 12V /M psu, also codar T28 rx, state price and cond. G3YGC/A, 16 Plymouth Ave, Rossall, Fleetwood,

School-boy reqs morse tuition records. Huw Hallybone, 7 Sauncey Ave, Harpenden, Herts. Tel Har 5910.

Pye Cambridge suitable for conversion to 2m, gd cond, pse state price. Phipps, 26 Spinney Hill Cres, Parklands, Northampton, NN3 1DL.

HRO coil pack tuning 1·7-4MHz in gd cond. G8ERF, QTHR.

Cheap high freq ham band rx. D. Kitchen, 245 Whiteacre Rd, Ashton-under-Lyne, Lancs.

Eddystone EC10, state cond and price. Wright, 21 St Peters Rd, Luton, Beds.

Any info on Ultra packset ub6, can copy and return or willing to pay. G8DDM, QTHR. Tel Penn 4483.

Manuals for Cossor ganging oscillator type 343 and scope 339A. Malone, 8 Pickering, Bracknell, Berks, RG124EA, Tel Bracknell 21502.

Urgently reqd, comp set of type heads with mount for Creed 7B, also tape punch/read eqpmnt, rf ammeters, bases/top cap connectors for 813 valves. G3WTA, QTHR. Tel 0670-2541.

Single sideband tx for 160m mains psu essential or 160m 12V dc /P tx/rx ssb or a.m. fone. GW3YTL, Gwarcwm, Bronwydd Arms, Carmarthen, Wales. Tel Llanpumpsaint 254.

Gd Drake rx and tx A288D or other gd gen cov rx, vhf rx range approx 40MHz-130MHz, robot or sim sstv monitor, walkie talkies. /M and base. R/ts freq mtr (vhf) 174/M or sim. GI3ZIA, QTHR. Tel Enniskillen 2188.

Beamec tv crt tester or sim instrument, Newnes *Radio TV Servicing* 1963/64, 64/65. A6705 Westholme, Westerton Rd, Leeholme, BP Auckland, Co Durham DL14 8HE.

Technical info for B2 rx, gd small scope teleqpmnt, OS2 etc, ailing or scrap hro. G3GEJ, QTHR.

Kokusai mech fltr, type MF455-10k, comp with xtals also following xtals: 10·8MHz, 8·33MHz, 3·5MHz. G4AGJ, 14A Eastgrove Ave, Sharples, Bolton, Lancs.

Communications rx, gd wkng cond. AR88D pref but willing to cnsdr any quality set in same price range, within 50 miles this address. G. R. Harris, 17 St Annes Rd, Headington, Oxford. Tel 64243.

Eddystone EA12 must be mint. G8CKA, QTHR.

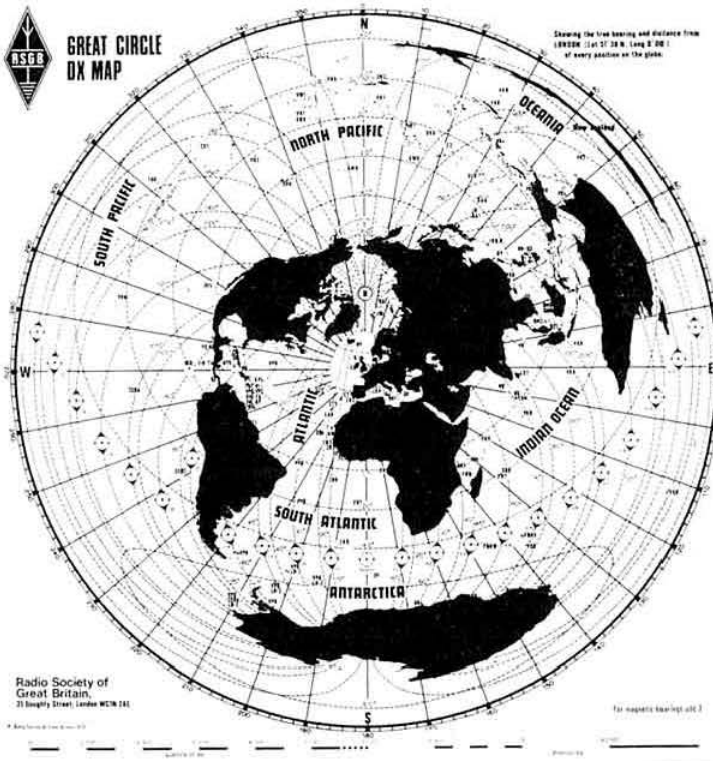
Manual, hndbk, circ info on Radiovision Commander, urgently reqd, buy or hire. For sale: Pye Cambridge on 144·63, £40. G8DVZ, 87 South Oval, Kings Heath, Northampton.

Coil sets for hro rx 7, types f-g-h-j, dets of price, cond. Payne, 159 Micklefield Road, High Wycombe, Bucks.

Codar AT5, tx mk 2, as psu, T28 rx or why. G3TFS, QTHR. Tel Ashtead 72689.

Samson ETM-2 keyer in fb cond with or without STA amp. G3WET, QTHR. Tel Aldridge 51551, evenings.

9MHz xtal fltr and carrier xtals, dets and price. GM3JFG, QTHR.



GREAT CIRCLE DX MAP

Designed and drawn by D. E. Cole

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TELFORD COMMUNICATIONS

Our illustration this month shows the new TC9 2 Metre Transmitter with a TC7 Mk. II Tunable I.F. the G8AEV 2 Metre converter may be fitted inside the TC7 case to make up a complete 2 Metre station at a total cost of **£108.**

TC9 2 Metre Transmitter
AM on xtal or vfo. FM on vfo only. One xtal at specified frequency (48MHz range) included in total price. All solid state. 10 Watts rf. Fully metered. Aerial change over and control/muting relays integral. Stabilised mains PSU's included, and AM/FM modulator. Mains operation only. Flywheel drive VFO. Case size 12" × 7" × 6½". Visor front to match TC7. Weight 11½lbs.
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TC7 Mk. II Tunable I.F.
AM/FM/CW/SSB. Flywheel drive. Any 2MHz. in range 20 to 30MHz. to order Mains PSU included. All solid state. S meter. Noise limiter. Integral monitor L.S. External L.S./Phones jack. Case size 12" × 5½" × 6½". Weight 5½lbs.
Price £40.00 **Delivery 5-6 weeks.**

G8AEV 2 Metre Converter
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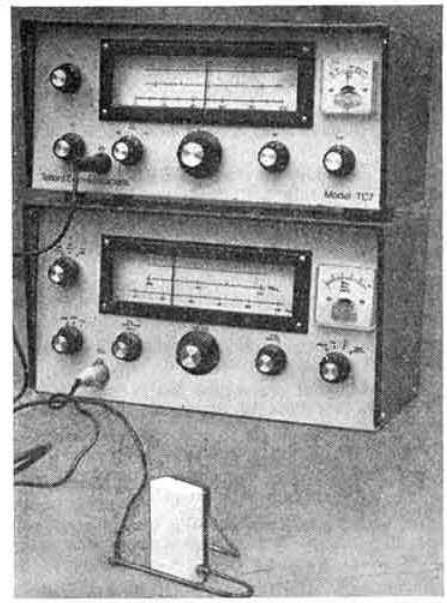

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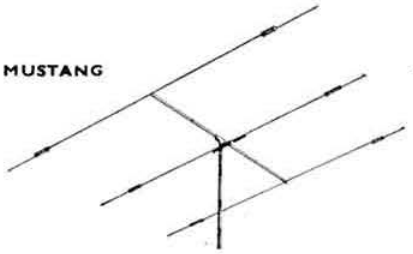

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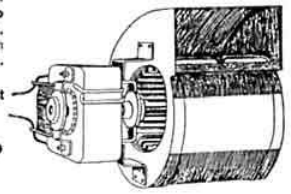
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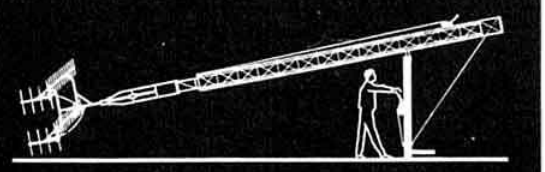

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The number of words in each advertisement must not exceed 32 not including name and address or callsign and QTHR or telephone number Four pages of each issue are allocated to Members' Ads at present, and in order to include as many advertisements as possible licensed members are requested to give their callsign and QTHR instead of their name and address. (QTHR means: "My address in the current call book is correct"). Also to conserve space, please keep advertisements as brief as possible. They will be edited to conform to a set style of abbreviations, so it is unnecessary to submit them in abbreviated form. Any which are not clear will be returned.

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POST TO MEMBERS' ADS, "RADIO COMMUNICATION", 35 DOUGHTY STREET, LONDON WC1N 2AE

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All items listed on this page are available to callers at RSGB headquarters at the above prices less postage and packing. Counter service 9.15am-5.15pm, Monday to Friday.

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