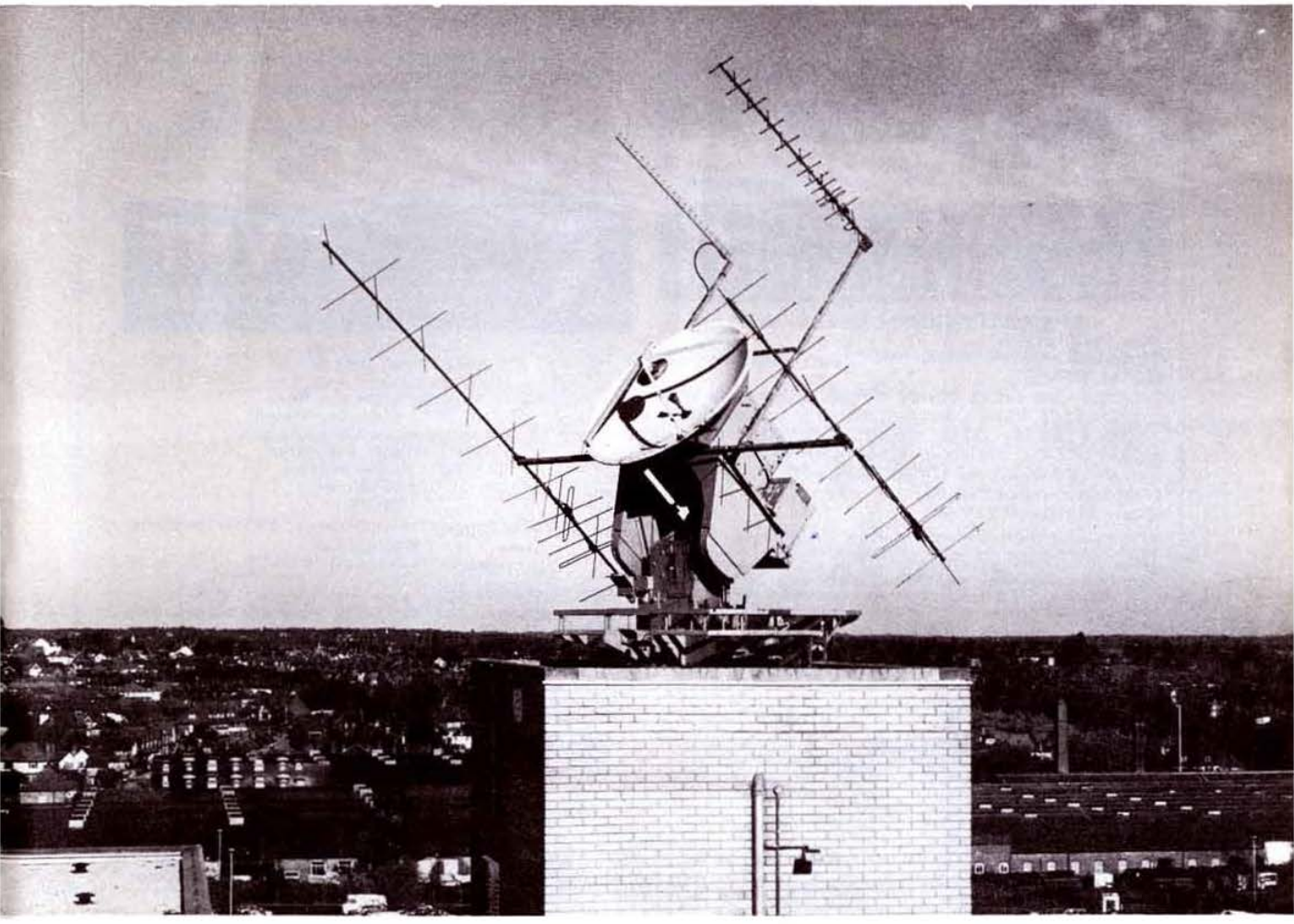
June 1978

radio communication

journal of the Radio Society of Great Britain

UoS – AMSAT



The University of Surrey AMSAT telecommand centre antenna mounting on the tower above the radio room of the university. An article on the telecommand centre is published in this issue

NEW FROM Catronics

Introducing the most comprehensive R.T.T.Y. TERMINAL UNIT you can, or indeed need ever buy – the Catronics CT100

Inputs for:

Audio FSK signal in
Data in from V.D.U. (e.g. G3PLX)
TTY Keyboard or Tape Reader

Outputs for:

V.D.U. or other TTL compatible equipment
TTY Magnet – single or double current
AFSK to drive Transmitter

Featuring a unique digitally controlled '**Autoprint**' circuit which is a superior replacement for the 'Antispace' and 'Autostart' facilities found on some other terminal units. The terminal will ignore most CW and phone signals but will respond to a correct RTTY signal.

Tuning correctly into an RTTY signal is made simple with a single '**correctly tuned**' LED plus an additional '**Mark frequency**' indicator.

The FSK demodulator circuit utilises a special 'state-of-the-art' system to give excellent performance and stability at low cost. The demodulator is set to decode signals within 75Hz of nominal frequency i.e. 1200–1350Hz for space and 1370–1520Hz for mark, when in narrow shift position.

The teleprinter interface unit incorporates electronic 'de-bounce' circuitry to eliminate spurious switching from the Keyboard. The loop supply is protected by a separate fuse and is suitable for driving all single current and double current magnets known to be available.

Units are as follows:

CT100. Receive only RTTY Terminal Unit housed in attractively styled metal cabinet approx 9 by 7 by 2¾in with integral mains power supply. Input sockets for AFSK and TTL. Output sockets for TTL drive to VDU.

CT101. Hi-stability AFSK oscillator for transmission purposes. Output socket from oscillator suitable for driving high or low impedance microphone circuits.

CT102. Teleprinter interface unit. Input socket for Keyboard or Tape reader. Output socket for Printer Magnet.

Units may be combined, e.g. a complete terminal unit for reception and transmission with facilities for connection to Teleprinter is designed CT100/1/2.

Units CT101 and/or CT102 may be added to the basic unit CT100 by the customer at a later date if required.

VAT inclusive prices are as follows

CT100/1/2 Complete Terminal Unit		£88.00
CT100 Receive only Unit		£71.00
	If ordered with CT100	If ordered separately
CT101 AFSK Oscillator	£8.00	£12.30
CT102 Teleprinter Interface	£9.00	£13.70

Plus delivery charge – £3.00 (securicor)

AMATEUR RADIO BULK BUYING GROUP

G3PLX RTTY VIDEO DISPLAY UNIT

(April 1977 Rad Com)

Complete Kit (excluding modulator, keyboard and P.S.U.), **£77.15**

Set of printed circuit boards **£14.85**. Veroboards also available at **£4.30** each. Set of i.c.s including programmed 74188s, **£56.15**; 2513, **£8.50**; AY5-1013, **£6.25**; 2102-1, **£2.85**; SN74188, **£3.40** each or ready programmed **£8.20** per pair. 7MHz Xtal, **£3.25**.

Flashing cursor kit **£7.70**.

Diode Matrix kit **£11.50**.

NOTE regarding PROM program. The PCB's and programmed PROMs supplied by us make use of a slightly different program sequence resulting in different pin connections to those published in the 'Rad Com' article. Whilst constructors buying PROMs and PCBs from us will have no difficulty, those producing their own PCBs or having PROMs programmed elsewhere should note this important difference. A detailed modification sheet is available with the PCBs.

G3TDZ FM 'BLACK BOX'

(As March 'Rad Com')—Most components available—s.a.e. for list.

MULTIMODE 1600 TRANSCEIVER

Special price for complete kit, £210.00
Receive only kit also available, £186.00

PCB, **£12.90**; QC1246AX, **£31.50**; less carrier xtals, **£27.50**; XF9-E, **£27.00**; XF9-M, **£25.30**; 8545kHz Xtal, **£3.00**; 400ns delay line, **£1.70**; MD108, **£7.65**; RS12V Relay, **£2.25**.

MiniKit 1 (containing all the above) **£147.00**
MiniKit 2 (semiconductors) **£54.50** or **£29.85** (receive only)
MiniKit 3 (R's and C's) **£19.55**.

VHF COMMUNICATIONS

NOW PUBLISHED —
the SPRING 1978 edition
which includes articles on
Preamp for 2m and 70cm
70cm FM Transceiver (Part 4)
Filters for 23cm, 13cm and 9cm
SHF Transmit Converter
Loop Yagi Antennas
CMOS Circuits
etc. etc

Send £1.25 for a copy of this edition or £4.50 for complete 1978 volume
Also 1977 subscription: £4.50

VHF COMMUNICATIONS is the English language edition of the German publication *UKW-BERICHTE*, a quarterly amateur radio magazine especially catering for vhf/uhf/shf technology. It is published in spring, summer, autumn and winter.

All special components required for the construction of the described equipment, such as printed circuit boards, coil formers, semiconductors and crystals, as well as complete kits, are available for despatch direct from Germany. Many of the printed circuit boards, in addition to a few selected kits, are stocked in the UK. A price list of kits and materials is available – send SAE for your copy.

ORDERS TO: VHF COMMUNICATIONS AT ADDRESS BELOW

All prices include VAT but please add minimum of 30p for post and packing

DEPT. 806, COMMUNICATIONS HOUSE, 20 WALLINGTON SQUARE, WALLINGTON, SURREY SM6 8RG
Tel: 01-669 6700 Open 9am to 5.30pm Mon to Fri, 9am to 1pm Sat. Closed for lunch 12.45 to 1.45pm

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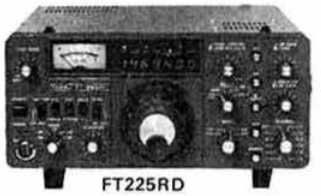
Closing date for contributions unless otherwise notified: 4th of month preceding month of publication

Communications Ltd

OF PROFESSIONAL EXPERIENCE

YAESU

NEW MULTI MODE 144MHz TRANSCEIVER AND MORE



FT225RD

Based upon the extremely popular FT221, Yaesu proudly present the top line multi mode 2 metre transceiver. Super accurate mode sensitive 100Hz digital readout, 10W of AM, 25W of FM (continuously variable) and even more power on SSB. Repeater up-down 600kHz and aux shift. 11 crystals control positions (per 1 MHz band) and memory facility.

FT225R. £470.00 **FT225RD £506.50**
Counter £57.75 **Memory £84.50**

All prices are VAT exclusive. EX-STOCK THIS MONTH

THE FT221R—A MULTI MODE FROM YAESU

The FT221R: The multimode USB, LSB, AM, FM, CW (with semi-break in and side tone), 2m transceiver offering the choice of phase locked VFO or 44 crystal channels, simplex or repeater (600Hz up and down shifts), with unique "double push" auto tone burst, mains or 12v (3A) operation, excellent selectivity SSB 2·4kHz (1·7:SF) or FM 12kHz. Front panel adjustable VOX and mic gain, a calibrator (1MHz÷10), 1kHz readout and linearity, sensitive squelch, clarifier with IRT and IRT with ITT (makes FSK easy), switchable "S" and centre zero tuning meter, noise blanker, serviceable plug in boards all contained in 11½" (14") × 5" × 11½", 22lb rigid package. 600kHz and 1·6MHz shifts over 4MHz.

FT221R £357+VAT YC221 £72.50+VAT MANUAL £9.50 (No VAT)

FT221R

THE FT7 MOBILE TRANSCEIVER

This is a 10-80m. transceiver. VFO controlled (to 1 kHz accuracy) plus crystal control facility. Selectable sidebands. CW, crystal calibrator, clarifier and an advanced noise blanker are some of the features packed into a cabinet only a few inches high, but through careful design the front panel remains remarkably uncluttered. Designed for a linear 10W. output consuming only a few Amps it eliminates: 30A cables from the passenger compartment and the cooling problems of a massive heat sink. Need more power? Flick in a PL110 (a 200W. PIP linear) installed in any suitable place in you car.

FT7 Transceiver £300+VAT **FL110 Linear £114.50+VAT**

FL110 ALL BAND LINEAR AMP

10-160m. Switched L.P.F. 15W→200W. PIP A1/A3j, 4W→75W. FI. Negative feedback with ALC to exciter. RF sensing (Adjustable hang time) with overide.

THE FT101E THE MOST POPULAR RIG IN THE WORLD

The FT101E a complete mains or 12v DC station contained in a compact 30lb package, 260W. P.I.P. of SSB (with in-built RF speech processor) 180W. CW and 80W of AM 10 to 160m (incl) 10MHz RX). The sensitive and selective (permeability tuned RF stages and eight-pole crystal filter, receiver offers: threshold adjustable noise blanker, switchable 25 and 100kHz calibrator, ±5k clarifier (with separate on/of switch), etc, etc.

The VFO is stable and linear (readout to 1kHz) external VFO or crystal control can be selected with LED indicators illuminated accordingly. Carrier level is adjustable for: tune up, AM and for CW operation, whose performance with the semi break in keying, with side tone, and the optional filter installed in a high order. Linear and transverter provisions are made with sockets for: relay contacts, ALC output, an internal HT supplies, low level RF heater links and switches, etc, etc.

FT101E £485+VAT **FT101EE £469+VAT** **FT101EX £440+VAT**

FT101E

THE FT901 – SIMPLY UNBELIEVABLE PERFORMANCE

FT901DM

160-10m (+ WWV Rx) 12 and 234v (PSU Built-in). SSB, AM, CW, FSK and FM (TX & RX), 180W. PIP, 80W FI. Analogue 1kHz and Digital to 100Hz. Sensitive, ½μV with AGC controlled Mosfet RF to push pull FET RF. Balance active mixer, push pull IF amp, to crystal filter then noise blanker. Continuously variable selectivity 300Hz to 2·4kHz and fixed 600Hz, 2·4kHz, 6kHz and 12kHz (at 6dB) 80dB cross mod rejection, 90dB desensitisation immunity (at 20kHz off at 14MHz) Audio Peak and separate notch tuning Negative RF feedback on 6146B toroidal tuned output stage (-31dB 3rd order) RF processor VOX Curtis electronic keyer tune button (10sec on full power) PLL VFO with memory for any TX RX or T/RX frequency Modular plug-in construction permability tuning (for possible new band allocations) 25kHz calibrator 20dB switchable attenuator sidetone clarifier, advance noise blanker are all features of the FT901—The 1980's Transceiver available.

FT901DM £805+VAT **FT901D £695+VAT** **FT901DE £695.00+VAT**

STOP PRESS

160m to 70cms. SSB-CW-AM-FSK-FM CO-CHANNEL, SPLIT, REPEATER, SATELLITE, SCANNING, ETC.

The best amateur transceiver now has the best range of accessories. The YC901, ATU/Power meter, the SP901(P) speaker (patch). The YO901 monitor scope, the FV901 external VFO-not just an oscillator but digital and analogue readout, multi channel memory with manual and auto scanning. The FTV901 transverter: another first, a three-band transverter (with repeater shift) 50 (70), 144 and 432MHz (8MHz) in a standard external speaker size box.

Watch this space for further details as soon as they become available. E & E.O.

Access

S.M.C. (Jack Tweedy) LTD
Roger Baines, G3YBO
79 Chatsworth Rd,
Chesterfield, Derbyshire
Chesterfield (0246) 34982
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Leeds 16. Yorkshire.
Tel: Leeds (0532) 782326
9-5: Mon-Wed & Fri-Sat.

S.M.C. (Jack Tweedy) LTD
Jack Tweedy, G3ZY
Ham Shack, Roughton Lane,
Woodhall Spa. Lincolnshire
Woodhall Spa (0526) 52793
9-5 Tues-Sat (+ appt)

BARCLAYCARD VISA

WATERS & STANTON

TELEPHONE HOCKLEY (03 704) 6835 (2 LINES)

FDK MULTI-800D

★ 25 Watts FM
★ Automatic tuning
★ Non-volatile memory
★ New mic up/down freq control

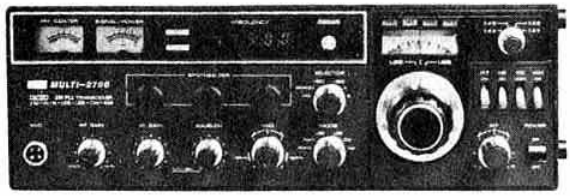
AMAZING VALUE £249 inc VAT

The Multi-800D is the latest 2m transceiver to leave the production line in Japan. It is a fully synthesised transceiver covering 144–148MHz with a full bodied 25 watts plus output to give you longer distance contacts. But its big attraction is the things it doesn't have. Ironical but true!

1) No restricted coverage—you can operate any channel you choose—no need to get the soldering iron out to change the diode matrix.
2) No power control on the rear panel; it's on the front—and the power is infinitely variable between 1 and 25 watts—ideal for transverting.
3) No tone-burst control on the rear panel—it's automatic but can be defeated by a front panel switch.
4) No confusing channel numbers or doubt whether you have selected the correct repeater shift—the bright LED read-out gives true frequency display on both TX and RX even when working normal or reverse 600kHz repeater shifts.
5) You won't have to retune the front-panel frequency selector for reverse repeater working or monitoring the input frequency—the flick of a front-panel control is all that is necessary.
6) The memory is not lost when you switch off the ignition or unplug the rig—it's there always and it can memorise two frequencies not just one!
7) It doesn't just have one repeater shift—you can programme any shift you wish in addition to the 600kHz—e.g. 1.6MHz for 70cms.
8) No wrist-aching tuning either—tuning is manual or electronic—you can take a leisurely stroll at 10kHz per second or race across the board at 500kHz per second.
9) And there are two safety features—every 100kHz of electronic tuning a bleep sounds—this means less looking at the dial and more eyes on the road—and there's also a remote "head-up" display available that enables you to place the frequency read-out in a position near the line of vision.

Having read about the things the 800D hasn't got, an SAE will bring you a four-page brochure about all the things it has got! But hurry—we already have a backlog of orders for the next shipment.

FDK Multi-2700 Mk II



LAST SHIPMENT AT OLD PRICE! (HP AVAILABLE) £489 inc VAT

There are two types of all-mode 2-metre rigs on the market—the budget rig with its no nonsense bare essentials and the deluxe rig with its many extras that make operating that much more pleasurable. Without doubts the Multi-2700 falls into the latter classification but at a price that is remarkably low compared with its competitors—in fact it is true to say that if we charged you for all the extras the price would be prohibitive. If you want the full story on the Multi-2700 simply send a 7p stamp for the 4-page brochure. But here listed are just a few of its features: 144–146MHz (143–149MHz on Receive) 15 watts output, vox, IRT, APC, speech compressor, dual VFO control, VCO, synthesized channel switching or analogue vfo, high/low power, FM/SSB/CW/AM/ noise blanker, variable AGC, pre-amp, OSCAR receiver converter, 230 volts AC/12 volts DC, LED readout, RF gain control, separate FM/SSB microphone gains, ALC, variable compression, antivox, variable delay, 100kHz calibrator, squelch, plus or minus 600kHz repeater shift, 1·6MHz repeater shift, microphone, cables, English manual and even a log-book!

In the past 12 months the Yen has risen by no less than 23% against Sterling and yet the price of the Multi-2700 still remains at **£489**. Buy now!

FDK QUARTZ-16

STILL AT OLD PRICE! (Limited period) £149.75 inc VAT

If ever you needed an excuse to purchase a 2-metre rig for the car here it is. We've managed to negotiate a special deal with our factory in Japan. The result? . . . **£149**'s worth of engineering that even amazes the most critical purchaser for its sheer value and performance. If you still need convincing then thumb through some of the past couple of years' advertising to see when a 2-metre FM rig could be bought for less than **£150!** The latest factory fresh shipment has just arrived so here's your chance to make the biggest saving of 1978! And here's a prediction too: many of you will look back at this advertisement in a few months' time and be glad you purchased your rig at such an incredibly low price—just a few will regret they hesitated and found the price had risen!

So what do you get for **£149·75**?—12 watts FM, 25 channel capability (SO, S20, R3, R4, R5, R6, R7 fitted) 2 priority channels, true S and R channel readout, channels fitted indicator light. Automatic protection circuit, microphone, quick release mobile mount, DC power lead, hardware etc., a 12 months' guarantee and free delivery. (Channels S21/22/23 available at **£7.50** extra inc. VAT)

WATERS & STANTON ELECTRONICS

FAST DELIVERY THROUGHOUT UK

PRICE LIST 1ST JUNE, 1978

YAESU COMMUNICATIONS EQUIPMENT (JAPAN)

FRG7 Gen. coverage receiver 5-30mHz AC/DC **£184.50**

FRG7D As above but digital readout **£227.25**

FR101D 160-2m+broadcast rx AC/DC **£523.00**

FT101E transceiver 160-10m AC/DC **£545.60**

FT101EE As above less processor **£527.60**

FT101E Extra-narrow CW filter **£23.35**

FV101B External vfo for FT101 **£82.65**

SP101B External speaker for FT. FR Series **£18.56**

FT200 Transceiver 80-10m 260 watts **£343.00**

FP200 Matching AC PSU for above **£73.70**

YO101 Monitor scope .. **£166.86**

FT221R 2m all mode transceiver AC/DC **£401.60**

YC221 Matching digital readout **£81.55**

FT227R 400 channel FM transceiver 12V DC **£214.85**

YP150 150 watt dummy load **£54.60**

FT901D Digital 160-10m transceiver 200W **£781.85**

FT901DM Digital 160-10m transceiver 200W **£905.00**

FT7 80-10m transceiver .. **£343.00**

QTR24 Amateur Radio World clock **£15.93**

YH55 Communication headphones **£9.85**

YD844 Desk microphone **£20.25**

YD846 Hand microphone .. **£8.40**

FT225R Details t.b.a. .. **£528.75**

FT225RD Details t.b.a. .. **£569.12**

FRG7000 Details t.b.a. .. **£320.60**

DENTRON RADIO COMPANY HF EQUIPMENT (USA)

MLA2500 160-10m Military quality amplifier 2KW pep continuous **£695.00** (n.c.)

MT3000A 160-10m ATU-SWR/PEP-5 way selector 3KW .. .. **£275** (n.c.)

MT2000A 160-10m ATU long wire, coax, balanced feed 3KW **£175.00** (n.c.)

160-1OAT 160-10m ATU long wire, coax, balanced feed 1KW **£99.50** (n.c.)

MONITOR 160-10m ATU as above, Rf indicator, 300 watts .. **£59.95** (n.c.)

W-2 160-10m SWR/POWER METER 0-200/02KW DC/PEP **£69.95** (n.c.)

160-10m Doublet. Tuned feeders **£25.00** (n.c.)

DTR-1 HF transceiver-new 1978 model **t.b.a.**

A separate catalogue on Dentron is available priced 25p.-refundable.

HF ANTENNAS (UK & USA)

Mosely TA33 (high power) 10-15-20m 3 el. **£119.25** (2.50)

Mosely TA33 JR 400W PEP 10-15-20m 3 el. **£106.87** (2.50)

Mosely TA32 JR 400W PEP 10-15-20m 2el. **£72.00** (2.50)

Mosely TD3JR Wire dipole 10-15-20m-23ft **£24.20** (1.00)

Mosely RD5 SWL Amateur band dipole 69ft. **£27.00** (1.00)

Hygain 12AVQ Vertical 2kw 10-15-20m **£39.95** (£2.00)

Hygain 14AVQ Vertical 2kw 10-40m **£56.20** (£2.00)

Hygain 18AVT Vertical 2kw 10-80m **£81.45** (£2.00)

HQ-1 "Mini beam" 10-20m **£94.00** (£2.00)

C4 "Mini-vertical" 10-20m **£41.50** (£2.00)

EL40X Compact 80/40 dipole inc. balun 79ft. 1kw **£29.00** (£1.00)

ASP VHF/UHF MOBILE ANTENNAS (USA)

201 ¼ wave standard 2m **£2.95** (£1.00)

677 5/8th wave deluxe 2m **£14.95** (£1.00)

2009 5/8th wave budget 2m .. **£7.95** (£1.00)

667 70cms collinear deluxe **£17.71** (£1.00)

462 70cms budget 3dB gain antenna **£6.75** (£1.00)

"No-hole" Boot mount for all above **£3.50** (£1.00)

K220 Magnetic mount (677/667)+4m cable **£8.50** (£1.00)

K220A Magnetic mount (2009/467/201)+4m cable **£8.50** (£1.00)

JAYBEAM VHF/UHF ANTENNAS (UK)

4METRE ANTENNAS

4Y/4M 4 element folded dipole yagi with 1½" boom **£12.65** (£2.00)

PMH2/4M 2 way phasing harness for two 4m yagis **£9.39** (£1.00)

2 METRE ANTENNAS

C5/2M 5dB glass fibre collinear omnidirectional **£30.93** (£2.00)

5Y/2M 5 element folded dipole yagi with 1" boom **£7.70** (£1.25)

8Y/2M 8 element folded dipole yagi with 1" boom **£10.00** (£1.25)

10Y/2M 10 element folded dipole 'long yagi' with 1½" boom and trombone support **£21.32** (£1.75)

PBM10/2M 10 element Parabeam with 1½" boom and trombone support boom **£25.36** (£2.00)

PBM14/2M 14 element Parabeam with 1½" boom and 45° braces **£31.16** (£2.00)

5XY/2M Crossed 5 element yagi with 1½" boom **£15.98** (£1.5 0)

8XY/2M Crossed 8 element yagi with 1½" boom **£19.91** (£1.75)

10XY/2M Crossed 10 element yagi with 1½" boom **£26.32** (£2.00)

PMH/2C 2 way phasing harness for circular polarisation **£5.06** (£1.00)

Q4/2M 4 element quad yagi **£16.31** (£1.50)

Q6/2M 6 element quad yagi **£21.71** (£2.00)

D5/2M Double 5 slot-fed yagi with 1" booms **£13.61** (£1.50)

D8/2M Double 8 slot-fed yagi with 1" booms **£18.22** (£2.00)

SVMK/2M Mounting kit for vertical polarisation for 2 slot-fed yagis **£3.82** (£1.00)

2 METRE ANTENNAS (Cont'd)

UGP/2M Unipole and ground plane **£7.03** (£1.00)

HO/2M Mobile 'Halo' head only **£3.26** (0.75)

HM/2M Mobile 'Halo' with 24" mast **£3.88** (£1.00)

PMH2/2M 2 way phasing harness for two 2m aerials **£6.80** (£1.00

PMH4/2M 4 way phasing harness for four 2m aerials .. **£16.33** (£1.00)

70cm Antennas

C8/70cm 8db glass fibre collinear, omnidirectional **£39.37** (£2.00)

D8/70cm Double 8 slot-fed yagi with ¾" booms **£15.46** (£1.50)

PBM18/70cm 18 element Parabeam yagi with 1½" boom .. **£18.56** (£1.50)

MBM48/70cm element Multibeam yagi with trombone mounting **£21.66**

MBM48/70cm element Multibeam yagi with trombone mounting £21.662(£2.00)

MBM88/70cm 88 element Multibeam yagi with trombone mounting **£28.97** (£2.00)

8XY/70cm Crossed 8 element yagi complete with phasing harness and 'N' type connector .. **£24.13** (£2.00)

12XY/70cm Crossed 12 element yagi complete with phasing harness and 'N' type connector .. **£29.70** (£2.00)

PMH2/70cm 2 way phasing harness for two 70cm yagis **£5.90** (£1.00)

PMH4/70cm 4 way phasing harness for four 70cm yagis .. **£12.26** (£1.00)

23cm ANTENNA

D15/1296 Double 15 slot-fed yagi with 'N' type connector .. **£22.78** (£1.00)

CDE/STOLLE JAYBEAM ROTATORS (USA/GERMAN/JAPAN)

AR40 VHF & light HF beams **£53.43**

CD44 HF beams **£106.87**

STOLLE 2010 VHF rotator **£48.95**

STOLLE 2030 VHF rotator deluxe control box **£54.00**

STOLLE Alignment bearing RZ100 **£11.25**

9502 Channel master. Ideal VHF arrays (3 core cable) .. **£45:00** (£1.50)

KR400 ½ ton deluxe rotator HF beams (6 core cable) **£95.00** (£1.50)

9523 Alignment bearing for 9502 **£9.55** (£1.00)

SWR METERS (JAPAN)

Single Meter SWR 3mHz-150mHz **£9.50**

Dual Meter SWR/Power 3mHz-150mHz **£11.95** (0.50)

NAIGAI (JAPAN)

2200 500W PEP 230v linear (10w Drive) **£399.00** (£4.50)

S.A.E. colour brochure.

MICROWAVE MODULES (UK)

MMT 432/28S Transverter **£133.88** (n.c.)

MMT432/144R Transverter **£169.88** (n.c.)

MMT144/28 Transverter **£88.88** (n.c.)

MMC144/2-4 4-6; 28-30 conv. **£20.25** (n.c.)

MMC144/28LO Converter **£22.50** (n.c.)

MMC70/28 28.7 conv. .. **£20.25** (n.c.)

MMC70/28 LO Converter **£22.50** (n.c.)

MMC432/144 or 28 converter **£27.00** (n.c.)

MMC1296/144 or 28 converter **£31.50** (n.c.)

MMD050 50mHz counter **£66.96** (n.c.)

MMD050/500 500mHz counter **£85.32** (n.c.)

MMD500P 500mHz pre-scaler **£27.00** (n.c.)

MMV1296 70 23cm tripler **£33.75** (n.c.)

MMP 12/3 transverter PSU **£56.25** (n.c.)

SHURE MICROPHONES (USA)

444 50k base station .. **£25.50** (£1.00)

526T 500-50Kbase station **£32.50** (£1.00)

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IC240 FM 22 channel transceiver **£189.00**

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available ex-stock and delivery is free.

IC-202

£169 inc. VAT

◀IC-202

IC202 The 2m SSB/CW portable which is clean enough to use as a prime mover to drive a linear. The VXO gives continuous coverage over the ranges 144·0-144·2 and 144·2–144·4. The coverage can be extended with extra crystals switchable from the front panel. This is the ideal set to buy if you are thinking of sampling the delights and advantages of SSB on 2m as it gives full coverage of the SSB and CW portions of the band with easy, continuous tuning.
Now available ex stock, delivered free for **£169 inc VAT.**

IC-215 ▶

IC-215 By far the best 2m FM portable on the market—with more power (3W) than most and batteries some 4 times as big thus giving a reasonable period of operating use. Add to this the superb, clear modulation for which ICOM are so famous and a good receiver, plus a solid, reliable construction and you have really good value for money.
Total channel capacity = 15
Channels fitted = 9(S20, S22, R3, R4, R5, R6, R7, R8, R9)

Now available ex-stock at **£159 inc VAT and delivery.**

IC-215

£159 inc. VAT and delivery

◀IC-240

IC-240 Think of the features you would instal in a mobile to provide a combination of optimum usefulness AND SAFETY. You will probably come up with the following requirements:
1 Easy channel selection with minimum knob twiddling—yet with all the normal FM channels available.
2 A fully automatic tone burst which operates only in repeat mode with NO buttons to press either on the front or on the back of the set.
3 Instant reverse repeat at the flick of a switch without any re-tuning or memory programming.
4 A very sensitive receiver with a spurious response performance far better than the average and a very clean transmitter with excellent clear, crisp modulation. (We measured a sensitivity of 0·1µv pd for 10dB sinad).
5 A reasonable price—but (more important) a quick, reliable after sales service.

COMPARE THIS LIST WITH PREVIOUS ADS FOR VARIOUS TRANSCEIVERS AND YOU WILL SEE THAT THE 240 WINS EVERY TIME:

IC-240 alone £198 inc. VAT

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IC-211E ▼ £549 inc VAT

Giving you FM/CW/USB/LSB, all produced from the amazing ICOM synthesizer and patent LSI chip. Frequency read out is to the nearest 100Hz and it is amazingly stable and accurate. You can use the two frequency stores as separate VFOs or for any repeater shift required. The tone burst is automatic, of course, and reverse repeat is available at the flick of a switch. Add a keypad (we will give you the circuit to make your own or you will be able to buy one shortly) and find a new facility which is quite impossible with old-fashioned rigs. The original waiting list has now been dealt with and you can now have one from stock.

IC-245E £396 inc VAT ▲

This truly amazing little box gets you mobile on FM, USB or (if you really think it a good idea) CW! The synthesizer is the same as the IC-211E and can be tuned to the nearest 100Hz, again with amazing accuracy. Of course such a versatile little box will often be used as a base station and facilities such as keypad operation can be added. They are now ex-stock!

IC-701 £999 inc VAT

◀ The popular "SLIM JIM" SJ2

144–146MHz—High efficiency 2 metre omni-directional vertical

An omni-directional 2 metre aerial developed by T & T from a design by F. C. Judd (G2BCX). Derived from the "J" the SJ2 is a free space aerial with *better than 50% greater efficiency than conventional ground plane types due to the very low angle radiation field.* The aerial is slim and compact (58 inches long) and as there are no radials it is unobtrusive and has low wind resistance. Supplied complete with mast clamp. **£15.50** inc. VAT (carriage £1.00).

The HF rig to beat them all, **HERE THIS MONTH.** ★ All solid state including the finals ★ 100W RF output Continuous Duty on All Bands. All Modes ★ All bands 1·8–30MHz ★ USB, LSB, CW, CW (narrow), RTTY ★ Double balanced Schottky Diode mixer used in both Tx and Rx ★ Fully synthesized with Digital readout to 100Hz and two stores to enable split frequency operation ★ ICOM's unique bandpass tune ★ VOX, Semi-break-in CW, RIT, AGC, Noise Blanker ★ Built-in RF speech processor ★ Extremely compact ★ All filters built in ★ 12V or mains operation ★ Electret desk mic. NO EXTRAS TO BUY.

INTRODUCING A NEW RANGE OF MICROPHONES BY LESON. For the time being available only from Herne Bay.
All these are suitable for ICOM transceivers and have a PTT switch and a frequency response 300–2500Hz. They are NOT fitted with a plug.

MODEL	TYPE	BUILT-IN AMPLIFIER	IMPEDANCE	PRICE (inc VAT)
TW232	Ceramic Desk mic with PTT, Lock sw and gain cont. Silver grey finish	Compression amp 0–30dB var.	<4·5K	£25.00
DH-218	Moving coil dynamic. Hand held	NONE	500Ω	£4.99
DH-233	Moving coil dynamic. Hand held	Pre-amp 0–15dB var.	<3·5K	£9.00
CH-229	Ceramic noise cancelling. Hand held	Compression amp 0–35dB var.	<5K	£15.00

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Frequency Range	10M to 160M
Modes	LSB USB CW AM FSK FAX/SSTV
Power Requirements	100/234V AC or 13·5V DC
Input Power	280W PEP (240W on 28MHz)

CQ 201 EXTERNAL DIGITAL READOUT VFO

Three Outputs	5·0-5·5MHz 8·2-8·7MHz 8·9-9·4MHz
Frequency Counter	10Hz to 30MHz
Output Voltage 2V (p-p)	Impedance 50-100ohms
Counter unit input Level	0·1V (p-p) 100kHz >
	1V (p-p) 100kHz <
Power Requirements	100/234V AC

CQ 301 LINEAR AMPLIFIER

Frequency Range	10M to 160M
Mode	LSB USB CW AM
Power Requirements	100/234V AC
Max Input	2KW SSB 1KW AM
Drive Power	100-200W
Circuit	2 × 3-500Z in Grounded Grid A1

M110 DESK MICROPHONE
Dynamic Unidirectional—Impedance 50K—Frequency Range 200-10,000Hz
Flexible Shaft with diecast base for stability and two position Switch.

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High Quality Speaker Unit 4W 8ohm range 180-8000Hz. Digital Clock with 7-segment display, with 59 minute sleep timer, and 24 hour alarm setting with two AC outlets one unswitched and one switched controlled by clock. Power Fail Indication. Power Requirements for Clock 100-234V AC and 50/60Hz switch Selection.

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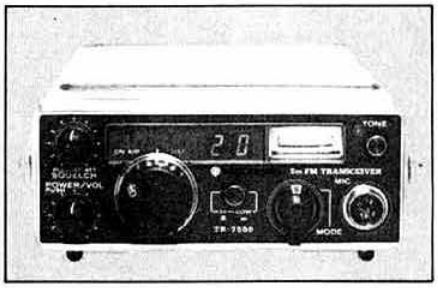
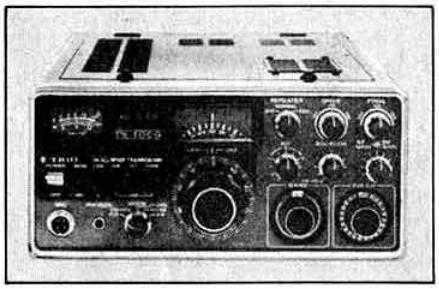


TRIO TR7500 The sensible one, £225 inc. VAT

The TR7500 gives you the ultimate FM mobile rig. Full band coverage 144–146MHz in 80 channels at 25kHz spacing—and no programming or crystals due to the use of an advanced synthesiser. Dial indication is commonsense itself; if you want S20, simply turn the dial to 20; R7, turn to 7, no need to remember complicated frequency plans. If you are operating on a repeater and you wish to listen on the input frequency or operate reverse repeater, simply touch one switch; there is no knob twiddling involved. Should you need a 1·6MHz shift—that's also available on the synthesiser—but remember, you may qualify for the WACS Award (worked all cop shops!).

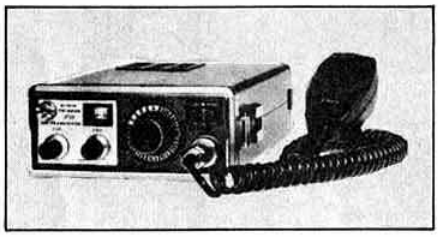
Potent performance in a package not much larger than the TR-2200 with 12 Watts transmitter output and better than 0·2μV sensitivity together with the unparalleled Trio quality and attention to detail make the TR7500 the *sensible* man's choice.



TRIO TS700G £458 inc. VAT (also including the matching VOX-3)

Say what you will, the TS700G set the standard for all other 2 metre all mode transceivers. A very high standard which has yet to be surpassed. Full 2 metre coverage, VFO or 22 crystal channels, all mode operation AM, FM, USB, LSB and CW. Mains or battery supply. Normal and reverse repeater facilities at the turn of a switch. Trio exclusive tuning fork access tone generator with fully auto tone burst. Best quality signal on the band thanks to TRIO design excellence in low intermod amplifiers. It's simply the best rig that you can buy, and it's backed by the combined reputations of TRIO and Lowe Electronics.

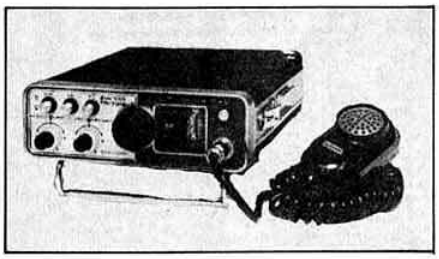
15 Watts output; 0·25 microvolt sensitivity; first class strong signal handling receiver; European standard selectivity. If you haven't yet handled the TS700G, rush to one of our branches and be prepared to be impressed. Send for full details now.



TRIO TR2200GX £147 (3 ch.) £177 (12 ch.) inc. VAT

This is the definitive 2 metre FM portable rig which has won praise from all over the world. Over 2W transmitter output with switched reduction to 400mW for local contacts. High gain receiver with double IF filtering at 10·7MHz and 455kHz for razor sharp selectivity.

The TR2200GX is supplied with all accessories including the battery charger for the optional Nicad battery pack, the removable telescopic antenna, the carrying case, the shoulder strap, external power lead, microphone and handbook. Fitted with 12 channels, the price is only **£177** inc. VAT. If you wish to start out at a lower price, we can supply the rig fitted 3 channels for only **£147**. With all its performance, the TR2200GX is a must for the portable operator. At the price, it has to be the best around. Just look around at the next rally and see how many operators are carrying them. Also available are a mobile mounting bracket at **£9.70**, a matching 10 Watt amplifier for **£45** and a flexible antenna. Send for full details now.

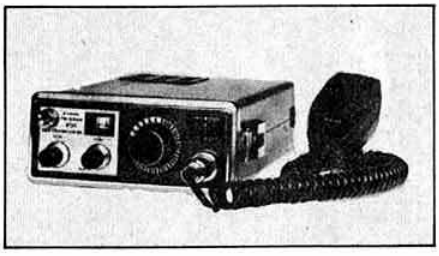


TRIO TR7010 £189 inc. VAT

Work real DX with ease on 2 metre SSB and CW. The TR7010 combines a high performance receiver with a 10 Watt transmitter and provides mobile or fixed station capability at low cost. Supplied ready to operate from 144·1–144·34MHz, the TR7010 covers all CW, SSB and beacon activity. 48 channels with 5kHz spacing plus VXO and RIT provide continuous coverage. Operation in any other part of the 2 metre band can be carried out by a simple crystal change and no re-alignment is required.

Single conversion using an IF of 10·7MHz with a first class crystal filter gives outstanding selectivity. Wide range amplifed AGC and newly developed FET devices in the RF and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals. The single conversion transmitter using fully balanced mixers generates a beautifully clean signal with crisp audio quality.

Join the SSB gang and work real DX for **£189**. Send for full details now.



TRIO TR3200 £185 inc. VAT

The newest FM handy transceiver from the ever expanding TRIO range. Superb performance for the 70cm operator with all the advantages of portability and TRIO reliability. 12 channel capability in the range 432–436MHz with three channels fitted (SU8, 18, 20). Transmitter output switched 2W/400mW and incorporating the exclusive TRIO 1750Hz tuning fork access tone generator (does that mean you can ring for credit?) High gain 5/8 wave antenna for enhanced performance on transmit and receive. Supplied complete with all accessories as for the TR2200GX and including the all important battery charger.

We have just received the first shipment of the VB3200 10W amplifier for the TR3200. Rather more complex than the VB2200, the VB3200 also includes a switchable receive preamplifier. Price . . . **£95** inc. VAT. Send for details now.

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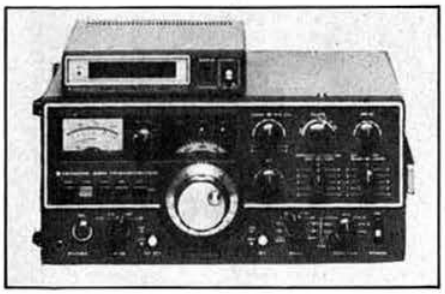


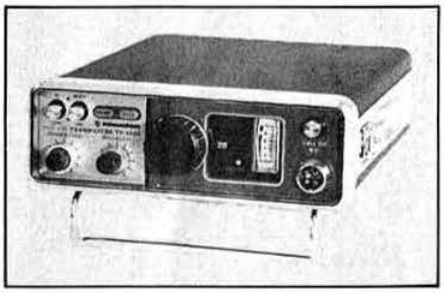
TRIO TS520S £525 inc VAT

Digital readout/counter DG5, £134 inc VAT

The logical development of the TS520, one of the world's most popular transceivers now includes full 6 band coverage 160–10 metres with all the performance, reliability and quality we expect from Trio. An outstanding receiver with high sensitivity (0·2 uV for 10dB S/N ratio on all bands) together with an equally excellent transmitter make the TS520S the best value for money rig around.

As a TS520S owner, you go on the air with a sense of pride and confidence. Thousands of these precision built transceivers are in use all over the world—in amateur shacks, field day sites, in DX and contest winning stations and no other rig offers you the performance, dependability, versatility and value that is built in to every TS520S.

See it soon and send for full details today.

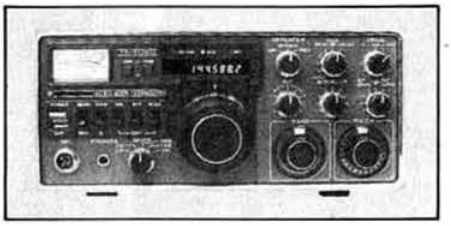


TRIO TR8300 £244 inc VAT

For the amateur who demands the best performance and top quality engineering in his UHF mobile rig, the TR8300 has to be the one. This new 70cm FM transceiver from Trio offers power in excess of 10 Watts, receiver performance of a very high order thanks to the use of advanced semiconductor devices in the RF stages (they look like Aspirins with legs) and styling to match the successful TR7010 and TR7200G.

Supplied complete with all accessories and fitted with four channels and provision for up to 22, the TR8300 allows instant use of the ever growing number of 70cm repeater stations all over the country. If you travel abroad, the TR8300 will cover all European operation thanks to its' amazing bandwidth without retuning (RX 431–439·5MHz).

Send for full details today.



TRIO TS700S £580 inc VAT

This is the ultimate TS700 with every possible extra. Full 2 metre coverage on VFO or 22 crystal controlled channels with digital readout on all modes to 100 Hz using the Trio exclusive easy on the eyes readout tubes. Built-in Vox and break-in CW with keyed sidetone. Low power facility for all modes in case you don't need the full 15–18 Watts normally given by the TS700S. Better than ever receiver performance, particularly in strong signal handling when compared to other equipment, and a built-in switched RF preamplifier. Automatic tone burst with repeater and reverse repeater shifts for no fuss use of 2 metre repeaters.

The remote VFO700S offers for the first time in a VHF rig the facility of splitting transmit and receive frequencies by any amount and also operation on two different transceive frequencies at the touch of a switch (invaluable for monitoring net frequencies or OSCAR checking). The VFO will also give VFO control of the TR7010 with a small adaptor unit.

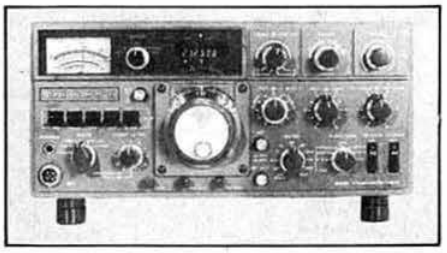
All in all the TS700S is the best, so see it soon at your nearest stockist; you will not be disappointed.

TRIO TR7400A £334 inc VAT

This 2 metre FM mobile rig has taken America by storm; everyone wants it and inevitably we are now being asked to supply it in this country. It certainly has everything going for it—144–148MHz coverage in 800 5kHz steps with PLL stability and digital frequency readout (but I still think that the TR7500 readout is more sensible in Europe G3PCY).

It has all repeater and reverse repeater shifts digitally programmed in together with an amazing array of squelch and tone burst facilities including automatic tone burst, sub audible squelch, CTCS (guess what that is) and provision for touch tone pad inputs. The big feature of course is the output power of 30–35 Watts—yes, I said 30–35 Watts. A sensitive receiver to match the TX performance completes the package of the rock crushing TR7400A.

Send for details today.



TRIO TS820 £723 inc VAT DG-1 £136 inc VAT

IN THIS SMALL SPACE, WE CANNOT ADEQUATELY DESCRIBE THE BEST HF TRANSCEIVER ON THE MARKET. SEE APRIL/MAY ISSUE FOR DETAILS OR SIMPLY ASK US FOR A LEAFLET. JOIN THOSE IN THE KNOW—USE THE TS820.

NOW IN STOCK, THE TL922 MATCHING 2·5kW LINEAR. ALSO IN STOCK, THE AT200 ANTENNA TUNER/POWER METER

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SRX 30 £158.00 inc VAT

For the keen short wave listener and the radio amateur who needs to tune around frequencies other than the amateur bands, the new SRX-30 is the one. This all new receiver covers the entire range of 500kHz to 30MHz in 30 bands and caters for AM, USB, LSB and CW reception. Using advanced drift cancelling techniques, the SRX-30 is *the* receiver for stable, trouble-free listening. Housed in a rugged case measuring only 12½" × 5½" × 9" deep, the SRX-30 operates from 12Vdc or 100–240Vac and with its built-in speaker, gives high performance, go-anywhere capability.

The SRX-30 brings a new high standard to low cost listening—at **£158.00** including VAT, it has to be seen and used to be appreciated—ask for full details now.

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CS1570 Dual trace dc to 30MHz*	464.40	3.00
CS1560A Dual trace dc to 15MHz*	324.00	3.00
CS1562 Dual trace dc to 10MHz*	270.00	3.00
*The price includes two matching full bandwidth × 10 probes		
PF810 In line power meter. 3 power ranges. 1·8–200MHz. 2 way antenna switch	64.80	3.00
CO1303G Station monitor scope (as CO1303D) but fitted in line RF monitor and 2 tone oscillator	129.60	3.00
CO1303D Single trace dc to 5MHz. Ideal small service scope	108.00	3.00
DM800 Dip resonance meter	48.60	0.86
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Trio LF30A Low pass filter 1kW rating. 32MHz cut off. 90dB stop band	17.00	0.67
Trio BPF2A 2m band pass filter—144–146MHz. 50W. rms. 100W P.E.P.	27.00	0.67
Shinwa 1110 2m band pass filter—144–146MHz	13.72	0·67
Shinwa 1006 2m low pass filter—146MHz cut off	11.48	0.67
Shinwa 1140 28MHz transverter filter—28–30MHz band pass	13.72	0.67
Shinwa 1005 HF low pass filter—32MHz cut off	10.80	0.67
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NR56 Tunable/crystal 2m FM receiver. 144–146MHz	54.00	0.86
ASV1515 VHF FM monitor receiver less crystals. Mains/battery. Self-contained	28.50	0.86
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Seiwa MS2 Scanner less crystals. 4 channel pocket scanner	67.50	0.67
Seiwa, MR2 Monitor less crystals 12 channel pocket receiver	63.00	0.67
Crystals for the above—each	2.40	0.15
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Trico Low impedance padded headsets	4.68	0.67
Maeden Accessory speakers	2.52	0.28
Morse keys HK708	8.10	0.67
EK150 Katsumi keyer, 240V ac/12V dc operation. Built-in monitor	60.75	0.67
EK1024 Electronic keyer with 1024 bit memory	118.12	0.67
RW151D Kuranishi watt meter/dummy load 0-5-25-150W-dc-500MHz	75.60	0.86
EW1 Wave meter	16.20	1.06
DL20 20W dummy load	4.67	0.24
Trio HC2 Ham clock	15.50	1.06
Hansen SWR3 Single meter	9.50	0.67
Hansen SWR25 Twin meter	10.80	0.67
FS301 Through line watt meter 3·5 to 30MHz	32.40	0.86
DAIWA ACCESSORIES		
CL-22 Aerial tuner unit. 1·8–30MHz	13.50	0.66
CSW-216 ATU with built-in SWR meter. 80m-10m 500 P.E.P.	103.50	3.00
CL-65 ATU 80-10m 500W P.E.P. 200W. CW	45.00	3.00
AT-400X Stepped attenuator	41.04	0.86
SWX-777 De luxe SWR/power meter with 'cross over' metering	55.00	1.06
SW-410 SWR/power meter 144MHz/432MHz	48.60	0.86
SW110 SWR/power meter 1·8–150MHz	25.92	0.86
CDE ROTATORS		
AR40 (5 core cable required	51.75	3.00
CD44 (8 core cable required)	106.87	3.00
Ham-2 (8 core cable required)	145.12	3.00
RAK ANTENNAS		
A-8XL 80m dipole 4kW rating	9.50	0.86
AL-48DXN 80/40m trap dipole. Length only 28m 2kW P.E.P.	20.00	1.06
Listener III SWL antenna. Double dipole. 24m overall	20.00	0.86
Listener I SWL antenna. Loaded wire antenna. Only 5m long	8.00	0.66
HD-26A Extendable dipole. Tunable from approx 70cm to 4m	6.75	0.44
HY-GAIN ANTENNAS—HF beams		
TH2Mk3 2 element yagi for 70·15 and 10m. 1kW rating	117.56	3.00
TH3Jnr 3 element yagi for 20·15 and 10m. 600W P.E.P.	121.50	3.00
TH3Mk3 3 element yagi for 20·15 and 10m. 1kW	167.62	3.00
TH6DXX 6 element total 20·15 and 10m.	201.37	3.00* *By BRS
Hyquad 2 element quad. 8·5dB gain on 20·15·10m	182.25	3.00
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12AVQ Trapped vertical self-support for 20·15. 10m	39.93	3.00
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★ **HILOMAST PUMP-UP MASTS-GREAT**
★ **FOR 2 METRE FM—TRY THE UNIDEN 2030. SAME PERFORMANCE AS THE TR72006 AND FITTED 11 CHANNELS—£145 inc VAT**

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7416	.25
7417	.40
7420	.15
7426	.30
7427	.45
7430	.15
7432	.30
7437	.30
7438	.35
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74151	.65
74153	.75
74154	.95
74156	.95
74157	.65
74161	.85
74163	.85
74164	.60
74165	1.50
74166	1.35
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74LS20	.25
74LS21	.25
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A FT-227R Provides new standards of convenience in 2 metre FM communications. A Phase Lock Loop Synthesiser generates 800 channels in 5kHz steps between 144 and 148MHz using an "optical coupling" system for channel selection instead of a rotary switch that could wear out. A memory circuit allows you to memorize any of these 800 channels with return to the memorized frequency at the flip of a switch. The standard repeater shift or any other offset frequency can be utilized. Automatic tone burst and advanced circuitry to protect PA transistors from high SWR or reversed supply polarity.

See Catalogue Page 19

B FT-7 The all-solid state FT-7 mobile transceiver provides high performance on the 80 through 10 metre bands. The operator may select upper or lower sideband or CW operation and the compact package provides many features engineered for convenience while mobile. A single knob provides all transceiver tuning and the state-of-the-art noise blanker minimizes impulse-type noise such as that found in mobile applications. The FT-7 is designed for operation directly from your car's 12 volt battery. Can also be used as a base station with the matching FP-4 AC PSU.

See Catalogue Page 18

C FT-901DM Unparalleled receiver performance plus advanced transmitter features make the FT-901DM the ham's dream come true. The receiver features rejection tuning, dual-filter variable band width tuning and audio peak frequency tuning for maximum rejection of unwanted signals. Transmitter includes built-in Curtis keyer and RF Speech Processor and features a 10 second "TUNE" timer to safeguard your finals. Includes memory for both transmit and receive frequencies, an advanced noise blanker and off-set tuning on both transmit and receive. All modes, USB, LSB, CW, FSK, AM and FM, 160 thru 10.

See Catalogue Page 3

D FT-225RD this is the very latest of the growing 2 metre range and incorporates digital frequency read-out, optional repeater shift, variable power output, noise blanker, selectable AGC and gives all-mode operation on LSB, USB, CW, FM and AM. The 225RD is, of course, fully portable and can be operated off mains supply or 12v DC and has a host of other fine features including provision for an optional memory unit. Model 225R analog version also available.

E FRG-7 The model FRG-7 is a precision built, high performance Communications receiver designed to cover the bands from 0·5MHz–29·9MHz without gap. The advanced technology employed in its circuitry includes the famous Wadley Loop System drift cancelling technique. This coupled with a triple conversion super heterodyne system guarantees extremely high sensitivity and exceptional stability. Careful design has minimised unwanted spurious signals so often encountered in cheaper imitations. Features include RF attenuator, selectable audio filter and automatic noise supression circuit.

See Catalogue page 13

F FRG-7000 New all solid-state digital read-out general coverage receiver. Covers from 0.25–29.9 MHz AM, SSB, CW. Has unique digital clock feature which incorporates timer which controls rear apron connections to external equipment such as tape recorder etc., etc. This de-luxe receiver has everything for the dedicated SWL and professional user and supplements the famous FRG-7 which continues in production of course.

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CURRENT COMMENT

GB2RS

Members may like to know that good progress is being made by the committee that has been set up to investigate the Society's News Bulletin Service. Some 40 letters were received in response to the request for suggestions that appeared in the September 1977 issue of *Radio Communication*. Several of the letters represented the views of groups of members.

It will be appreciated that any significant changes in the service will require amendments to the existing licence and that the Home Office, as licensing authority, will have to give its approval.

The *ad hoc* committee will be recommending a change in the 3·5MHz band frequency. Most letters asked for this. However, as 3,600kHz is in the rtty allocation supported by the IARU, of which the RSGB is a member, it is not anticipated that there will be a return to that frequency. 3,650kHz is the Belgium society's frequency for their news bulletin, so we do not feel able to remain there. However, once a frequency has been established it is felt that it eventually "punches its own hole" in the band.

The 144MHz transmissions have been discussed in detail, and the committee is likely to recommend frequencies and modes that will be receivable on most of the equipment currently in use.

As far as the contents are concerned there appears to be a demand for information about local events. However, the members of the committee are concerned lest the bulletins should become a repetition of what has already appeared in *Radio Communication*.

Nevertheless it is thought that there is a demand for local **news**. It has been suggested that this could go out on vhf (in addition to the national news) and that the national news only would go out on 3·5MHz. This would at least make the administration reasonably clean cut—especially if the zonal manager and regional representatives were brought into the organization of the service.

The opportunity is taken to record grateful thanks to G3KQF who took over the "chair" during the writer's temporary indisposition, and to G3BA who compiled the first draft report.

G2AMV

QTC

amateur radio news

Licensing matters

Following negotiation between the Home Office and the Society there are three decisions to report:

(i) the Home Office will now accept applications for the Phase 3 uhf repeaters and also special experimental projects such as microwave repeaters. Further meetings will take place concerning vhf repeaters.

(ii) applications can now be accepted for special event stations using the 144MHz band and above. These will use the new prefix GB8. All applications for special event stations should be made through the Society.

(iii) stations operating under the amateur (maritime) licence on the hf bands will no longer be restricted to crystal control.

With apologies. . . .

Dr E. H. Squance, GI8OJG, apologizes for the following error which appeared in his article "Calculation of distances between QTHs using scientific calculators" in the May issue. In the execution program, for Step to 17 read Step to 18.

Mr J. T. Evans, G3VDB, author of "A cmos rtty modulator for new tones", also in the May issue, draws attention to the omission of a short piece of track from the component side of the pcb diagram on page 318. Referring to the component layout on page 319, the missing track runs between the two circular pads 0·1in to the right of R26 and 0·2in below IC6 pin 8.

JOTA 21-22 October 1978

There has been confusion about the dates for "Jamboree on the Air" this year, due to 1 October being a Sunday. JOTA is always held on the third **full** weekend in October, which this year is 21-22 October, and not 15-16 October as many people had assumed.

All requested special event callsigns for this event have been recorded by the Society for these dates, and the necessary applications will be made to the Home Office in due course.

ZL2MHF

The New Zealand beacon ZL2MHF situated on Mount Climie is now operating on a frequency of 28·23MHz.

In order that propagation on the 28MHz band can be investigated, it would be appreciated if signal reports of the beacon could be forwarded either by the QSL Bureau or direct to: The Secretary, NZART Branch 63, PO Box 40212, Upper Hutt, New Zealand.

Stolen property

On 29 March, in Leicester: Yaesu FT75 mobile psu, rf and volume knobs missing. Information to Sunbase International, the Hill, Oaks Road, Great Glen, Leicester; tel 053539 2202.

Between 26 March and 4 April from M61 motorway, at Bamber Bridge, Preston: (a) two Shibaden cctv cameras, serial numbers 110149 and 140148, each fitted with 75mm Cosmicor lens serial numbers 18168 and 14006 or 16356; (b) vhf base station type CM151, modified for cctv, manufactured by Communicators Ltd; (c) two grey plastic distribution boxes, one containing 30V psu.

Information to Detective Inspector Thompson, Lancashire Constabulary, tel Leyland 33561.

RSGB NATIONAL MOBILE RALLY

Woburn Abbey

6 August 1978

Details of trade stands available from Norman Miller, G3MVV, "Avon", Gardiners Lane, Crays Hill, Billericay, Essex.

Visitors wishing to stay overnight with self-contained caravans may do so at £1.65 per night. Because of the wild deer in the park no camping with tents or awnings is permitted. Booking forms available from G3MVV on receipt of sae.

SCOTTISH MOBILE RALLY

Palace of Art
Bellahouston, Glasgow

Saturday 10 June 1978
11am–6pm

Trade stands, demonstrations, raffles etc.
Snack bar.
Talk-in on GB3SMR SO and S24; also monitoring local vhf and uhf repeaters.
Full details from GM4FDM, QTHR.

Radio Amateur Old Timers' Association

The twentieth reunion of RAOTA was held on 21 April at The Horseshoe, Tottenham Court Road, London W1. An attendance of 31 included Lord and Lady Wallace of Coslany; Dr Rudi Stuber, HB9T; Mr Ray Ashmore, G8KYY, of *Wireless World*; and Mrs Yvonne Ashmore. Mr Ashmore took the place of Mr Tom Ivall, the *WW* editor, who was unable to attend. A pleasant evening of nostalgia was enjoyed by those present.

The next reunion is due to take place on Friday 27 April, 1979.

Any radio amateur who has held a transmitting licence for a consecutive period of 25 years is eligible to join RAOTA. Details of membership can be obtained from Miss May Gadsden, 79 New River Crescent, London N13 5RQ; tel 01-882 1272.

Worked All Britain AGM 1978

At the annual general meeting of WAB held on 23 April 1978, there was considerable discussion on the apparently misleading statement which appeared in a number of publications last year. The statement included in publicity relative to the WAB Counties Award suggested that "all profits are donated to RAIBC". This is not strictly accurate, and the committee would like it known that while a fixed sum per year is, and will continue to be, set aside for RAIBC, for many reasons this is not as suggested "*all profits*".

Please return

Will the Welsh swl who took away Eddystone and Hallicrafter receiver handbooks, please return them to Rayer, Longdon Heath, Upton-on-Severn, Worcs, as promised.

1979 NRSA Exhibition

The 1979 Northern Radio Societies Association Radio and Electronics Exhibition is to be held at Belle Vue, Manchester, on Sunday 22 April.

The organizers of the 1978 exhibition wish to a apologize for the overcrowded conditions at this year's event and would ask visitors to note that next year's event will be at the same venue but in a hall some 2½ times the size of this year's exhibition area.

The G3PAO Memorial Lecture

The Verulam Amateur Radio Club's G3PAO Memorial Lecture was held in the Market Hall, St Albans, on 23 March. This annual event is to commemorate George Slaughter, G3PAO, founder member and one-time chairman, secretary and newsletter editor of the VARC, who died in 1977. Pat Gowen, G3IOR, chairman of AMSAT UK, gave a talk covering all aspects of satellite operation, past, present and future. Those members and visitors present, over 80 in all and including G3PAO's widow and family, enjoyed a first-class lecture.

Some of the personalities who were present (l to r): Ron Broadbent, G3AAJ, RR for Region 19 and hon sec of AMSAT UK; Brian Pickford, G4DUS, hon sec of Verulam ARC; Pat Gowen; Derek Purchese, G3LXP, chairman VARC; John Swinnerton, G2YS, past-president of RSGB; and Jim Sleight, G3OJI, county controller for Hertfordshire Raynet

The diagrammatic representation of radio signals

by D. M. CLOKE, G4BMO*

The phase diagram

Any radio signal can be expressed in a mathematical form. However, the mathematics are complex, and an easier and more visual way of describing a radio signal is by the use of phase diagrams. By using a diagrammatic method it is possible to understand the theory behind such circuits as the phasing method of producing ssb, without the use of any mathematical notation.

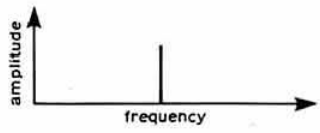


Fig 1

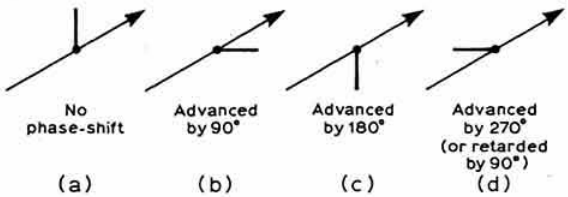


Fig 2

Fig 1 represents a single radio carrier wave on an amplitude/frequency diagram, but this diagram is incapable of distinguishing between the above carrier and the same carrier at a different phase angle. However, if this carrier is shown rotating around the base line at such a speed that the angle of rotation is the phase angle, then a phase advance can be shown as a phase diagram (Figs 2 (a)–(d)). Of course, any carrier wave is always advancing in phase—by 360°/cycle. Thus it can be considered in the diagram to be continuously rotating around the base line. As the frequency of the carrier is increased, the speed of rotation will also increase.

Fig 3

*The Homestead, Smithy Lane, Mouldsworth, Chester CH3 8AR

Fig 4

Two antiphase signals of the same frequency and equal amplitude will cancel out if added together. This is shown in the phase diagrams (Fig 3) by vector addition. Two signals of the same frequency, but differing in phase by 90°, can also be added by vector addition (Fig 4); the resultant here is at a different phase angle from either of the two signals added to produce it. Thus the phase and amplitude of the signal resulting from the addition of two or more signals of the same frequency may be found by their vector addition.

Amplitude modulation

If a carrier wave is modulated by a single sine-wave tone, two sidebands of equal amplitude are produced, equally spaced in frequency on either side of the carrier. Shown as a phase diagram, the lower sideband will rotate around the base line at a slower speed than the carrier; the upper sideband, having a higher frequency, will rotate faster than the carrier. To simplify the following diagrams, the carrier can be considered to be stationary, the upper and lower sidebands then appearing to rotate in opposite directions.

In the previous diagrams a phase advance has been shown as a clockwise rotation, and the same convention will be used throughout; the upper sidebands in the following diagrams rotating clockwise and the lower sidebands anticlockwise.

The resulting phase diagrams of an amplitude modulated carrier are best shown in relation to the modulating af, which in Fig 5 is single sine-wave tone. A single sine wave af signal will also be used in all subsequent diagrams except where the text indicates otherwise.

Now consider the same af signal simultaneously modulating two independent rf carriers of the same frequency, but one rf signal advanced in phase by 90° (Fig 6). Repeat this procedure with the same two rf signals, but with the af signal advanced in phase by 90° in both cases (Fig 7).

The phase diagrams in Figs 6 and 7 are the key to the phasing method of producing ssb.

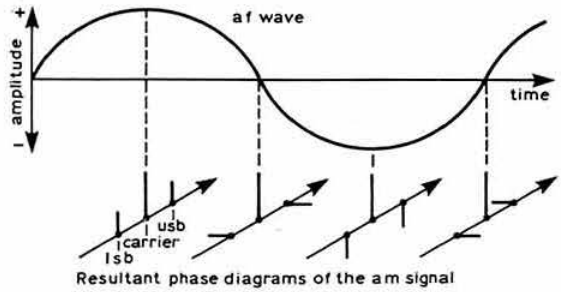


Fig 5

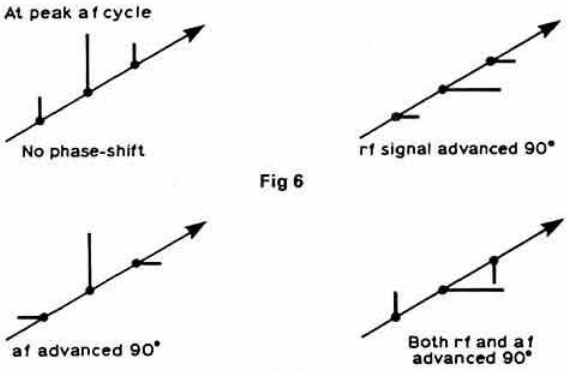


Fig 6

Fig 7

SSB—The phasing method

Fig 8 shows a block diagram of a phasing type exciter. Applying phase diagrams to the outputs of the two balanced modulators it is possible to demonstrate how the ssb is produced (Fig 9). As two signals of equal amplitude and opposite phase cancel out, the lower sideband in Fig 9 is suppressed and the upper sidebands reinforce each other to give the upper sideband ssb output.

Phase diagrams will also reveal that a 90° phase shift is not a fundamental requirement of this method; any angle of phase shift can be used for either the af or rf signals, as long as both angles are the same, and one signal is also phase inverted by 180°. Thus the af shift could be 45°, and the rf phase shift either 135° (ie 180−45) or 225° (ie 180+45). However, the output falls as the phase angle moves further from 90°, such that, using a 45° af phase shift, the final ssb output will be 3dB less than using a 90° af shift. A 0° or 180° shift will give zero output. To see how angles other than 90° can produce ssb in this circuit, phase diagrams are again applied to the phasing type exciter; this time using a 45° advanced af phase shift and a 135° advanced rf signal (Fig 10).

The output is lower than using two 90° phase shifts and is also shifted in phase. Phase shift is, however, unimportant in a single sideband signal. The use of angles other than 90° in a phasing exciter is largely of theoretical

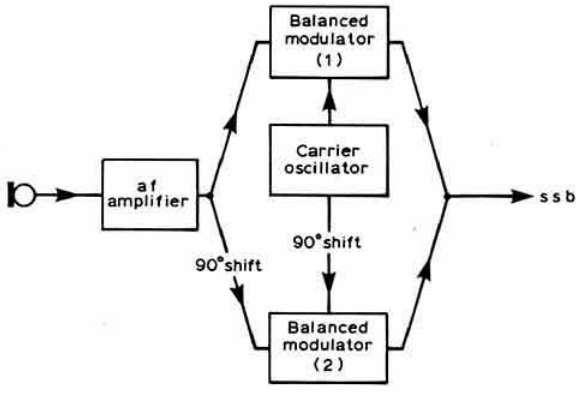


Fig 8

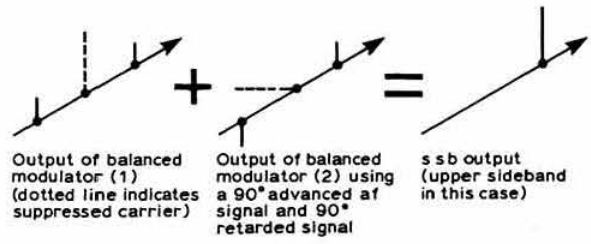


Fig 9

interest, for though at first sight it appears to relax the requirements for this method, the same basic problem of making accurate wideband af phase shift networks still remains; indeed the smaller the angle used, the more accurate the phase shifts have to be.

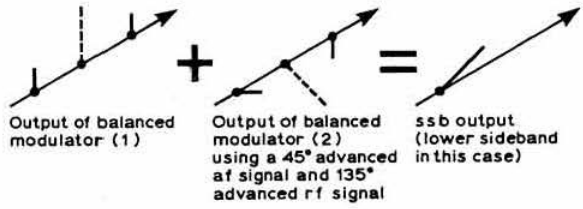


Fig 10

SSB—The third method

The problem of making accurate wideband phase shift networks is overcome in a third method exciter in an interesting way that also has its own set of problems. The "third method" can be considered as a phasing exciter with several modifications designed to produce a 90° shift in the af signal without a wideband phase shift network. However, the signals produced 90° out of phase, though in the af spectrum, are actually the lower sidebands of a filter method ssb exciter working at very low frequency. To see how the third method works, phase diagrams will again be applied to each stage of the circuit.

Fig 11 shows the block diagram of a third method exciter. The lf oscillator normally has a frequency of about 1·6kHz, ie in the middle of the audio frequency spectrum. However, the theory is easier to understand if the lf oscillator is above the af spectrum at a frequency of about 4kHz, and this case will be considered first.

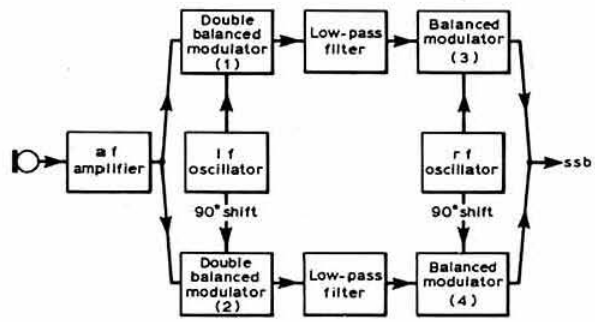


Fig 11

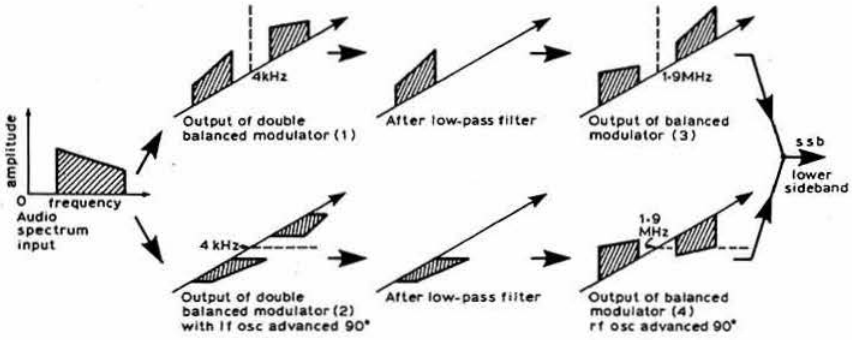


Fig 12

The lowpass filter has a cut off at the same frequency as the lf signal. For the purpose of the diagrams an rf oscillator frequency of 1·9MHz will be used as an example.

Applying phase diagrams to a third method exciter, using an lf oscillator frequency of 4kHz, and an audio spectrum instead of a single frequency sine wave af signal, gives the set of diagrams in Fig 12. It is important to note that the two signals, 90° out of phase, which are fed into the second pair of balanced modulators, are not audio signals but the lower sidebands of the first mixing process. Another point which arises is that the filters can be either lowpass or highpass, with the same cut-off frequency. Using highpass filters in Fig 12 would mean that the balanced modulators (1) and (2) need only be single balanced; the af appearing in their outputs being removed by the filters.

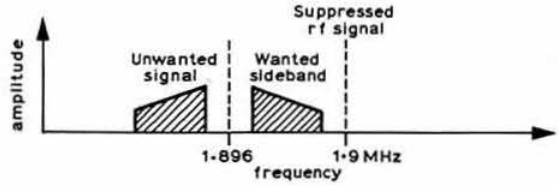


Fig 13

The heart of a third method exciter is the lowpass (or highpass) filter, which must be good enough to suppress the unwanted sideband. To show the effect of removing the filters, the resulting spectrum is shown on an amplitude/frequency graph in Fig 13. The effect of inaccuracy in any phase shift is likewise shown in Fig 14.

Figs 13 and 14 clearly show the difference in the output spectrum with the two specified "fault" conditions. A third method exciter using an lf oscillator frequency of 4kHz might have inadequate lowpass filters, some error in one of the phase shift networks, and some af leak through the first balance modulators, producing an output spectrum as in Fig 15.

However, in practice an lf oscillator frequency of about 1·6kHz is normally used. This leads to the advantage that in the event of an error in any phase shift angle, the unwanted sideband of the *second* mixing process appears in the background of the wanted signal and no increase in

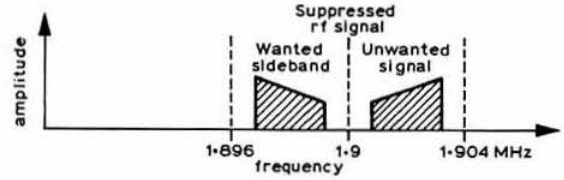
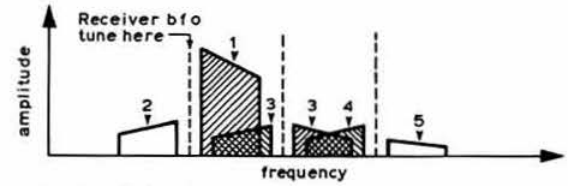


Fig 14

bandwidth occurs. This unwanted signal is, however, *not* the lower sideband in the case of an upper sideband exciter; the suppression of this unwanted sideband being wholly determined by the lowpass filter.

To see how the third method works with an lf oscillator frequency in the middle of the af range, phase diagrams are again applied to the block diagram of the third method exciter (Fig 11). First, an af frequency below the lf oscillator frequency will be considered, and for the sake of simplicity a single sine-wave tone is used throughout (Fig 16).

To show what happens to af frequencies above the lf oscillator frequency of 1·6kHz, a problem arises, as the modulating signal is higher in frequency than the signal being modulated, and so the lower sideband of such a process will be a negative frequency. To overcome this difficulty, in the following diagrams the lf signal is considered to be modulating the af. This does not affect the final result, but it does simplify the diagrams. Applying phase diagrams to the third method exciter with an af frequency higher than the lf signal gives Fig 17.



1 ..... Wanted sideband
2 ..... Sideband due to inadequate low-pass filters
3 ..... Sidebands due to af leak into second balanced modulators
4 ..... Signal due to inaccurate phase shifts
5 ..... Signal due to inaccurate phase shifts and poor low-pass filters

Fig 15

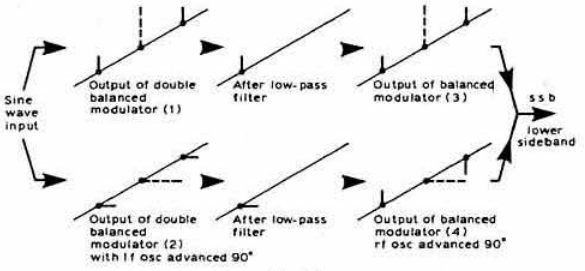


Fig 16

The result is interesting. By comparing Figs 16 and 17 it will be seen that when using an lf oscillator at a frequency in the middle of the audio spectrum, that part of the af signal above the low frequency appears above the rf signal frequency, while the af below the lf signal frequency appears below the rf signal (this can be reversed by exchanging the inputs to either balanced modulator).

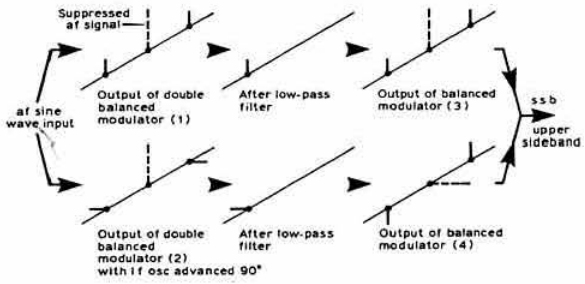


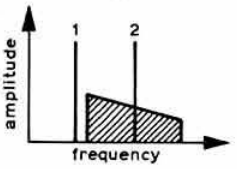
Fig 17

The effect of any imbalance of the balanced modulators working at rf will cause a 1·6kHz tone to appear on the transmission when correctly tuned on a receiver. Imbalance of the double balanced modulators suppressing the lf signal will result in carrier leak on the received transmission. These two "fault" conditions are illustrated in Fig 18. The effect of a gross error in any of the phase shift angles when using a 1·6kHz lf signal is shown in Fig 19.

It is interesting to compare the output spectra of Figs 19 and 14 where the lf signal frequencies are 1·6 and 4kHz respectively. This clearly shows the advantage of the 1·6kHz frequency when any phase angle error is present.

In summary, the following points must apply to any third method ssb exciter:

(1) The low (or high) pass filters must be good enough to suppress the unwanted sideband. No simple filter can produce a 60dB cut-off within 300Hz at 1·6kHz.



1..... Signal due to lf oscillator 'leakthrough' causes carrier leak on received signal

2..... Signal due to rf oscillator 'leakthrough' causes 1·6kHz tone on received signal

Fig 18

(2) The modulators fed with the lf carrier and the af signal must be double balanced to stop any af appearing in their outputs. This is not a requirement if highpass filters and an lf oscillator frequency of about 4kHz or over are used. Thus, any output from the exciter that occurs without the lf oscillator running is due to af leaking through the double-balanced modulators and is a fault condition as such (provided that stopping the lf oscillator does not unbalance the modulators).

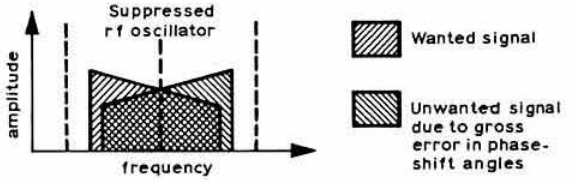


Fig 19

(3) There should be tailoring of the af spectrum to ensure that the overall bandwidth is kept to a minimum.

(4) Frequencies lower than about 1·6kHz cannot be used for the lf oscillator signal as the lower sideband of the first mixing process becomes inverted about the 0Hz point and will then appear on top of the upper sideband. In this condition the filter could not separate out the wanted sideband.

Frequency modulation and phase modulation

Theoretically, an fm transmission has an infinite bandwidth because theory tells us that the number of sidebands produced in any fm transmission are infinite in number. However, in practice only the first few sidebands are at a significant level (although there are people on 144MHz who attempt to verify the theory!) Indeed, in true nbfm only the first pair of sidebands are significant.

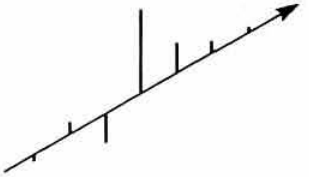


Fig 20

The spectral distribution of narrow-band fm is shown in Fig 20 as a phase diagram. The sideband distribution shown reveals some interesting points:

(1) It resembles the spectrum of an a.m. signal, with the major difference that the lower sideband is 180° out of phase with its a.m. counterpart.

(2) The bandwidth of an nbfm signal is only slightly greater than the equivalent a.m. signal. The minimum possible bandwidth for an fm system is the same as that required for a.m., as reducing the deviation level to a very low amount only decreases the *amplitude* of the significant sidebands.

As the deviation level is increased in an fm transmitter, the output spectrum changes in a way quite unlike an a.m.

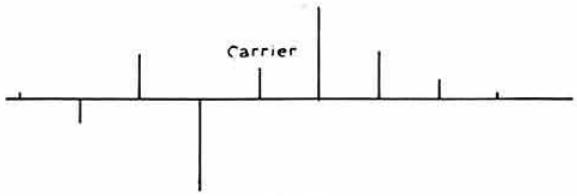


Fig 21

signal—this is better shown in two dimensions (Fig 21). The carrier is reduced in amplitude, and the higher order sidebands become significant. At certain deviation levels the carrier will have zero amplitude. To determine the amplitude of any component of an fm signal, Bessel functions give a useful set of graphs (Fig 22).

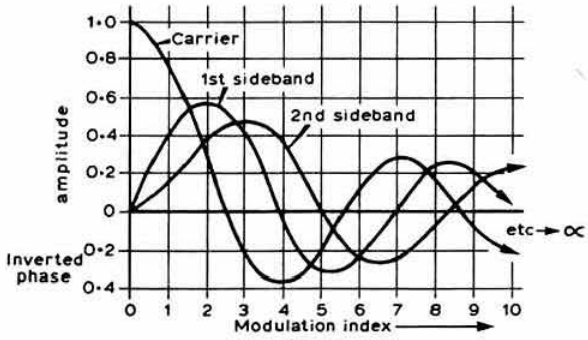


Fig 22

However, in the following phase diagrams a low deviation level is assumed, and only the first pair of sidebands are considered. It must therefore be remembered that the following phase diagrams do not show the higher order sidebands—which for nbfm is a good approximation.

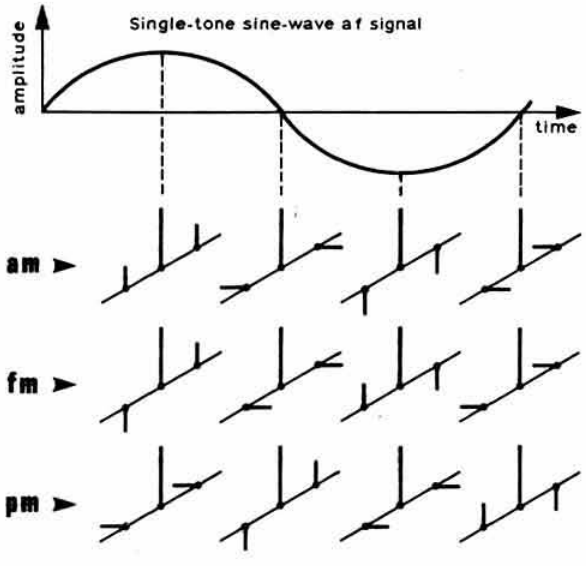


Fig 23

The interesting relationships between a.m., fm and pm (phase modulation) are best demonstrated by considering the same af signal to be fed into a modulator of each modulation method (Fig 23). This shows the important difference between fm and pm—they produce the same output spectra, but out of phase with each other by 90°. This means that fm and pm can only be separated by reference to the original modulating signal. The phase diagrams also show that it is possible to produce nbfm by phase shifting one sideband of an a.m. signal by 180° (or phase modulation by phase shifting both sidebands, or the carrier, by 90°). This is the so-called "indirect fm" system, and can be used in practice with the type of circuit given in block form in Fig 24.

Comparing the phase diagrams of a.m., fm and pm in Fig 23 suggests several interesting possibilities when the diagrams are added together. These mixed-mode additions will now be considered.

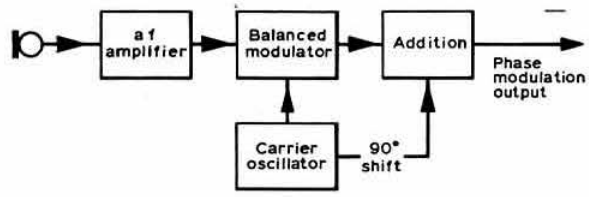


Fig 24

Mixed mode modulation

The addition of the a.m. and fm spectral components due to the same modulating signal would result in cancellation of the first lower sideband of the fm signal, leaving an ssb full carrier signal. However, this presents a practical difficulty, as the carrier must be phase coherent (ie from the same source) in any addition of this kind, and once a carrier is frequency modulated the fm sidebands will appear on all outputs. Any later a.m. will also modulate those sidebands, causing sidebands of sidebands to appear! Nevertheless, if an fm signal is also subsequently modulated by the same af signal, the lower sideband is cancelled when the amplitude of fm and a.m. is adjusted correctly. This is only an approximate ssb (full carrier) signal, as only the first lower sideband of the fm signal can be completely cancelled. To find the spectral content of such a signal, phase diagrams can be applied to each fm sideband in turn to produce all the resulting a.m. sidebands—the resulting sidebands can then by added by vector addition to produce the overall final spectrum.

Such a method of cancelling a sideband cannot produce an overall sideband suppression of suitable quality for serious transmission, due to the presence of higher order sidebands and intermodulation of the a.m. and fm sidebands. However, the block diagram of such an exciter (Fig 25) reveals that any unwanted fm of an a.m.

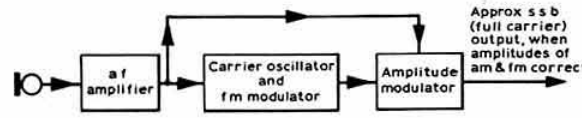


Fig 25

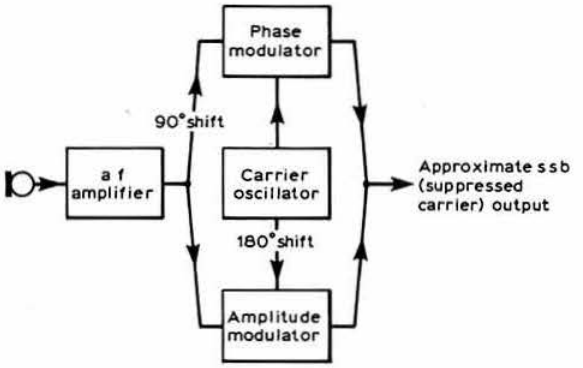


Fig 26

transmitter will show up as an asymmetry of the transmission.

Referring back to Fig 23 shows that the addition of a.m. and pm signals, modulated by the same af, will not result in the cancellation of any sideband. However, if a 90° phase shift is used in the audio feed to one of the modulators, an approximate ssb (full carrier) signal will be produced. By also phase shifting one of the rf signals by 180° the carrier can also be cancelled, giving an ssb suppressed carrier signal. Such a circuit is shown in block form in Fig 26. Applying phase diagrams to such an ssb exciter demonstrates how the ssb is formed (Fig 27).

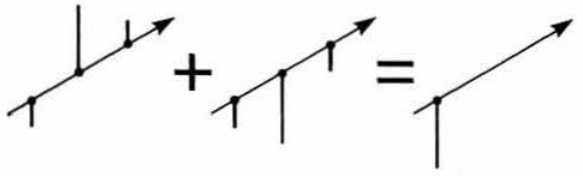


Fig 27

Again it must be stressed that the ssb produced by any method involving fm or pm can only produce an approximate ssb spectrum, even when very low deviation levels are used. Indeed, the output from such an exciter may better be described as an asymmetrical signal, rather than ssb.

As noted previously, the spectrum of a phase modulated signal that has been subsequently amplitude modulated with the same audio signal will be symmetrical. The signal produced in such a process is not without interest, as many a.m. transmitters undoubtedly have some unwanted phase modulation taking place as well. Such a signal will have a complex spectral output due to the formation of "sidebands of sidebands"; however, the resultant signal will have the characteristics of both a.m. and pm and will be resolvable to some degree on both types of receiving detector. This gives a useful way of detecting unwanted pm on an a.m. transmission.

Acknowledgement

The author would like to thank Mr C. M. Parry, G8JFJ, for his help in preparing this article.

References

[1] D. H. O. Bebbington, G8GGB: personal communication.

[2] "Modulation, Noise, & Spectral Analysis", P. F. Panter. McGraw-Hill, New York. □

NEW PRODUCTS

Antenna tuners

MFJ Enterprises announce a range of three new tuners using air-wound coils.

Top of the line is the MFJ-941 Versa Tuner 2 featuring a built-in swr bridge, dual-range wattmeter (30 and 300W) and a six-way antenna selection switch. Designed for use between 3 and 30MHz, the maximum power capability is 300W. The MFJ-901 is a tuner unit handling up to 200W and covering the same frequency range. The MFJ-900 Econo Tuner is similar to the MFJ-901 Versa Tuner except that it does not have the 1:4 balun for feeding balanced lines found in the two more expensive tuners. SO-239 connectors are provided for transmitter input and coaxial fed antennas. USA prices for the three units are $79.95, $59.95 and $49.95 respectively.

Further information can be obtained from MFJ Enterprises, PO Box 494, Mississippi State, MS 39762, USA.

The MFJ Versa Tuner 2

Buzz plug

A 13A plug with a built-in alarm is now available from Wellco Electric Ltd. The buzz plug sounds when the power fails or a fuse blows. The plug contains a 1·5V battery (size N) and requires no special wiring. It is suitable for the many applications where continuous power has to be maintained. The suggested retail price is £5·69 incl VAT. The buzz plug is obtainable from Wellco Electric Ltd, Wilbury Way, Hitchin, Herts, SG4 0TZ; tel 0462 52651

A simple 10GHz receiver with transmitter option

by D. EVANS, G3RPE, and C. SUCKLING, G3WDG*

Introduction

During recent years amateurs have had much success with simple 10GHz equipment. Usually this has consisted of transmitters generating a mere 1–20mW, receivers using point-contact diode mixers and with an i.f. bandwidth of 100–200kHz, and horn or dish antennas having gains of 20–35dB. Provided that the equipment is operated to take advantage of low-loss propagation modes, such as that over line-of-sight paths or of super-refraction via ducts, then contacts over paths hundreds of kilometres long can be achieved virtually as a matter of routine.

Both calculations and direct measurements show that this size of equipment usually has a reserve of system gain of tens of decibels. This reserve means that it is not even necessary for the equipment to be working well for it to be successful: an overall efficiency of one per cent may be all that is required to cope with most low-loss paths. It also means that "compromise" techniques, such as the use of a Gunn oscillator as a self-oscillating mixer (and usually also as the transmitter), are quite satisfactory under these propagation conditions *provided* that the rest of the system is working reasonably well.

However, for paths containing obstructions the path losses are normally very much greater. Losses 60–80dB (1–100 million times) greater than those over unobstructed paths are not untypical. In order to work over these obstructed paths, the overall system gain has to be correspondingly increased and it becomes necessary to start counting every decibel. The receiver described below, although it is simple to construct, is intended to be efficient at this level. An unusual feature is the flexibility of the design. Because of its particular configuration, a small amount of the local oscillator power is radiated and obviously this can be modulated and used as a transmitter. By a simple modification the output power can be increased if desired, but at some expense of the performance of the receiver.

Design and construction

The receiver is shown schematically in Fig 1. It consists of a simple mixer assembly which is connected directly to a Gunn oscillator of the type which defines its cavity by an iris. The mixer uses a length of waveguide into which is fitted the mixer diode, the hot end of which is decoupled and feeds the i.f. amplifier in the conventional way. Diodes of the 1N23 type are recommended; those with later prefixes (E, F, G) are preferred for their lower noise figures. The signal-input end of the guide can be of any convenient length, and it is fitted with a matching screw or screws to match the mixer diode to the waveguide. The length of the waveguide at the local oscillator end is critical: it needs to be made electrically an odd number of quarter guide wavelengths, ie $n\lambda_g/4$, where n is 1, 3, 5, 7 etc as is convenient. This rear cavity is closed by the same iris as is used to define the Gunn oscillator cavity.

A basic problem in the design of receivers is how to couple the local oscillator drive into the mixer while keeping to a minimum the amount of signal lost by its coupling with the local oscillator circuitry. A feature of the present design is that this isolation is provided simply by using the iris to undercouple the Gunn oscillator. Apart from simplifying construction compared with other methods of achieving isolation, for example by using a directional coupler, the present method has the important advantage of enabling the loaded Q of the Gunn oscillator to be significantly increased. This means that the stability of the Gunn oscillator is improved, which in turn raises the overall efficiency of the receiver.

Practical details

Two forms of the mixer assembly (which were developed quite independently) are shown in Figs 2(a) and 2(b). Also shown as Fig 2(c) is a recommended design of Gunn oscillator which is the G8APP design [1] with a fixed rather than adjustable rf short. A feature of the design given in Fig 2(a) is that it requires the minimum amount of tools in its fabrication. Points that can be made with respect to its construction are:

(a) First drill a hole about 3/32in diameter centrally through the broad faces of a suitable length of waveguide 16 and open one of the holes to 0·25in diameter.

(b) Remove the brass centre boss from a knob intended to be used with a 0·25in diameter shaft by breaking away the surrounding bakelite. Fit the two flanges in their positions and solder these and the boss in a single operation. The latter may be jigged using a 0·25in drill. Note that the position of the input flange is not critical in any way, but that at the oscillator end it should be within about 1mm of that specified.

(c) Drill and tap the holes for the matching screw. Remove the excess waveguide projecting from the flanges by sawing, filing and finally by grinding on wet silicon carbide paper backed by a sheet of glass. Carefully remove burrs from the inside of the guide, especially where the insulation is to be fitted.

(d) Carefully file away the lip from the mixer diode large

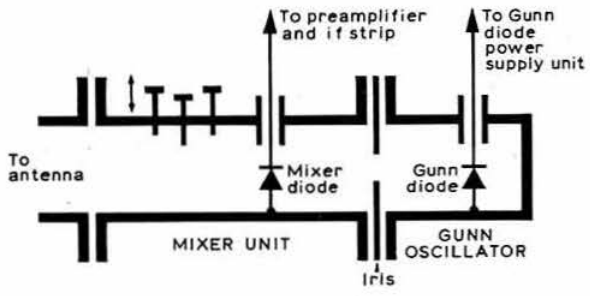


Fig 1. The general arrangement of the receiver

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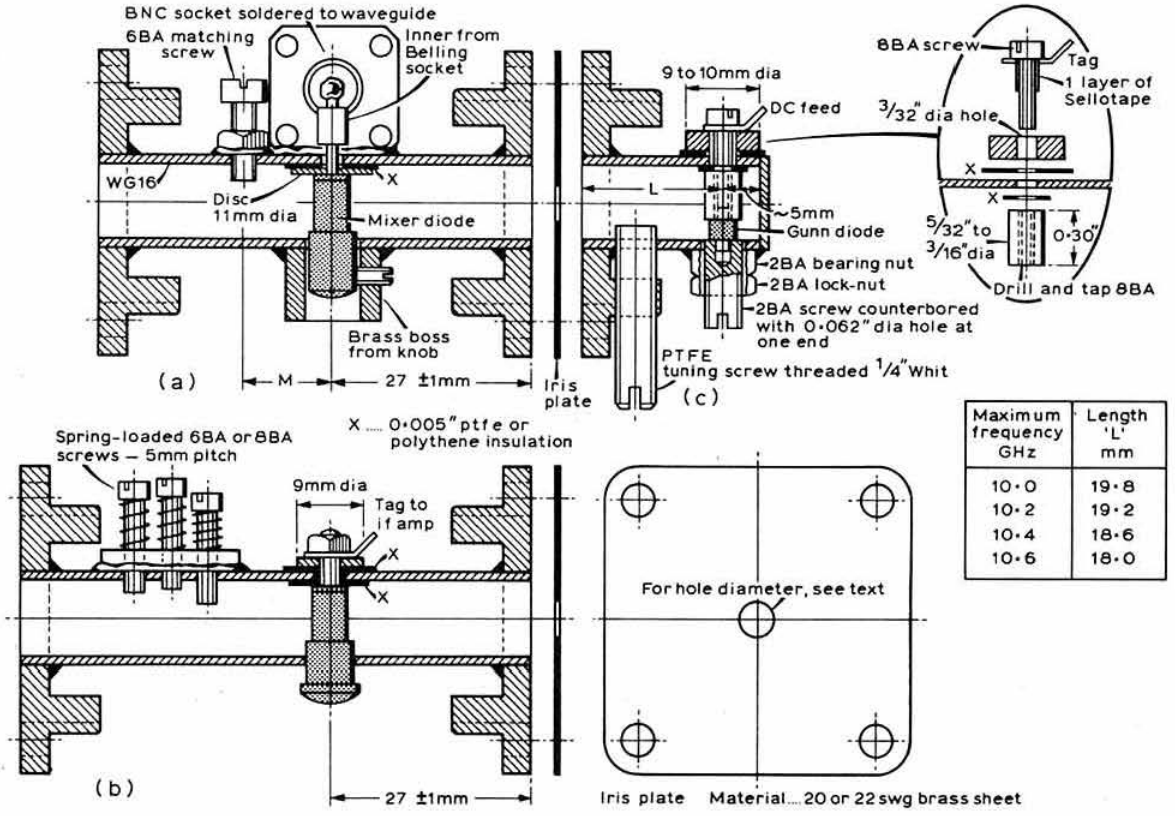

Maximum frequency GHz	Length 'L' mm
10·0	19·8
10·2	19·2
10·4	18·6
10·6	18·0

Fig 2. (a) One form of the mixer assembly (G3WDG). The single matching screw fits in one of two holes tapped close to the centre line of the guide, with the length M 11mm for 10·0–10·1GHz and 10mm for 10·3–10·4GHz. (b) An alternative configuration for the mixer (G3RPE). The position of the matching screws is not critical; they can be placed any convenient distance from the diode. (c) A modified G8APP design of Gunn oscillator

connection (or from the adaptor if the diode is of the reversible type) so that the connection is uniformly 0·25in diameter.

(e) Drill the hole in the capacitor plate so that it is a tight fit on the diode pin. When assembling, press the diode against the wall of the guide before tightening the grub screw.

The construction of the design given in Fig 2(b) is similar, but in this case the diode is bolted to the by-pass capacitor at one end, while the other end is made a tight fit in the wall of the guide. In mixer diodes that are reversible it will be found that one connection pin is solid and, preferably, this is the one that is tapped. The pin is undersized for the 8BA thread specified, so the forces involved in tapping the thread are small: it can be done while holding the diode with the fingers.

The fabrication of the Gunn oscillator should present few problems. Constructional details are given in [1] if these are required. The heatsinking in this design is certainly adequate for the low power diodes which generate up to 20mW and which dissipate about 1W. It is insufficient for high power devices which dissipate about 10W. Note that for many low-power Gunn diodes the connection with the flange should be made negative.

Alignment

The preferred method of aligning the mixer is as follows:

(a) Connect the input of the mixer via a variable attenuator [2] to a suitable rf source, which can conveniently be the local oscillator to be used. Inject rf at *signal* frequency and adjust the matching screws to maximize the mixer current while, at the same time, setting the variable attenuator so that this maximum occurs at the optimum value for the particular mixer diode being used. For point contact diodes, a current of 250–500μA is suitable. The matching screws should then be locked in position. During this operation, the rear end of the mixer cavity should be closed with either the iris to be used or by a blank plate.

(b) With the input connected to a matched load [3], and the Gunn oscillator fitted in its normal position, alter the size of the hole in the iris plate until the diode current is the same as that during *(a)*. Obviously the size of the hole will depend on the output power of the oscillator but will normally be in the range 3–5mm diameter.

In an alternative method used by G3WDG, the receiver is assembled with the antenna and waveguide run which is to be used. For initial tests an iris about 4mm (3/16in) is suggested. The matching screw (in the appropriate hole in

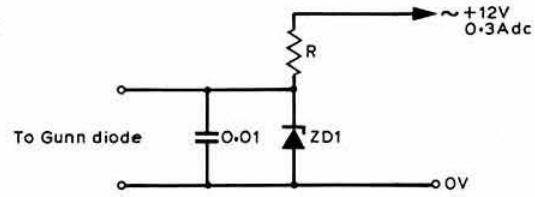

Fig 3. A simple zener diode psu. The working voltage of ZD1 is normally 7-9V, see text

the G3WDG design) is then adjusted to set the mixer current at about 250μA. If the current is greater than this, even when the screw does not penetrate into the guide, then the iris should be reduced in diameter. Conversely, if the mixer current obtained with up to the maximum recommended penetration of 3–4mm is still less than the optimum value, then the size of the iris should be increased. If the size exceeds 6mm, then there is a risk that the stability of the Gunn oscillator might be adversely affected. If the mixer current is still too low, then a fault in construction, a poor mixer diode or a badly-matched antenna should be suspected. The latter can be checked by substituting a large horn (or any other well-matched load) for the antenna in question. If correct operation is obtained, then the matching of the original antenna should be improved using, for example, another set of matching screws fitted to the antenna.

Alternative configurations

The critical dimension of the mixer assembly is the length of the guide between the diode and the iris. This was determined experimentally by fabricating an adjustable iris from 0·02in thick sheet 0·9in wide which was bent into the form of a square "U" with the base 0·4in wide. Using the set-up described under Alignment *(a)*, the position of the iris, the penetration of the matching screws and the insertion loss of the attenuator were adjusted at signal frequency to peak at the optimum current for the mixer diode. It was found that moving the iris away from its best position by up to about 1mm could be compensated for by readjustment of the matching screws. The value given in Fig 2, 27mm, represents a compromise length between 10·0 and 10·5GHz. It is somewhat smaller than the values calculated for $3\lambda_g/4$ at these frequencies, namely 29·8 and 27·4 respectively.

The same procedure is recommended if it were desired to optimize the mixer assembly at another frequency, or to lengthen the cavity by making it $5\lambda_g/4$ or $7\lambda_g/4$ in order to fit a wavemeter.

Other Gunn oscillators which employ an iris at the output flange can be substituted directly. Examples are given in [4].

As noted earlier, some of the local oscillator power is radiated from the antenna port and may be used as a low-power transmitter. By increasing the size of the hole in the iris plate the amount radiated may be increased to make the transmitter more effective, although the reduced Q of the oscillator cavity resulting from this change means that the efficiency of the receiver will be impaired. Despite this, the performance of such equipment should be competitive with that of most other transceiver configurations. The size of the iris should not exceed about 6mm diameter, otherwise the stability of the Gunn oscillator may be seriously affected.

Power supply unit

The simplest practical psu consists of a zener diode stabilized circuit as shown in Fig 3. If, as in this case, the receiver local oscillator is not to be modulated, then the working voltage of the Gunn diode will be close to that which produces maximum power output. This can be checked by operating the oscillator via a variable resistor (eg 47Ω 3W) from a 12V 0·3A dc supply, and using the mixer diode current as a power indicator. A zener diode of the optimum working voltage and 1W rating can then be fitted, and the value of resistor R set so that the zener diode passes 50–100mA with the Gunn diode connected.

It is of advantage to be able to frequency modulate the receiver local oscillator with tone since this enables cw signals to be detected. If there is a chance that the unit will be used as a transceiver, if only as a low-power spare equipment, then it is worthwhile also to build in speech modulating facilities. A recently developed circuit produced by G8AGN/G8CZO is given in Fig 4. A deviation

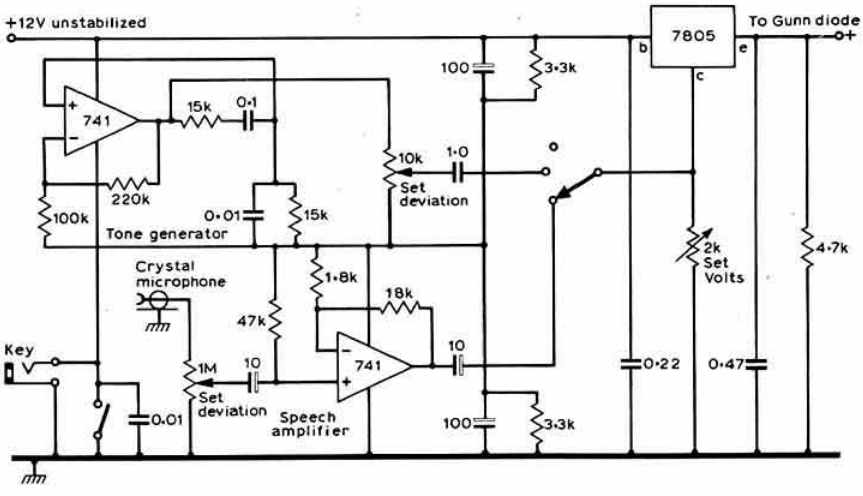

Fig 4. A modulated psu which is due to G8AGN/G8CZO

of about 100kHz is usually employed, this being suitable for standard broadcast fm components.

Receiver preamplifier and i.f. strip

One of the advantages of having a separate receiver is that there is a wide freedom of choice for the i.f. frequency. In fact almost any frequency can be used in principle since its value will be taken into account during the final calibrating process. With single-ended mixers of the type described above, there are advantages in using a relatively high i.f. in the region of 100MHz. A convenient form for this can be a standard fm broadcast receiver, which may have limited afc facilities built in—as well as a tape recorder. Some receivers of this type can tune 150MHz, which is a useful i.f. in that the receiver can be made to tune 10,000–10,100MHz on one channel, and 10,300–10,400MHz on the other. Suitable preamplifiers using either BFY90 or 40673 devices are given in [5].

A useful check on the overall performance of the receiver is to measure the difference in its noise output when the antenna is pointed at the sky or at objects such as the ground. This technique is described briefly in [6].

References

RC = Radio Communication; M = RSGB *VHF/UHF Manual*, 3rd edn.

[1] *RC* February 1976, p123.
[2] *RC* December 1972, p280; also *M*, Fig 8.39.
[3] *RC* November 1972, p741; also *M*, Fig 8.36 and 8.37. Horn antennas normally represent a well-matched load.
[4] *RC* May 1974, p288, Figs 6, 7 and 8. Figs 7 and 8 are also shown as Figs 8.52 and 8.53 in *M*. Also *RC* September 1976, p667, Figs 1 and 2.
[5] *M*, Figs 8.74—8.78.
[6] *RC* July 1977, p541. □

Modifications to the Yaesu FR50B receiver

by E. ELSLEY, G3YUQ*

IN his quest for a simpler approach to amateur radio, the author has exchanged his FRDX400 receiver for an FR50B/FL50B receiver/transmitter combination. These two units perform very well together, using the FR50B vfo to give transceive operation. No modifications to the FL50B transmitter have been found necessary.

The FR50B receiver can, however, be very much improved by a couple of simple modifications, and this article gives details of changes which will improve the selectivity and cross-modulation performance. The author realizes that most amateurs are reluctant to modify their equipment, especially when it may affect its resale value, but these modifications can be removed and the set restored to its original specification very quickly if required.

Selectivity

The FR50B uses a two-stage ceramic filter in the i.f. strip and, while this quite simple arrangement gives good selectivity, it can be further improved by replacing it with a good mechanical filter. The author used a Kokusai MF455 10k unit, obtained secondhand without carrier crystals (not required) for £10. The Kokusai MF455 15k filter is equally suitable and, as its bandwidth is slightly greater than the 10k unit, it could possibly be better, giving a more natural quality to the signal.

Fitting the filter is very simple. First, remove the receiver from the cabinet by removing the four self-tapping screws from under the set; the receiver can then be withdrawn from the back of its cabinet. Locate the filter (see Fig 1) and disconnect the input and output capacitors C28, C29, and the earth from the ceramic filter pcb. Next, remove the two self-tapping screws which secure the board to the chassis, and remove board to expose an oblong hole in the chassis. Drill out to 6BA the

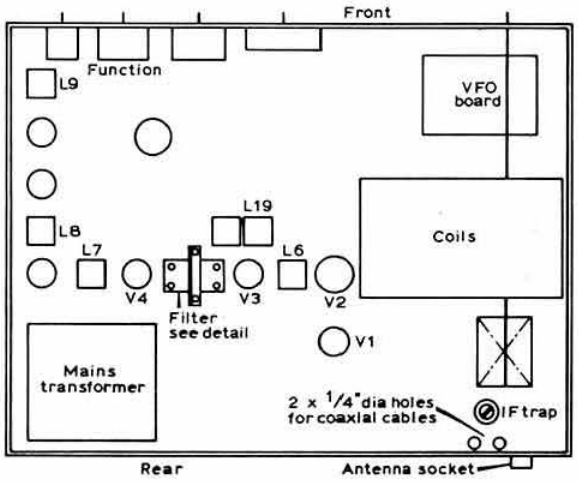

Fig 1. Under-chassis layout of the FR50B

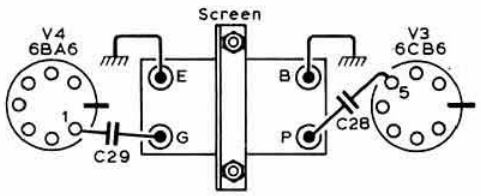

Fig 2. Detail of filter installation

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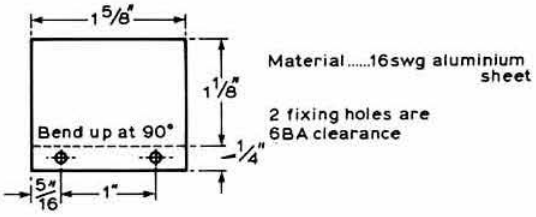

Fig 3. Screen for filter

two holes used for the self-tapping screws, and lower the Kokusai filter through the chassis with terminal P facing V3 and terminal G facing V4, as shown in Fig 2. Place the screen across the bolts (Fig 3) and secure to the chassis with the nuts provided. Connect C28 to terminal P, and C29 to terminal G. Terminals E and B are connected to earth via a short lead. Check that the connections are as shown in Figs 2 and 4; note that the component numbers are as shown in the Yaesu handbook.

Switch on the receiver and allow to warm up. Set function switch to a.m. and bandswitch to 3·5MHz. Switch on the calibrator, adjust the tuning to zero, and zero beat with the calibrator to give a reading. Adjust the cores of L6, L7, L8 and L19 for maximum reading; note that L6, L8 and L19 have cores at top and bottom. Set the bfo pitch to 456·5kHz. Then set the function switch to ssb, and adjust the top core of L9 for clear ssb reception. Seal all adjusted cores with a little candle wax.

The modification is now complete, and on tuning across the band the improvement in selectivity and signal to noise ratio is most noticeable. The bfo pitch control does not require adjustment when changing band but may be set to 453·5kHz to receive the opposite sideband if required. A little adjustment may be necessary as the set warms up, as the bfo on the FR50B does drift a little.

Cross-modulation

The FR50B receiver suffers from cross-modulation, and the author experimented with various attenuators to try to cure the problem. The final circuit used is shown in Fig 5. No originality is claimed for the circuit, which is based on one obtained from *Amateur Radio Techniques* 5th edn, p70, with a modification to switch position 5 on the original circuit.

The front panel of the FR50B has a control marked CH SELECT which is not used, having a dummy control at the rear to hold the knob. This is removed and replaced by a two-pole five-way wafer switch on which the resistors are mounted. Coaxial cable is taken from the antenna socket to the switch, and from the switch to the i.f. trap. To bring

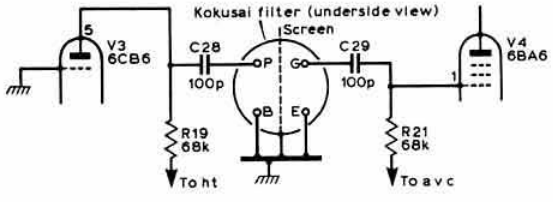

Fig 4. Circuit diagram of connections to Kokusai filter for the FR50B

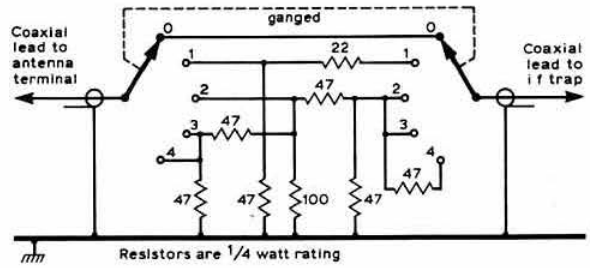

Fig 5. Attenuator for the FR50B

the coaxial cables from the underside of the chassis it is necessary to drill two ¼in holes near the i.f. trap, as shown in Fig 1.

The panel marking can be changed by using the cover plate shown in Fig 6. The plate is made of thin aluminium and finished by brushing across with sand paper. It is then lettered up using Letraset or similar transfers. If using Letraset, the best type to use is Folio Medium 14pt 3·8mm, which almost matches the FR50 lettering. The plate is held in position by the switch fixing nut.

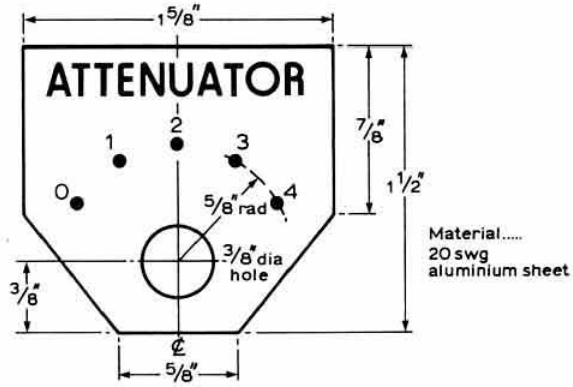

Fig 6. Cover plate for attenuator control

The results of this modification are quite noticeable. In the evenings, on 7MHz, with rf gain at maximum and no attenuation, the band is just noise; reducing the rf gain reduces the noise. However, with full rf gain and maximum attenuation (position 4), signals can be picked out with ease.

Conclusion

These simple modifications have, for quite low cost, changed the performance of the author's FR50B receiver into the de-luxe class, and are well worth the little time spent on them.

As mentioned earlier, the receiver can be restored very quickly to its original state, leaving only two small holes in the chassis.

The author will be pleased to hear from anyone trying out these modifications, and will help with any queries (sae, please). □

An afterburner for the G3TDZ fm black box

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

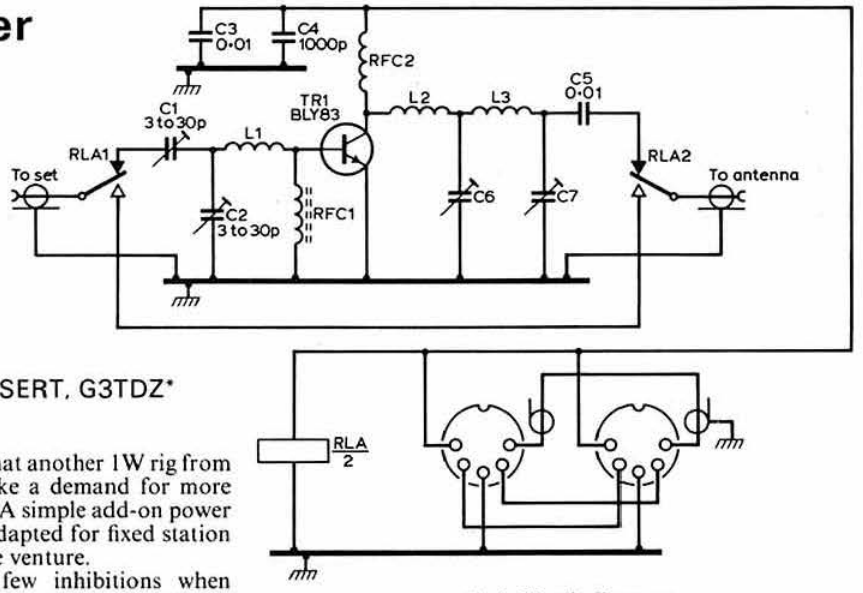

Fig 1. Circuit diagram

IN retrospect it was inevitable that another 1W rig from the 'TDZ stable would provoke a demand for more power by would-be constructors. A simple add-on power amplifier which could easily be adapted for fixed station or mobile use seems a worthwhile venture.

While most amateurs have few inhibitions when throwing together a thermionic amplifier, experimentation with solid-state rf power is met with rather more caution. The single transistor amplifier offered here may be employed as an add-on for a number of different transmitter conditions; Table 1 shows coil winding data and trimmer capacitances under various loading conditions.

The first fact one must face with rf power devices is the gain one might expect. While quoted gains of individual transistors listed in data sheets vary from as low as 4dB to over 10dB, a fair rule of thumb is to think in terms of 6dB, ie a four-fold increase from a single stage.

The circuit of Fig 1 employs a "turnstile" transistor type BLY83. With a 12–13·5V supply, a power of 7W may be realized, and 13W when using a 24–28V supply; the drive level necessary however is 1·35W. One watt from the 'TDZ black box produces just over 4W from a 12V rail.

The rf circuitry is laid out on a single-sided copper laminate, copper side uppermost. All connections are soldered directly to the copper, but the mounting holes may be used for guidance if desired. Oxley type trimmers were fitted in the prototype. A threaded spacer or distance piece screws onto the transistor stud and to the chassis, forming, with the copper surface, an adequate heat sink. For simplicity, a relay is used to couple in the amplifier when on transmit.

Fig 2 shows the pcb layout and component mounting positions. Chassis details are left to individual choice. □

Table 1

Condition	L2	L3	C6	C7
4W, 12V, 50Ω	0·145µH 8 turns	0·135µH 7 turns	24pF	44pF
4W, 12V, 75Ω	0·145µH 8 turns	0·148µH 8 turns	23·6pF	34·5pF
7W, 12V, 50Ω	0·12µH 7 turns	0·125µH 7 turns	20pF	40·65pF
7W, 12V, 75Ω	0·12µH 7 turns	0·145µH 8 turns	19·6pF	31·8pF
13W, 24V, 50Ω	0·165µH 8 turns	0·15µH 8 turns	14·8pF	35·8pF
13W, 24V, 75Ω	0·165µH 8 turns	0·165µH 8 turns	14·4pF	29·2pF

All coils are ¼in id air-spaced, self-supporting, 20swg copper. L1 is ¼in long, and L2, L3 ½in long. (Mounting holes, Fig 2)

*8 Armley Grange Crescent, Leeds LS12 3QL.

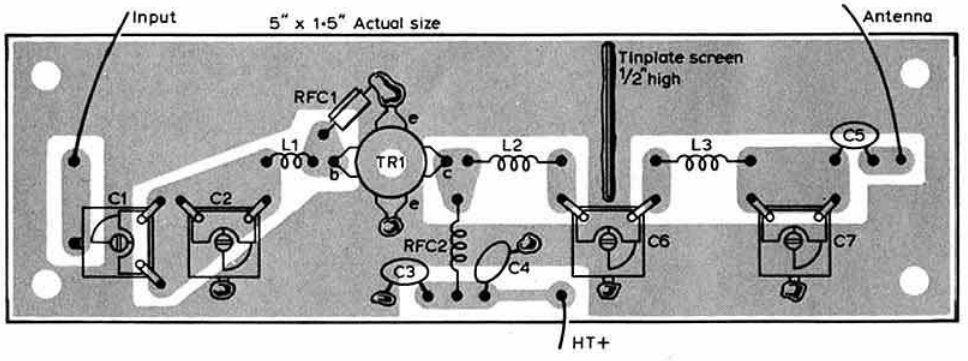

Fig 2. PCB and component layout

The University of Surrey AMSAT telecommand centre

by M. SWEETING, BSc, G3YJO*

FOUR years ago this month UoS-AMSAT was formed to provide a permanent European control station for the amateur satellite Oscar 6. The aim of this short article is to outline the reasons for which the station was established, what it achieved, and its future role with Oscar 8 and beyond.

Problems with Oscar 6

Soon after launch, Oscar 6 exhibited a fault which resulted in random mode changes. Variations in solar array currents, due to the toppling motion or the spacecraft moving in or out of sunlight, induced spikes into adjacent switching logic lines, causing a change of status. The most important of these random mode changes were those resulting in change to the status of the transponder or 435MHz beacon. When scheduled ON, the transponder would suddenly switch itself off with some inconvenience to the users. When scheduled OFF, the transponder would periodically switch itself back on, and, as Oscar 6 did not have a positive power budget, this latter occurrence was potentially dangerous. The 435MHz beacon pa went short-circuit soon after launch and, if this switched itself on, excessive battery discharge resulted.

UoS-AMSAT telecommand

Because of these problems it became of paramount importance to establish a global chain of command stations to ensure that Oscar 6 was maintained in the correct mode at the correct time. To provide European coverage the simplest possible automatic command station was quickly set up at the University of Surrey, using low power, fixed beam headings and pre-recorded command tapes, while work on a more sophisticated, long-term project got under way.

An old Bofors gun mount, modified to carry a 2m dia parabaloid, was acquired from ASWE, cleaned up and placed on top of the tower above the radio room. The tracking mount weighs 3½ tons, and is driven by two 30V, 30A dc motors capable of providing a maximum az/el (azimuth/elevation) slew rate of 60°/s. The original control equipment, using metadyne generators, was far too bulky and extremely noisy, and so was replaced entirely by a solid-state control system. The determination of the transfer characteristic of the mechanism, the design, construction and testing of the prototype power and control electronics was carried out by students and completed in five months.

Antennas for the 144, 432, 1,300 and 137MHz satellite bands were mounted around the dish (which has a 10GHz feed for terrestrial amateur colour tv experiments). A high-power command pa and a digital command encoder were constructed alongside the development of computer programs to provide accurate az/el predictions for every visible orbit. The final program, run on the university's main ICL1905 computer, produced

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Command centre showing (l to r): autocommand logic, az/el control and Oscar 8 command encoder (in panel), and the on-line facility to the ICL 1905 and (on right) the author at the communication equipment controls

Photographs (including front cover) by UoS Audio Visual Aid Unit

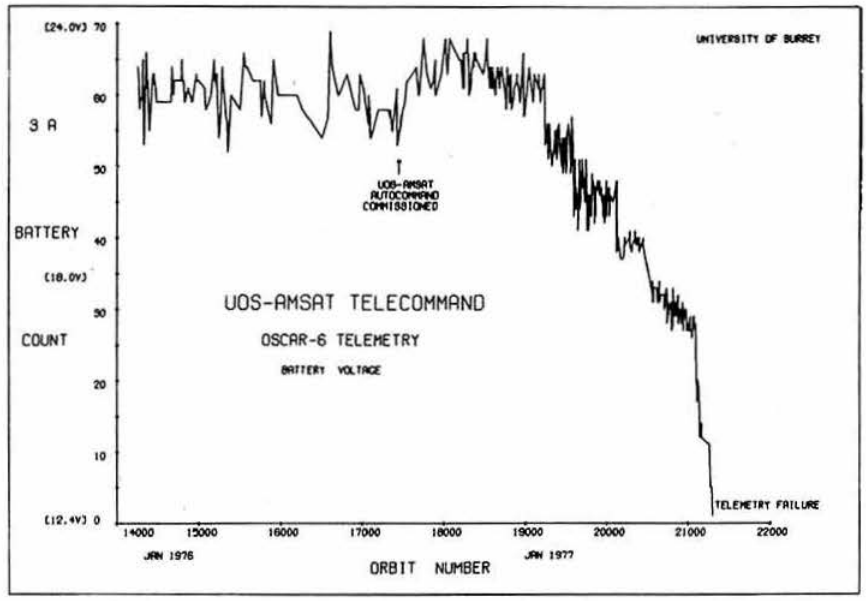

Fig 1. Oscar 6 battery voltage as a function of orbit number during the last 18 months of the satellite's life

data which, when loaded into the autocommand logic on paper tape, switched on the power amplifier to warm up 5min before aos (acquisition of signal); controlled the antennas to track in az and el throughout the orbit; and switched on and off the command transmitter, having selected the appropriate command sequence scheduled for that particular orbit. At los (loss of signal) the station shut itself down and waited for the next orbit. The autocommand data was reloaded every 10 days and, in the meantime, the station required no attention—theoretically. Special test orbits (HG5BME news broadcasts and Oscar 6-Oscar 7 intersatellite links) were all switched automatically.

The full autocommand facility was commissioned in August 1976, and the immediate effect on the battery discharge level can be seen in Fig 1, which shows the on-board nicad battery voltage as a function of orbit number during the last 18 months of the spacecraft's life.

The eventual decline and fall of Oscar 6 is also well demonstrated in Fig 1. In January 1977 the orbit was in almost total sunlight and the nicad battery was getting very hot indeed; further aggravated by I^2R losses in the

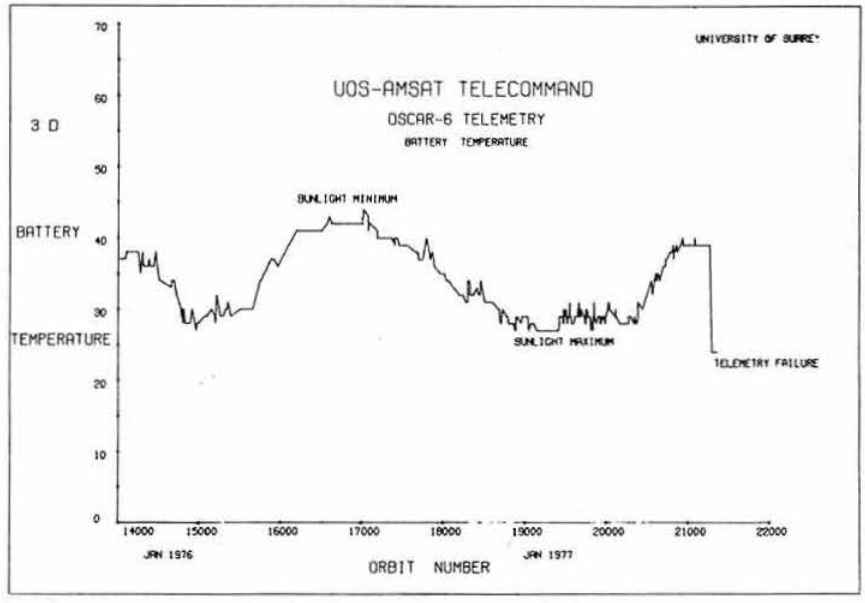

Fig 2. Oscar 6 battery temperature during the same period as Fig 1

battery as the internal resistance of the cells increased with old age. Fig 2 shows the battery temperature during the same period (Note that the higher the telemetry count, the lower the temperature). The excessive battery temperature accelerated the deterioration of the battery as cell after cell failed (short circuit), and the bus voltage dropped accordingly. Even the gradual cooling of the battery in March-April 1977 did not halt the decay. In June the telemetry indicated a dramatic drop in voltage, and then finally became garbled. Two weeks later the transponder fell silent.

Weather satellites

The interval between the demise of Oscar 6 and the launch of Oscar 8 provided a breathing space to update the UoS station and to build up some equipment for the reception of the NOAA-4 and 5 meteorological satellites. Daily cloud-cover pictures were taken until the failure of the NOAA-5 instruments in March 1978. Several spacecraft in the Nimbus and (Russian) Meteor series are also periodically observed.

AMSAT Oscar 8

Oscar 8 was launched from the Western Test Range at Lompoc, California, on 5 March at 1754 and was ejected from the second stage of the Thor-Delta launch vehicle at 1919 over Greenland. The 435·1MHz beacon was heard at UoS for a few seconds after ejection and before the spacecraft dropped below the Arctic horizon. On the following orbits, downlink telemetry and doppler measurements were taken and the command functions checked out. The data, including telemetry from other UK stations, was collated and transmitted from UoS to AMSAT-USA at the Goddard Space Flight Centre via an excellent 28MHz link and later via direct landline.

During the two-week evaluation period, before Oscar 8 was handed over to the ARRL, UoS-AMSAT Telecommand carried out an extensive series of command and communication experiments – the results of the latter showing the transponders to have excellent sensitivities. UoS-AMSAT will now liaise with the ARRL to maintain the operating schedule for Oscar 8, and will continue with telemetry retrieval and analysis as well as command and communication experiments.

In the future

Apart from the surveillance of Oscar 8, UoS-AMSAT is developing an 8080 microprocessor-based autocommand system, designed to replace the somewhat inflexible ICL1905+logic presently employed. The microcommand system should enable more extensive use to be made of the Oscar 7 codestore facility, and should also result in improved command efficiencies for Oscars 7 and 8.

Modifications to the meteorological satellite downlink equipment are under way to enable it to receive transmissions from Tiros-N, due for launch later this year, and also from the geostationary Meteosat.

Preparations for the Phase 3 (elliptical orbit) spacecraft have started, and plans for a space hardware team at UoS are also under discussion with a view to a UK contribution in flight hardware to the AMSAT programme.

Operators (l to r): G8MLO (Kev), G4EDW (Paul), G3YJO (Martin), G8JFX (Tim) and G4CWH (Colin) on the roof of the university with the antenna mounting in the background. Other operators, not shown, are G8NEF and G8NEH

Conclusions

By meticulous control UoS-AMSAT helped to extend the operational life of Oscar 6 by an estimated one year. During that time some seven million commands were transmitted and the station was operational for 24h, seven days a week. Three breakdowns were experienced—two due to fan failure and one due to mains failure, in each case the station was in operation again within 6h.

A comprehensive amateur groundstation facility has been established in the UK as a result of the shortcomings of Oscar 6. Continued work with Oscar 7, Oscar 8 and meteorological spacecraft, in conjunction with the planned flight hardware, not only provides a useful contribution to the AMSAT programme in general, but also a valuable educational and research tool within the UK.

Acknowledgements

In this brief review it has been possible to describe only the barest bones of the University of Surrey AMSAT telecommand centre activities, which would not have been possible but for the very considerable assistance of the university authorities, especially Professor D. R. Chick and members of the Department of Electronic and Electrical Engineering. Many industries and concerns, notably: ASWE, STC, ITT, SMC, Western Electronics, Microwave Modules, Storno, Plessey and others have generously supported its activities. Thanks are also due, not least of all, to the students who devoted an enormous amount of time and effort in building up this facility. □

microwaves

Charles Suckling, G3WDG *

Winchester round table

About 80 people attended the latest microwave round table meeting, which was held at IBA Engineering HQ, Crawley Court. Visitors included DL3ER from Munich, and ZL3TCB/G8OOK. In the morning session G3RPE discussed the preparations which were being made by the Microwave Committee for the Hungary IARU conference and for WARC 1979. G4CNV then outlined the committee's proposals for a new set of microwave operating awards (see below), which were received enthusiastically by the meeting. G3WDG continued the discussion by outlining the rules for the forthcoming microwave contests. The subject of talkback was raised, and from the discussion which followed it soon became clear that most stations would be using 144·33MHz ssb, or 433·2MHz fm; a few even favoured 144MHz fm! In general it seemed that horizontal polarization would be used on 144MHz, and vertical on 432MHz, but that this would not be universal. It was suggested by G3WDG that preferred polarizations, as well as frequencies, be included in the information sheets, so that people would at least know what was in use.

G8AGN then gave a brief report on some work he is doing concerning the prediction of duct formation from available meteorological data. Preliminary results seem to indicate that ducts capable of propagating microwave frequencies are surprisingly common. To test his theories he has analysed a considerable number of duct-assisted contacts, and he has found that the enhanced propagation conditions which made these contacts possible corresponded well with the predictions. In this context G8AGN would like to receive as much information as possible about any tests made above 1GHz (whether successful or not) since 1971, using super-refraction or tropospheric propagation. Further work should show whether his method is likely to prove useful enough in predicting good propagation conditions on a regular basis, and this would obviously be of great interest.

In the afternoon session G3JVL dealt with the practical realization of an efficient flyswatter antenna system. In the basic design a plane or parabolically curved reflector is mounted at an angle of approximately 45° at the top of a mast. A feed dish nearer ground level, where the rf-carrying components are mounted, is arranged to point vertically upwards at the reflector, which reflects the signals in a horizontal direction. The general design of this antenna is described in the August 1977 issue of *Radio Communication*. G3JVL made the following important points concerning the implementation of this system.

(a) The overall design of the antenna is remarkably uncritical. *Any* size of reflector and feed will work, although generally the bigger the better. An hour or so spent on the original design data will give an idea of what is required.

(b) An important advantage of this antenna is that the component mounted at the top of the mast is only a flat sheet. Perforations can be made in the reflector, provided that the diameter of the holes is less than $\lambda/10$, and these will reduce windage at low wind speed. To cope with worse weather, G3JVL's reflector is pivoted just in front of its centre of gravity, so that it will "feather" in high winds. This means that a fairly large reflector can be used with safety. The use of a parabolically curved reflector is not recommended, as the increase in gain possible with this type of reflector is hardly worth the difficulties in its manufacture. The reflector at present used by G3JVL is a perforated flat steel sheet, 31in by 48in, which is stiffened by ribs soldered to it. A coat of paint reduces the rate at which it rusts.

(c) The mast system used to support the antenna must be vertical to within a small fraction of a beamwidth, ie a few degrees at 10GHz. The reflector does not have to be at exactly 45° to the mast if the position of the feed can be adjusted to suit the actual angle.

(d) The antenna would seem to be useful also for portable work from sites where there are local obstructions, especially because there is no feeder cable or waveguide to get mixed up with the guys.

Once again, thanks are due to Don and Anne Hayter for organizing a most enjoyable event.

New microwave operating awards

The current set of microwave operating awards is in the form of certificates issued for a station's first contact beyond 600km on 1·3GHz, 500km on 2·3GHz, 400km on 3·4GHz, 300km on 5·7GHz and 150km on 10 and 24GHz. In order to recognize regular consistent operation, the Microwave Committee has proposed two new awards, a QTH-locator based award and a counties-plus-countries award for each band 1·3–24GHz. Both awards will apply to stations operating portable or from home, although only one site may be used (a site is defined as anywhere within 5km of a fixed point).

The QTH-locator award will be progressive, the lowest category being issued on receipt of proof of contacts with stations in five different large QTH-locator squares, eg ZL, AM etc, and additional stickers will be given when further multiples of five squares have been worked, ie 10, 15, 20 etc.

The counties-plus-countries award will be the same as that currently issued for 1·3GHz, ie 20 UK counties plus 3 countries (including the county and country of operation). Counties will be defined as those existing at the time of introduction of the award. Both types of award will be retrospective, so that existing achievements can be recognized.

It is felt that these awards will represent something for everyone to aim at. The level of difficulty is quite different for the two awards; for example, five QTH squares on 1·3GHz is quite easy, while 20 counties plus three countries will be a considerable achievement on the higher bands, although not impossible given several years of consistent operation using state-of-the-art equipment.

The writer would be very pleased to receive any comments on the above proposals. □

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Visiting the USA as an amateur radio operator

by BILL JOHNSTON, N5KR*

EVERY year millions of visitors come to the USA, and among them are many amateur radio operators who would like to operate their radio equipment while here. Unfortunately, many foreign visitors are confused as to whether they may obtain a permit to operate, and if so, what procedure is to be followed. Since *Radio Communication* is probably the most widely read amateur radio publication outside the USA, this seems to be the appropriate place to explain the simple procedures whereby any foreign amateur may operate his equipment (or that of another amateur) during his visit. The information presented here applies to all W, K and N call areas, including Hawaii, Alaska, Puerto Rico, and most of the Pacific islands under American administration.

First of all, any person, whether he has an amateur licence or not, may visit the station of an American amateur and participate in the activities of the station. The visitor may speak over the microphone, and/or operate the morse key, teleprinter keyboard, or even a television camera. The station licence-holder must be present, however, to operate the radio equipment itself, and it may only be operated in the bands that the class of his personal licence allows. Furthermore, and this is very important, such operation can be carried out only in contact with other USA stations, or with stations in countries which have a third-party agreement with the USA (the visitor is the third party in this case). Although the USA has third-party agreements with most countries in North and South America, outside this hemisphere it has such agreements with only three countries: Israel, Jordan and Liberia. So one can see that such operation is restricted, and not all what the average travelling amateur has in mind.

Obtaining a reciprocal licence

The USA has reciprocal licensing agreements with more than 50 countries (including the UK), and radio amateurs who are citizens of these countries may obtain a permit from the Federal Communications Commission (FCC) by simple application. A complete list of these countries is included in the appendix. With a reciprocal licence, the foreigner has full operating privileges while in the USA, whether it be with his own equipment, borrowed equipment, or while visiting the station of another amateur. The operating privileges are equivalent to the Extra Class licence (the highest USA licence), and one may operate equipment accordingly, and communicate with amateurs in all countries. Obviously, this is a very simple procedure, and is just what the visitor desires.

To be eligible, an amateur must be a citizen of the country that issued his licence, and that country must have a reciprocal agreement with the USA. If an amateur is not a citizen of the country that issued his licence, even if his own country has a reciprocal agreement with the USA, he does not qualify. If an amateur is an American citizen (perhaps through dual citizenship), he may not obtain a reciprocal licence, even if he meets the first requirement. All is not lost, however, since anyone who does not meet the eligibility requirements for a reciprocal licence can still obtain a regular USA licence simply by passing the appropriate examination once he gets to the USA. More will be said about that later. There is only one minor exception with regard to eligibility, and that is a person who is a "foreign government, or a representative thereof", who is not eligible for either a reciprocal licence or a regular USA licence. (No one the author has talked to seems to know just who might be a "foreign government, or a representative thereof", but he is told that "if you are one, you will know it".) If one has any doubts, there is a space on the application forms for comments.

Let us assume that one qualifies for a reciprocal licence to operate in the USA. What must one do to obtain it? First get a copy of the correct form—FCC Form 610-A. Copies are available from the FCC's main office and its various field offices, though a heavy workload may delay the response. If one is in a hurry, it is better to request a copy of the desired form from the ARRL at: International Services Desk, American Radio Relay League, 225 Main Street, Newington, Connecticut 06111, USA. A self-addressed airmail envelope and a couple of IRCs would be appreciated, but this is not mandatory.

Once the form is completed, a photocopy of the applicant's own licence should be attached, and the application sent to the address given on the form at least two months in advance of the visit, but preferably three or four months ahead. The licensing delays at the FCC, caused by the cb boom in the USA, still exist, and it is better to be safe than sorry. There is no fee or charge for the licence.

The application form requires certification that the applicant is familiar with Part 97 of the FCC regulations, a copy of which may be obtained, at a small charge, from the USA Government Printing Office in Washington DC. However, to be quite frank, it will probably arrive after the visit is over. A much better investment is a copy of the *Radio Amateur's Licence Manual* which can be obtained from the ARRL, at the address listed previously, for $3, postpaid by surface mail. It contains a complete copy of the regulations, plus a plain-language explanation of the major points. A complete listing of the American band limits is given, along with a detailed listing of the types of emissions permitted within specific sub-bands. The remainder of the book deals with how to prepare for the exams for a regular USA licence, so those parts will not concern applicants for reciprocal licences.

The reciprocal licence is normally valid for a period of one year, unless one's native licence expires sooner, in which case the reciprocal licence expires at the same time. It may be renewed as often as necessary, but application for renewal should be made at least a couple of months in advance. Aliens who will be living in the USA for an

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extended period are encouraged to obtain a regular USA licence by taking the exams.

Assuming the reciprocal permit has been received, one may begin operating immediately on entry to the USA. Remember, however, that while over here the visitor must abide by the USA regulations, though having full USA privileges. A point to be especially careful about is to remember that American phone sub-bands are somewhat more restrictive than those of most other countries. Having a copy of the ARRL's *Radio Amateur's Licence Manual* on hand will give quick answers to any questions that might arise.

The only way a foreign amateur's operation will differ from that of an American amateur is in the manner of identification. A foreigner's identification consists of his own callsign, followed by the word "portable" or "mobile", as appropriate, followed by the prefix of the USA callsign area from which he is operating. For example, on phone one might say, "G4XYZ portable W4", "XE1XY mobile KL7", etc. On cw or rtty, these would be "G4XYZ/W4" and "XE1XY/KL7", respectively.

There are no restrictions as to the type of mobile operation permitted, and one simply says "mobile" (though one may be more specific if desired), whether in a car, on foot, in an aircraft, in a canoe, or hanging from a parachute (the author does them all). Also, do not forget that in a boat (or plane) on entering international waters one is obviously no longer in the USA, and jurisdiction immediately reverts to one's own country. Incidentally, amateur operation on an aircraft requires advance approval from the captain, which is fairly difficult to secure on a commercial airliner, so most aeronautical mobile operation is done in private aircraft.

Probably about one out of every three American amateurs will say that the use of the letter W as part of the portable identification is unnecessary. This is entirely incorrect. As an example, "XE1XY/2" would signify that XE1XY was operating portable in the second district of *Mexico*, whereas "XE1XY/W2" shows that the portable operation is in the second district of the USA. Consequently, the use of the letter W is required by regulation for reciprocal licensees.

If one visits an American amateur, simply use his callsign while operating his equipment; he does not have to be present if one has a reciprocal licence. However, there is a complication if operating the equipment in a sub-band that the host's own licence does not permit. Remember that with a reciprocal licence one has full privileges, so if the licence of the host is any class other than Extra Class, one's callsign must be added to his. For example, on cw it might be "W5XYZ/G4XYZ/W5". On phone this is usually spoken as "W5XYZ slant G4XYZ portable W5". That is a QSO in itself!

If a foreign amateur is using his own equipment, or equipment borrowed and used away from its home station, he should always use his own callsign. In any case, one is required to give the callsign only at the beginning and end of the QSO, and once every 10min if the QSO lasts longer than that.

The required identification must be made in English, though it may be repeated in another language if desired. The QSO itself may be in any modern language. Also, the foreign amateur operating under a reciprocal licence in the USA must give his approximate location once during each QSO; saying something like, "I'm in Plains, Georgia", or "I'm a few miles east of Apache Junction, Arizona", is perfectly acceptable.

Obtaining a regular USA licence

What happens if one does not qualify for a reciprocal licence? A regular USA licence may still be obtained simply by passing the appropriate exams. In this case one will receive a regular USA callsign and operate just as any other American amateur. Anyone may obtain a licence in this manner, regardless of nationality, even if one's own country does not extend the same courtesy to Americans, and even if one qualifies for a reciprocal licence. There is only one exception, as in the case of the reciprocal licence, one must not be a "representative of a foreign government". At the present time, there is no fee or charge for the licence, and it is valid for five years. It is renewed by simple application.

As the licence being talked about is the standard US licence, this is not the place to discuss it in detail. Suffice it to say that there are several classes of licence which convey greater privileges, obtained by passing exams of greater scope and difficulty. There are 28 cities where the exams are held at least once a week, and 72 additional cities where exams are held two or more times per year—a total of 100 cities where the exams may be taken. If one fails, 30 days must elapse before resitting the exam. If one passes, the licence should arrive within 8 to 12 weeks, and one must wait until it arrives before going on the air.

The ARRL *Radio Amateur's Licence Manual* gives complete details on the privileges conveyed by each class of licence, as well as study material appropriate for the various exams. *73* magazine publishes several excellent books for use as study guides. For more information, see any recent issue of the magazine, or write to the publisher at: 73 Radio Bookshop, Peterborough, New Hampshire 03458, USA.

What equipment to bring?

The author is a firm believer in travelling light—it saves energy, and trouble with customs. If one wants to meet American amateurs, the ideal piece of equipment to carry is a small synthesized 144MHz fm rig: it is estimated that there are more than 4,000 operational repeaters in the USA, and almost every American amateur is active on the band so one cannot go wrong with a 144MHz rig. There is no publication which lists all USA repeaters and their frequencies, but the book *Repeater Atlas* ($1·95 from the 73 Radio Bookshop), and the *ARRL Repeater Directory* (free but you must send 3 IRCs to cover the cost of postage by surface mail) are both good investments. Most repeaters in the USA are "open" repeaters, where visitors are welcome, and are simply keyed by the input carrier, requiring no special tone or code. Do not worry about the relatively few "closed" machines.

If a synthesized rig is not available, a multi-channel hand-held is the next best thing. The only problem is that USA repeaters operate primarily in the 146-148MHz segment, not common to IARU Region 1, so a sizeable expenditure for new crystals would be necessary. In any case, the most common repeater frequencies (low in, high out) are 146·16/·76, ·22/·82, ·28/·88, ·34/·94; the most common fm simplex frequencies are 146·46 and 146·52.

Better than bringing one's own equipment would be to make advance arrangements to borrow a rig from a friend in the USA. Long-time friends on the air should be willing to lend something suitable for a visit.

As far as the hf bands are concerned, the author's personal opinion is that one should leave the hf gear at home and do low-band operating during visits to other stations. At the very least, one would want to carry only a small, light-weight solid-state rig. Remember also that the USA is a very large country, with almost as many amateurs as the rest of the world combined, and dx operating is usually more successful from one's own country.

There are a couple of other vhf bands which might be interesting if one can obtain the loan of suitable equipment. The first of these is 50 to 54MHz, an extremely interesting band inclined to very long distance E-layer openings, which is not available in Region 1. Most activity is on ssb in the lower half of the band, with considerable fm repeater and simplex activity in the upper half. Another band is 220 to 224MHz, which is not available in either Region 1 or Region 3 (or for that matter, even in many parts of Region 2). Most activity on 220MHz is fm (repeater and simplex), and activity is heaviest in the larger cities. This is a band where building antennas is actually fun! The 70MHz band is not available in Region 2.

Summary

Obtaining a reciprocal licence in the USA is a simple matter, and those few who do not qualify can still get a regular USA licence by passing the exams. There is no charge for the licence. A visit to the USA can be much more interesting if a 144MHz fm rig is used, so one can meet American amateurs on thousands of repeaters across the country. Be sure to give the author a call on the way through New Mexico!

Appendix. Countries which have reciprocal licensing agreements with the USA

Antigua, Argentina, Australia, Austria, Bahamas, Barbados, Belgium, Belize, Bermuda, Bolivia, Brazil, British Solomons, British Virgin Islands, Canada, Cayman Islands, Chile, Colombia, Comoro Islands, Costa Rica, Denmark, Dominica, Dominican Republic, Ecuador, Eire, El Salvador, Falkland Islands, Fiji, Finland, France, French Antarctica, French Guiana, French Polynesia, Germany, Gilbraltar, Gilbert and Ellice Islands, Grenada, Guadeloupe, Guatemala, Guyana, Honduras, Hong Kong, India, Indonesia, Israel, Jamaica, Kuwait, Line Islands, Luxembourg, Martinique, Monaco, Montserrat, Netherlands, Netherlands Antilles, New Caledonia, New Hebrides, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Philippines, Portugal, Reunion, St Helena, St Lucia, St Pierre and Miquelon, St Vincent, Seychelles, Sierra Leone, Surinam, Sweden, Switzerland, Trinidad and Tobago, Turks and Caicos, United Kingdom, Uruguay, Venezuela, Wallis and Futuna. (Additional countries are added from time to time. Check a recent *QST* for an up-to-date listing). □

Observing radio satellites

by P. T. GREED, G3MQD*

AN active radio club has been operating since the early 'sixties, under the callsign G3PZV, from The Headlands School, Swindon, but it was not until the late 'sixties that an attempt at monitoring satellite frequencies was made, and this resulted in a group being formed for the sole purpose of radio satellite "observation". The enthusiasm with which the students greeted this new venture was extremely rewarding and there developed keen rivalry between individual sub-groups, each adopting its own satellite, to see which could make the most accurate predictions over greater and greater time intervals.

From small beginnings the group has developed its own methods to determine some of the major orbital parameters upon which to base predictions, and it now carries out three types of observation:

(i) recording the acquisition of signal (aos) and loss of signal (los) of satellite signals;

(ii) the measurement of the doppler shift produced by the satellite's motion;

(iii) decoding the telemetry.

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The receiving equipment used by the group

The group uses an adapted Drake 2B receiver for the hf signals, and precedes it with a converter for the vhf signals. A general purpose dipole is used for most reception, as a highly directional antenna array can be a disadvantage when one is "searching" for satellites.

New students to the group are involved immediately in general monitoring, and a record is kept of all observations under the sub-headings:

Date Frequency Time of aos Time of los Observer/s.

What might at the time seem an insignificant observation may well have extreme significance on later investigation. From these seemingly simple recordings,

A student measuring doppler shift (suppressed-beam method)

the students base their initial predictions—sometimes with awe-inspiring success and at other times with baffling failure. This exercise certainly underlines a factor which some students initially overlook; that of the Earth's rotation! Students thus learn the need to produce accurate predictions if many hours are not to be wasted looking for a satellite which is not going to appear, and at this stage the students are introduced to the theory of satellite orbits.

The apparent change in frequency, known as the doppler shift, is quite noticeable with radio satellites, and the students have made numerous measurements of this effect. To the ear the change in frequency heard in a loudspeaker is easily detectable, but one must bear in mind that the actual percentage change of the apparent signal is very small, about ±0·0015 per cent. From the plot of the observed frequency against time, several determinations can be made; the two most notable being the time of closest approach (tca) and the actual distance between the ground station and the satellite at tca. From Figs 1(a) and 1(b) it can easily be seen that the frequency shift of the 145·972MHz signal is far greater than that for

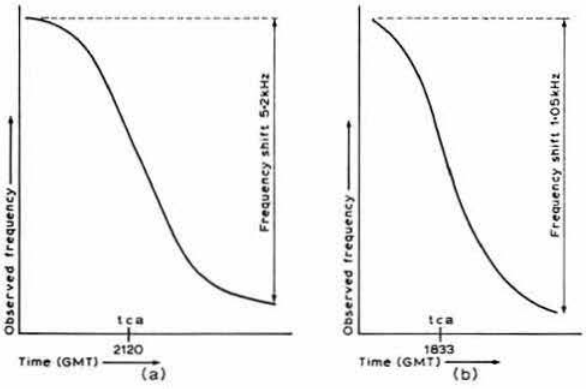


Fig 1. Doppler shift plots for Oscar 7's telemetry beacons. (a) Orbit No 13570—145MHz. (b) Orbit No 13556—29Mhz

the 29·502MHz signal. Fig 1(a) gives the tca as 2120gmt, at which time the satellite was at a distance of 3,074km at an altitude (elevation) of 16·7°.

The Oscar series of satellites which have as their secondary purpose "the aim to have available a real satellite for direct student participation" are extremely useful in aiding teachers and/or lecturers to make satellite study a real and living study, and the issuing by AMSAT of the telemetry decoding calibration equations have enabled students to become intimately involved with the satellites' systems. The hf telemetry signal of Oscar 7, on 29·502MHz, is in cw mode and gives 24 channels of information each consisting of three numerals, the last two being the significant channel information. For example, from orbit number 2041 of Oscar 7, Channel 3A—battery voltage:

significant figures (N) 72;
calibration equation V = 0·1(N) + 6·4 volts,
thus 72 represents a battery voltage of 13·6V.

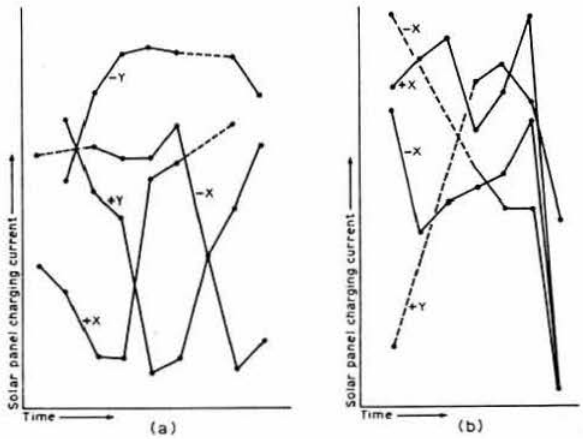


Fig 2. Measurement of solar panel charging current

The time required to send all 24 channels is 80s, and during a nearly-overhead pass it is possible for each satellite system to be sampled 15 or 16 times. So not only can students record the measurements of the satellite's systems, but also the variation in them during one pass from which other information can be deduced. For example, if one knows the positions of the solar panels on the satellite and monitors the variation in the solar panels' charging currents during a pass (Fig 2(a)), the rate and direction of the tumbling of the satellite can be calculated. Similarly the same observations can indicate if and when the satellite enters the earth's shadow (Fig 2(b)).

Students have found the study of satellites most stimulating, and one student has used a Nimbus satellite in his A-level examination investigation to determine a value for the radius of the earth.

The group, which is a member of AMSAT-UK, would be most interested to hear from other schools or educational establishments which carry out similar satellite studies with the possibility of a combined project being arranged. Also, AMSAT-UK would be especially interested to know of those having used or are using the Oscar-series satellites in their studies. □

technical topics

Pat Hawker, G3VA

THIS month the emphasis is on antennas, still the least understood and most mystifying part of an amateur station. Perhaps one day it will all be codified and become just a matter of selecting from the catalogues an installation in which a graduated price scale determines the results likely to be achieved; but that is very far from the current situation! Antennas remain an area where novel ideas still continue to be developed, often at low cost; and where nobody, repeat nobody, can claim to know it all already; or where this year's information is likely to be rendered obsolete by next year's new components. Since the final test of an antenna is not made with a meter but by on-the-air operation, the antenna remains a direct encouragement to all three aspects of amateur radio: self-training, intercommunication and technical investigations. And the same ideas are often directly applicable to hf, vhf and uhf operation. The antenna, then, is a true microcosm of our hobby.

Reducing the size of antennas

For many amateurs who are interested in operation at hf, or even 70MHz, one of the perennial problems is the basic size of the dipole element. It would be so much easier in many locations if a 3·5MHz monopole (ie $\lambda/4$ vertical in which the earth provides the missing half of the dipole) did not need a 66ft element, or if a 14MHz dipole needed only about the same span as one for the 21MHz band.

Over the years, of course, many antennas have been developed that provide the basic requirement of any effective antenna system (ie that it should represent a series-resonant circuit at the operating frequency) with elements physically smaller than a standard $\lambda/2$ dipole or $\lambda/4$ monopole. The use of loading coils, helically wound radiators, tuning and matching units, capacitance hats of various forms etc, are all tried and tested methods of achieving series resonance; then there are such space saving techniques as dropping down the high-voltage ends of dipoles or folding parts of the element in the form of loading stubs etc, including those formed within quad loops. More recently, there has been considerable work, particularly for military communications, on various forms of dielectric loading, including coating the element with a high-permittivity (ferrite) material.

Some 30 years ago, Harold Wheeler wrote a paper "Fundamental limitations of small antennas" (*Proc IRE*, 1947, Vol 35, pp1479–84) which although concerned specifically with receiving antennas still remains one of the classic references on this subject. He wrote, for instance:

"It has occasionally been pointed out that a small antenna free of dissipation could take from a radio wave and deliver to a load *an amount of power independent of the size of the antenna*. This would be true at one frequency if the antenna could be resonated at that frequency without adding dissipation. It results from the fact that a smaller antenna delivers its lesser voltage from a lower resistance such that the available power remains the same."

However, Wheeler also noted: "While the radiation pattern and, hence, the directive gain of a small antenna remain the same for a smaller size, the radiation resistance decreases relative to the other resistance in the coupling circuit. *The resulting reduction in coupling efficiency is one of the principal limitations of the smaller antenna.* Another aspect of the same limitation relates to the frequency bandwidth of operation with fixed values of the circuit element. A smaller antenna with the same reactance and radiation resistance must be more sharply tuned to deliver its available power. Therefore, the *reduction of size imposes a fundamental limitation on the bandwidth.* If the bandwidth so limited is insufficient, further damping must be added at the expense of coupling inefficiency.

"The limitations verify the experience that larger antennas are generally more efficient, especially for wideband operation."

Since 1947 the development of the *active* antenna has shown that for reception it *is* possible to match a short antenna effectively over a wide bandwidth, although this does not mean that a short active antenna erected inside a building (and thus close to sources of electrical interference) should be expected to provide the same signal-to-noise ratios as an antenna out in the clear and having the benefit of height gain. Except at the very lowest powers, however, there has so far been little development of active antennas for amateur transmission.

Two recent articles provide useful surveys of techniques and characteristics of loaded short antennas: "Signal/noise performance of loaded wire antennas" by Dr P. A. Ramsdale (*Proc IEE*, Vol 124, No 10, October 1977, pp840–843) and "Properties of dielectrically loaded antennas" in the same journal (pp837–839). The former covers a number of different forms of loading, including the trap loading commonly used by amateurs and less well-known resistive and travelling-wave loading techniques where the object is to obtain directivity with relatively short antennas (though it is shown that these should include at least a $\lambda/4$ monopole section). This paper also brings out a point that has puzzled amateurs for a number of years: the difficulty of getting a good vertical collinear array simply by using a succession of resonant circuits (LC or stub) to provide 180° phase reversals.

D. L. Smith (*IEEE Trans Ant & Prop* AP-23, 1975 pp20–27) studied such antennas and found that a 180° phase shift was not achieved in this way but discovered that a collinear pattern was set up at *a lower frequency* (about 0·8 times the design frequency). In the equivalent monopole case such an antenna will act as a $0{\cdot}6\lambda$ inductive-loaded element with the load $0{\cdot}2\lambda$ from the end; its gain, however, is slightly less than an unloaded antenna of the same height. This could be the explanation of the problem noted by G6CJ in making the coaxial collinear antenna work (*TT* November, September 1972) although 144MHz versions of this antenna still turn up in the amateur journals from time to time, and an apparently successful large hf array was described in *IEEE Trans Ant & Prop* July 1972, pp513-516.

Doubly-fed coaxial antennas

In *Electronics Letters*, 16 March 1978, Vol 14, No 6, pp178–9) F. Rahman and T. S. M. MacLean of the University of Birmingham describe a new form of dipole antenna which, in its monopole form, is claimed to have useful height reduction properties and which it would seem could also be developed as a vertically-polarized directive array of modest height. In monopole or dipole form it provides a purely resistive feedpoint.

Two different forms have been investigated at Birmingham with self-resonant heights (dipole) of $\lambda/3$ and $\lambda/4$ respectively (ie about $\lambda/6$ and $\lambda/8$ monopole heights). The first type, it is stated, can also be made self-resonant at much lower heights and can then form a directive array.

Basically these antennas are made by using doubly-fed, air-cored coaxial line, folded back on itself so as to allow double feeding: see Figs 1 (a) and (b).

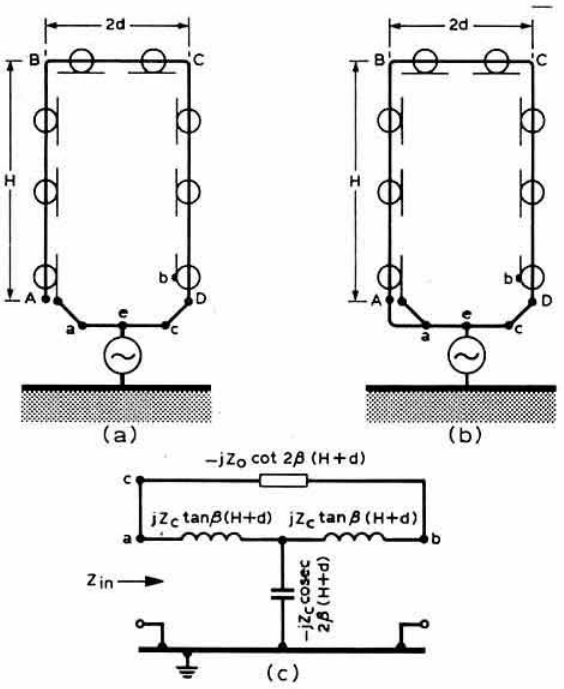


Fig 1. (a) The open-circuited form of doubly-fed coaxial monopole. (b) The short-circuited form that provides rather greater height reduction, even when the two branches are closely spaced, but of rather narrower bandwidth. (c) Equivalent circuit for the mathematically inclined

Operation of the antenna shown in Fig 1 (a) is described roughly as follows:

Let the spacing $2d$ be considered negligible initially, so that the electrical distance between e and the feed-points a and c can be ignored. When the coaxial cable length ABCD is $\lambda/4$, the input impedance between c and earth is equal to the input impedance between the coaxial outer conductor b and earth also. Hence equal voltages are applied to the outer surfaces of both radiating arms. Consequently the current distribution along AB and CD is the same as that along two monopoles connected in parallel, since the current will fall to zero at the midpoint of BC, which has been assumed to be of negligible length.

The input impedance in this case is that of these two $\lambda/8$ monopoles connected in parallel, and is thus capacitive. To eliminate this reactance the length of the coaxial cable ABCD must be increased (it will be assumed without increasing the spacing $2d$). When ABCD is made equal to $\lambda/3$, for example, it can be shown that the antenna behaves as a series rather than a parallel resonant circuit, and thus fulfils the requirement for any useful wire antenna.

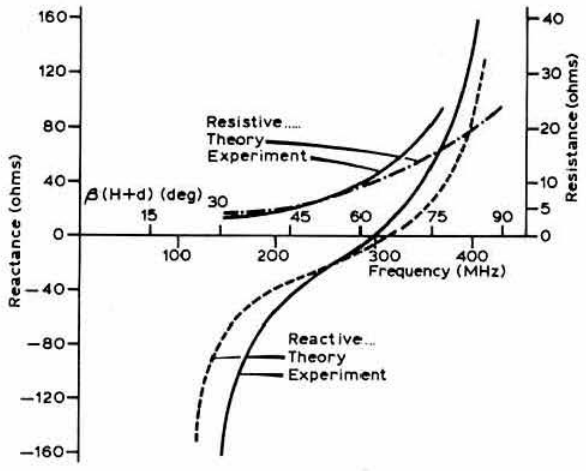


Fig 2. Input impedance of the open-circuited doubly-fed coaxial dipole plotted against frequency. Based on model antenna at 300MHz with dimensions of 2H 14cm and 2d 7cm using 1·6cm diameter coaxial cable. The graph shows both resistive and reactive components of the input impedance, theoretical and measured. The reactive component, of course, is zero at resonance, leaving a purely resistive impedance of over 10Ω

Fig 2 shows measurements made on a model antenna designed for 300MHz. Although the currents in the two monopoles are no longer equal, radiation patterns in both E and H planes were indistinguishable from those of a conventional dipole, it is stated. Further experiments with increasing separation between the vertical arms, but the same height H, gave increased height reduction factors up to over 3 (spacing said to be 27cm) with radiation pattern then showing array type characteristics. Input resistance is approximately that of a single monopole of height H when the spacing $2d$ is small, as indicated in Fig 2. The short-circuited form of this antenna, shown in Fig 1 (b), appears to be rather less attractive as the bandwidth is reduced, although of lower self-resonant height.

Although shown in monopole form, the antenna could, of course, be used in dipole form.

The experimental results would seem to be very promising and yet still leave plenty of scope for further development and evaluation as an antenna for amateur applications by anyone with some suitable spare cable.

G6XN miniature and compact beams

The February 1977 *TT* included the powerful arguments of Les Moxon, G6XN, in favour of further development of effective, lightweight two-element minibeams capable of about 4dB forward gain, achievable over restricted but practical bandwidths. One of the principal tools in achieving such results, G6XN then suggested, was the use of two open-wire feeders, one to each element, to allow fine tuning from within the shack and to permit just 180° rotation. The beam itself was loosely based on a form of "neutralized" VK2ABQ. Now, in a letter written at the end of January, G6XN reports further on this project. He writes:

"This development is going well, with dimensions (for 14MHz) now reduced to 10ft square, using all-metal construction. Vertical rods, each 2ft long, support zig-zag wire loading as roughly indicated in Fig 3. Two open-wire feeders are used and this is proving absolutely essential because the operational bandwidth for a better-than-20dB front-to-back ratio is only 65kHz; for better-than-10dB f:b ratio and less than 1dB drop in gain it is still only about 130–200kHz.

"Before putting this up in the air, in its new form, I have a few more measurements to make, including some experiments with a view to eventual multi-banding. Feasibility of this is already proved, but not the best method."

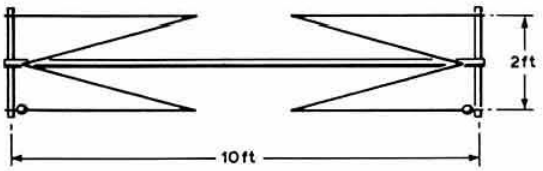


Fig 3. Use of vertical rods to support zig-zag wire loading in the latest version of G6XN's two-element 14MHz minibeam (see also *TT* February 1977)

G6XN has also been working on another form of compact VK2ABQ wire-loaded beam, improved by the addition of a third element, with boom lengths of 11ft, 12ft and 13ft, element lengths of the order of 24ft, and with a performance "indistinguishable from that of big beams" over a restricted range of frequencies. This beam incorporates the "disappearing inductance" form of multi-banding and has already been pretty thoroughly tested at 14MHz; it has also proved itself on 28MHz, even at low height.

All-band trapless vertical

On previous occasions attention has been drawn to an important characteristic of any length of transmission line that is one or more exact electrical half-wavelengths long: the impedance at the far end of the line will be precisely duplicated at the near end, whether or not there are pronounced standing waves along the line. This property can be used, for example, as a means of tuning quad or beam reflector elements from within the shack (*TT* July 1973, *ART*, and also utilized in the G6XN twin feeders). Another application of this appears in *Zero Beat* (the lively monthly publication of the Victoria, BC, shortwave club) in an article by Rick Murphy, VE3FHS, reprinted from *The Canadian Amateur* of unknown date: see Fig 4.

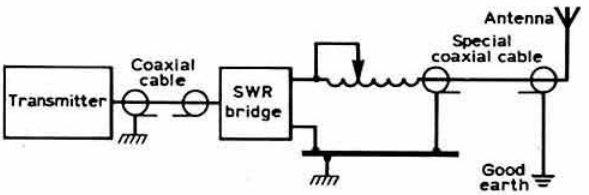


Fig 4. All-band trapless vertical antenna, described by VE3FHS, in which the base impedance of the vertical element is transferred into the shack by means of a length of transmission line that is an exact multiple of an electrical half-wave. The base matching network can thus be adjusted from the operating position

This idea provides a means of matching, within the shack, the base impedance (which may be resistive or reactive) of a fixed-length vertical rod antenna, making it possible to use the element on different bands without any adjustment of matching networks located at the base of the antenna. The resonant length of transmission line simply transfers the base impedance into the shack where it can be matched to the transmitter: for example, by a roller-coaster series-inductor or by other forms of transmatch. Accurate adjustment of this inductor is indicated by means of the swr meter placed between the inductor and the transmitter.

The actual impedance of the resonant transmission line is of no consequence: VE3FHS suggests either 50 or 75Ω coaxial cable, although presumably the losses (due to high swr on this part of the line) would be reduced by using open-wire or 300Ω line. The matching inductor is tuned for minimum swr at the usual operating frequency, and VE3FHS reports that bandwidth for an swr of under about 1·7 is roughly 150kHz on all bands.

The system, it is stated, was tested with a 22ft vertical element working as 5λ/8 on 28MHz, λ/2 on 21MHz, extended λ/4 on 14MHz and as a base-loaded λ/4 on 7 and 3·5MHz. It is claimed to provide a better performance than is usually achieved with the shorter trap-vertical rod antennas. VE3FHS recommends the use of a small loading coil at the base of the antenna to resonate it accurately at the highest frequency band (eg 28MHz), since this enables the shack tuning inductor to be smaller and more easily tuned, with wider bandwidth at all frequencies.

He used (for the cw ends of the bands) a 92ft length of unspecified coaxial cable (presumably having a velocity factor of the order of 0·7) to form an electrical λ/2 at 3·5MHz, λ at 7MHz, 2λ at 14MHz, 3λ at 21MHz and 4λ at 28MHz. To operate on 1·8MHz would require double the length of cable; for use only on 7MHz upwards, 46ft would suffice. Note that the feeder lengths will vary with the velocity factor of the cable. The length is fairly critical (within, say, 1ft) and this can be checked by obtaining unity swr at the required frequency. If the lowest swr dip is at a higher than required frequency, the cable needs lengthening. VE3FHS found 92ft satisfactory for all bands, except 14MHz where he connects in an extra 2ft length. Clearly some experimentation may be required—but then that is what amateur radio is all about.

Franklin encore

As an addition to the earlier comments on Franklin oscillators (*TT* November 1977, April, May 1978), Harry Burton, ZL2APC, has brought to my attention two references to solid-state oscillators of this type: the first, based on jfets, in an article he wrote for *Break-in* in December 1970; and a short note by Carl Drumeller, W5JJ, in *Ham Radio* January 1972, using bipolar transistors.

His own unit (Fig 5) was used as a transfer oscillator to track in on transmitted signals and helped him to win the NZART frequency measuring contests in 1969 and 1971. In his article he noted that the late Geoffrey Gouriett in his published description of the Gouriett-Clapp (or less fairly the Clapp) oscillator in *Wireless Engineer* (April 1950, p105) had commented that for maximum stability of this form of series-tuned Colpitts it is essential to use some form of limiter to confine oscillation to a linear portion of the device characteristic. This is seldom found in practice, except in a few diode-stabilized vfos.

Harry Burton also noted that in the Colpitts, Clapp and Seiler oscillators the decoupling or isolation of the active device from the LC tank circuit is achieved by swamping the capacitive changes caused by age or temperature by the use of large shunt capacitances incorporated as part of the tuned circuit: the magnitude of these swamping capacitances is related to the mutual conductance of the active device, and hence there tend to be practical limits to such an approach, particularly with lower gain devices such as jfets. The Franklin represents an alternative approach, with isolation of the active devices provided by the very loose capacitative coupling.

He listed the potential advantages of the Franklin as:

(1) No taps required in the tuned circuits, either inductive or capacitative.

(2) The simple parallel tuned circuit has no extra capacitors subject to ambient temperature changes and/or heating by circulating rf currents.

(3) It is capable of being used over a wide tuning range.

(4) The two cascaded active devices used to achieve 360° phase change can provide high gain even with low-gain jfets.

The basic tuned circuit is of course subject to temperature/ageing variations, but in a well-made unit this should represent the only significant cause of frequency variation.

In 1970 ZL2APC used two audio-type p-channel jfet devices which had a limit of about 4MHz, but with suitable polarity reversals n-channel fets such as the MPF103, 2N3819 series could be used; today one would also consider the use of dual-gate mosfets. The output is taken from across a 470Ω resistor forming an unbypassed portion of the source resistor of the second amplifier. This is followed by a common-emitter npn bipolar transistor as a buffer stage driving a further p-channel jfet. He considers that a source follower provides better isolation than an emitter follower since bipolar transistors are not really unilateral; hence the use of the fet rather than a second bipolar transistor.

The 2pF coupling capacitors were made from copper tabs mounted on the frame of the tuning capacitor, forming low-drift air-spaced and adjustable units. ZL2APC also noted that vernier-bandspread or remote control could readily be incorporated as indicated, and a similar type of arrangement could also be used to turn it into a voltage-controlled oscillator for use with a huff-and-puff stabilizer or vco frequency-synthesizer arrangement.

Using lamps, leds and neons

There are some components that have been around so long that everybody takes them for granted. These undoubtedly include miniature incandescent lamps, used for pilot and indicator lamps, dial lights, occasionally even for matrix displays. Because they can usually be replaced easily there is not much concern about achieving better reliability—yet most amateurs would agree that such miniature bulbs are among the least reliable of modern components.

An article by Martin Grossman, "Focus on lamps" (*Electronic Design*, 4, 15 February 1978, pp54–63) includes much practical advice on how to keep such lamps burning—and conversely on what makes them fail.

How many of us, I wonder, realize that operating these lamps from dc greatly shortens their lives, compared with the use of a low-impedance ac source?

One reason is that dc is often fed to the lamp through a series resistor or through a semiconductor device. Unfortunately the filament resistance of a lamp increases with age, so that the voltage across any lamp forming part of a resistor chain will gradually increase. Even more deadly is the uneven evaporation of the filament (causing notches)

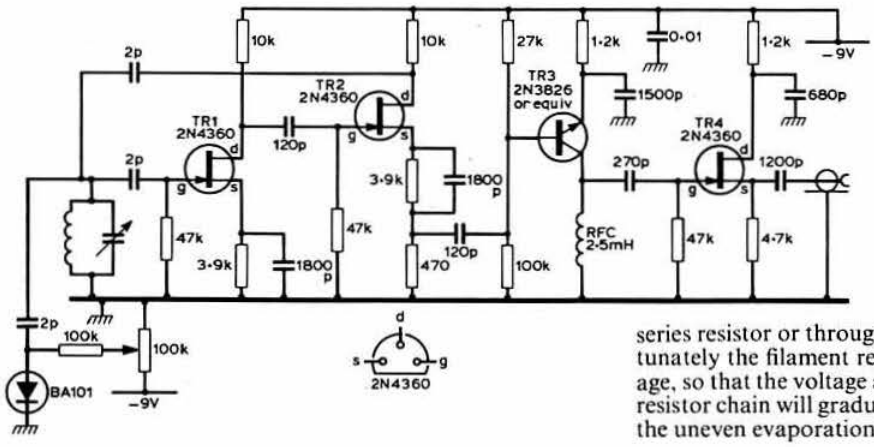


Fig 5. A 1970 Franklin solid-state oscillator used very successfully by ZL2APC, including the untuned buffer/isolator stages. It is shown in the optional voltage controlled form

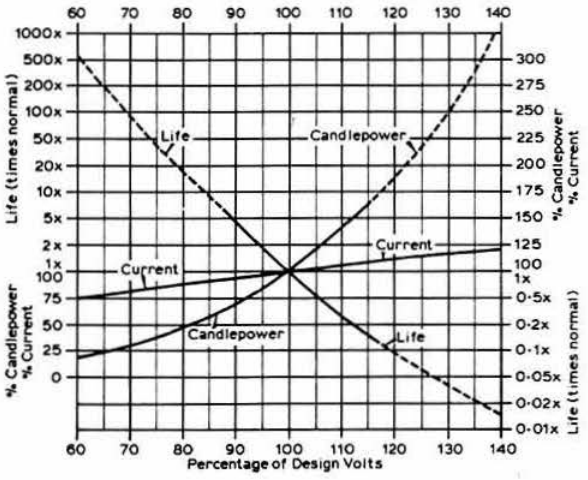


Fig 6. Typical life-expectancy curves for miniature incandescent bulbs

that, for reasons not fully understood, is more serious with dc-operated lamps. It is suggested that ac operated lamps can last from 2 to 10 times as long as those operated from dc.

Lamp life is affected, of course, by supply voltage, roughly in accordance with the type of life curves often supplied by the manufacturers, as shown in Fig 6. It is, however, important to appreciate that makers' life estimates etc are based on the devices being operated in ideal rather than practical conditions. A lamp operating in a flashing mode will normally fail more rapidly, although it has been shown that a flashing light attracts considerably more attention than a steady light. There is also a danger of choosing a flashing time that excites mechanical resonances of the filament. High-voltage lamps have long, finely-coiled filaments with many resonant points, and the adjacent turns may short circuit when a filament vibrates. Switching a lamp on and off at intervals sufficiently long for the filament to cool down will tend to reduce lamp life because of the high inrush current when the cold filament is first switched on. Tungsten filaments, incidentally, are more fragile at room temperature than at operating temperature. Ventilation, usually by encouraging convection of air, keeps bulb temperatures low and will extend the life of the bulb.

In comparison with an incandescent lamp, a light-emitting diode (led), though normally providing less light intensity, can last virtually for ever (a well-made led has a half-life of over 20 years of continuous use!). In effect useful life is determined by the gradual loss of light intensity and so tends to be measured to the point where the intensity has dropped to half its original value. But, of course, it is necessary to pay attention to a number of points if such longevity is to be achieved.

Do not mix leds and lamps in close proximity: the heat from the bulbs can destroy the leds. At high ambient temperatures the light output from a led decreases; continuous running at 80°C or higher accelerates the loss of intensity. At low temperatures (which can crack the bulb of a miniature lamp) a led can be extremely efficient.

A led always needs a series (ballast) resistor to limit current. A led can be operated from ac, but because the reverse breakdown voltage is usually only about 3–6V, it may need a series diode or diode in inverse parallel configuration, in addition to a series resistor.

The light from a led tends to be more directional and the user often needs to be almost directly in front of the device (viewing angle often given as 28°) although some devices are constructed to have wider viewing angles (up to about 65° or even 180° when used with special lenses). A cut-price led may well be a device with lower than rated light output, since such devices are often weeded out during manufacture and disposed of at bargain prices.

Like most semiconductor devices, a led can be damaged by careless soldering; makers often specify a maximum soldering temperature of 260°C for not more than 5s. When attempting to fit a led into an 0·1in matrix printed circuit board, note that not all devices have standard lead spacing.

Miniature neons have a rated life a good deal better than incandescent lamps but only about one-tenth that of a led. They last longer on ac than dc (about twice as long) and should not be exposed to high temperatures. An undesirable characteristic of some neons is a tendency to flicker due to movement of the corona discharge.

Logical break-in

An increasing number of hf cw operators appear to be making effective use of fast, full "break-in" operation (where incoming signals can be heard between letters and words). One hears stations using a quick "r" to eliminate the need for the other operator to send twice the rst, QTH or name, etc—a useful extension to the many other advantages of break-in in providing effective communication.

In *Old Man*, Nr 3, 1978, Emil Zellweger, HB9BAT, and Hans-Ulrich Boksberger, HB9ASX, describe a cmos logic system for "Full-BK (fast) without relays": Fig 7. Well not entirely without relays since two high-voltage reed relays (500V, 3A) are used for antenna changeover between transmitter and receiver, but the logic arrangement is designed so that all operations, including keying, receiver muting and antenna changeover occur in the right timing sequence, as shown in the timing diagram. Fine adjustment of the timing is provided by RV1, although for full details of the system reference may have to be made to the original German text.

High Q and a 4CX250B linear

During 1976 Bill Williams, G8AVX (25 Streetsbrook Road, Shirley, Solihull, West Midlands), described in *Radio Communication* (October 1976) a useful 432MHz plate-line power amplifier, and a number of these have been constructed successfully. However, one constructor found that in AB2 mode the amplifier ran at high dc input and produced much heat but very little rf, apparently due to some form of parasitic oscillation. After correspondence, G8AVX undertook some bench tests of the recalcitrant amplifier, but as a precaution inserted his well-worn 4CX250B instead of the brand-new American one used by the constructor. The amplifier worked fine.

After considerable investigation G8AVX has come to the conclusion that the pa stage is only conditionally

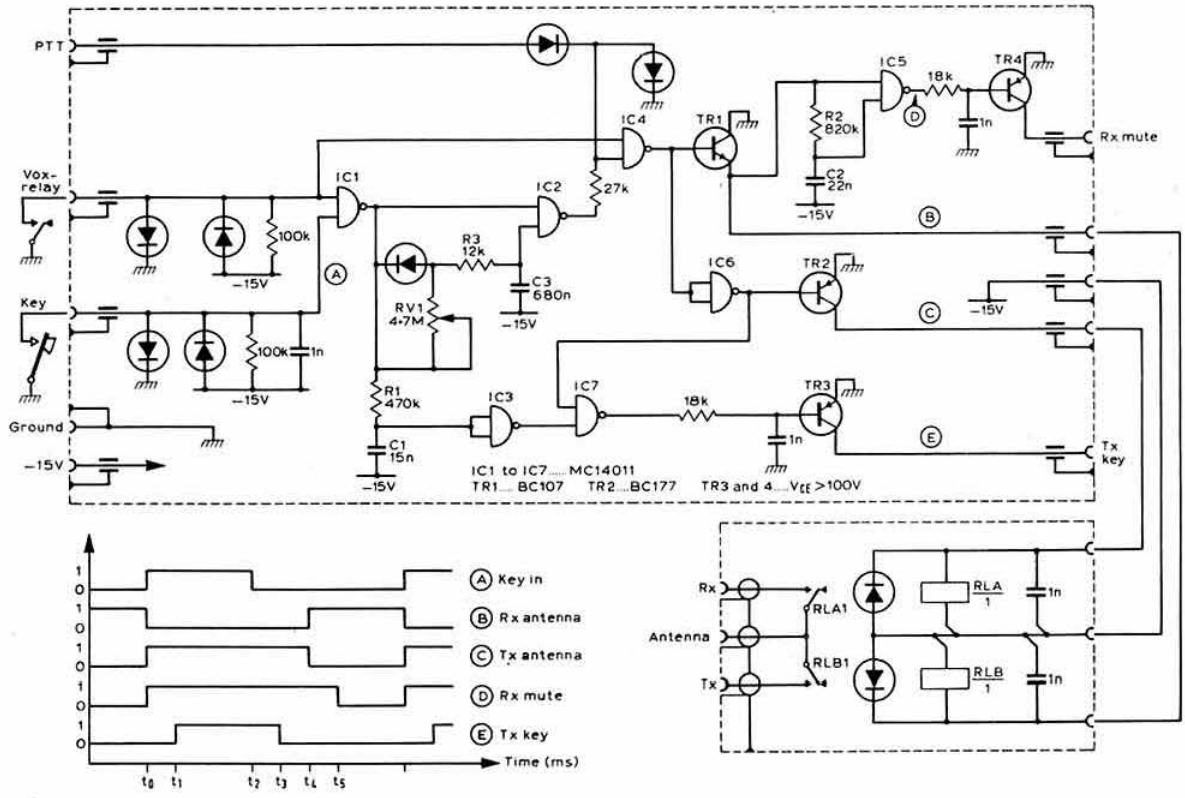


Fig 7. Logic system for fast break-in operation showing timing sequence

stable and, unless correctly neutralized, is inherently liable to oscillation (tptg?) depending upon specific combinations of valve gain, inter-electrode capacitance and tuned-circuit Q. Despite apparently effective "cold" neutralization, it has proved steadfastly impossible to achieve entirely satisfactory neutralization of the higher-gain 4CX250B over all drive levels and with an anode voltage exceeding 1kV.

G8AVX is slowly becoming convinced that this is likely to apply generally to virtually any linear amplifiers using a full specification 4CX250B in high-Q cavities or coaxial lines, although no problems are encountered when the stage is operated Class C. He is therefore wondering if any other readers have encountered and beaten this problem without resorting to such brutal measures as a passive grid arrangement with resultant lower power gain. If not, it looks as though one amateur will have to convert to the use of a grounded-grid triode.

En passant

Polystyrene containers represent a fire hazard. The polystyrene is inflammable and not self-extinguishing and will burn with an orange-yellow flame, developing a dense, black, acrid smoke . . . fire extinguishing devices and prohibition of smoking in areas with such containers is recommended (*ABU Technical Review*, March 1978).

"Research and critical listening tests have indicated that the tone quality of a microphone is ultimately determined by the physical characteristics of the diaphragm material . . . today the best diaphragm is made of thin polyester film which provides more accurate vibrations than fluorocarbon film . . . however, because the electric charge on the surface of thin polyester film discharges rapidly, it could not be used until recently as a diaphragm for electret microphones." (Sony advert for their broadcast radio-microphone system based on a back electret condenser capsule).

Harry Burton, ZL2APC, suggests that the vhf alignment aid described by J. R. Compton, G4COM, in the January 1976 issue of *Radio Communication* (and see also alternative noise source by LA8AK in *TT*, February 1978) is worthy of further publicity. He writes: "It is extremely useful, relatively simple and easy to get going. I modified mine of course (what else!) to use a higher output noise source (BC107 as a zener) with a switched attenuator between the noise source and the output terminal (10dB per step). TR3, 4 and 5 are run at full rail voltage and RV3 is an internal adjustment to make sure the BC107 zeners.

"It may be of interest that, of all the transistors I tried, about the noisiest as a zener was the BC109! The device is very useful on 70cm, and most of the local vhf/uhf gang are enthusiastic. Hewlett Packard seem to make a comparable unit (*HP Journal* February/March 1959 and January 1958) and this still appears in their catalogue as the 340B." □

the month on the air

John Allaway, G3FKM *

THE writing of this month's *MOTA* has been considerably hindered by the writer's absence during a visit to the IARU Region 1 Conference in Hungary. Full details of the proceedings will appear at a later date, but suffice it to say that no change in band plans, or in any other matters affecting those who use the bands below 30MHz, were made. Representatives of over 30 Region 1 societies were present, and the event once again emphasized the vast fund of goodwill and friendship which exists among radio amateurs of all countries—irrespective of national politics.

G4BPX is the recipient of a large number of cards for "GU4BPX"—mostly from the USA, and apologizes to those who have contacted the pirate as he cannot confirm their QSOs.

144MHz fm. G4BPX is the recipient of a large number of cards for "GU4BPX"—mostly from the USA, and apologizes to those who have contacted the pirate as he cannot confirm their QSOs.

DX news

OE5XHM is the callsign of a special station located in Hochburg, Austria, and celebrates the city's 1,100th anniversary. The activity will continue throughout the year and special QSLs will be sent out.

Fred Laun, K3ZO, who has previously operated from LU, HS and HI, was due to arrive in Thailand at the end of May. He will be there for three or four years and hopes to get the callsign HS1ABD. When he gets on the air he will mostly be on 3·5, 7 and 28MHz, and QSLs for him will be dealt with by K3EST (5801 Huntland Rd, Temple Hills, Md, 20031, USA).

BRS33915 has pointed out that WB0MSZ produces a very useful QSL manager directory—it consists of a print-out which is up-dated weekly from information received from all over the world. It costs $1 and may be obtained direct from Gary Yarus, 921 N Clay Ave, Kirkwood, Mo, 63122, USA.

ZL4LR/A, on Campbell Is, has been advising contacts to QSL to ZL3FE—his home callsign. However, as he will be on the island for about six months, an arrangement has now been made whereby a faster QSL service may be obtained via N4NX (see "QTH Corner"). VK2AGT, Lord Howe Is, is reported to be found occasionally on 14,218kHz after 1330. Permission was given to stations in New Zealand to use the whole area 7 to 7·3MHz from 19 March.

GW3CDP reports a dx net which meets at 1700 each Monday, Wednesday and Friday on 21,275kHz. It is controlled by WB8ZJW and HI8GMC, and some of the stations taking part one evening recently included HK0QA, HC8GI, KH6JEB, KL7IYH and C5AAP.

There is now a resident amateur in Tuvalu whose callsign is VR8O. He has been noted around 14,205kHz after 0900. A35NW is a new Tonga call which is held by a New Zealand amateur who will be in the islands for another five months or so.

Peter Reed, G4BVH, returned to Masirah Is on 8 May. He will be there for about three months and hopes to be using his previous A4XVK callsign—mostly on cw—on all bands 7 to 28MHz. Peter will use dipole antennas.

ZD9GG has now closed down, and it seems that there is no amateur with the new group of meteorologists on Marion Is, so that the island will not be heard for a while.

The prefix for stations situated in the Yukon Territory was changed from VE8 to VY1 on 25 April. Northwest Territories stations will continue to use VE8.

YI1BGD has been appearing regularly on or near 14,230kHz and attracting great attention. Unfortunately signals are rather weak and it is hoped that better equipment will soon be available.

VR3AH should now be back on Christmas Is, and his new QSL manager will be WB4PRU. Some logs for Doug's previous operation from the island (when K2BT was his QSL manager) have been lost. Stations in the Solomon Is are due to start using the H4 prefix in July.

Maurice Caplan, VS5MC, is believed to have left Brunei and returned to the UK.

Top band

In spite of the lateness in the year, G3CWI reports contacts with W1ZM (ssb), K2ANR, W8LRL and VE1BCZ, around 0400. He would like to publicise the current popularity of the band in the Midlands for mobile use—especially around 1,910kHz.

Dxpeditions

It is now known that 4Z4TT will be in Niue during the period 26 May to 9 June. He will have two Atlas 210s, plus external vfo, a TH2-Mk3 beam, and dipole antennas for 3·5 and 7MHz. Operating frequencies are listed as: 3,795, 3,895, 7,085, 7,155, 14,195, 14,280, 21,245, 21,355, 28,495 and 28,600kHz. The expedition will only use ssb. QSLs should be sent direct to Baruch at the address in "QTH Corner", and requests should be accompanied by $1 and sae—please do not send ircs (this requirement, if meant to apply to stations outside the USA, appears to be unfortunate).

Jim Smith, P29JS, will be on Cocos Keeling Is from 30 May to 14 June as VK9YS, and will use 14,005–14,010kHz on cw, and 14,195, 21,255 and 28,600kHz on ssb. QSLs should be sent via K4UTE.

3B8DA hopes to visit St Brandon and Rodrigues Is during the year. This may mean that he will be 3B7DA or 3B9DA during June or July. At present he has trouble with his transceiver.

The final QSO count for the FO0X expedition was 29,069! Of these, 21,000 were with N America and 4,000 with Europe; about 800 of the latter were with France. The QSO rate was 187 an hour—a very creditable performance. The departure from Clipperton was rather

*10 Knightlow Road, Birmingham B17 8QB.

dramatic due to rising seas—but reports say that all the equipment was saved, although no attempt was made to remove the antenna towers as there would have been no chance of getting them onto the ship. In the course of moving the equipment, HB9AHL received a head injury. Fortunately the details of 29,069 contacts in the logbooks were safely preserved, and QSLs are expected from the printers early this month.

HC5EE, who operated from Galapagos Is as HD8EE last year, expects to return to the islands this summer—possibly in June.

Jack Leib, HB9TL, will be in Corsica and using his F0CH/FC call from 16 July to 3 August. On cw he will transmit 19kHz above band edges, and on ssb he will be found on 3,778, 7,091, 14,193, 14,275, 21,275 and 28,493kHz. QSLs go to the address in "QTH Corner".

There are rumours of possible activity from the Neutral Zone during June. It may last for two weeks and the operators are likely to be JY3ZH, JY5HH, OE6EEG, 9K2DJ and DJ9ZB.

News from overseas

G2HJT has kindly provided a list of amateurs in the VP8 area which was sent to him by Vic Redsull, VP8PP, who left the Falklands on 10 April. The list of licence holders on 23 March was as follows: VP8AH (Salvador), VP8AI (Roy Cove), VP8BN, DQ and DR (Stanley), VP8GN (Port San Carlos), VP8HY (Stanley), VP8HZ, JB (Saunders Is), VP8JC, JE (Stanley), VP8ML (Teal Inlet), VP8MV (Goose Green), VP8MZ (S Sandwich Is), VP8NE (Goose Green), VP8NJ (Stanley), VP8NL (San Carlos), VP8NO (Stanley), VP8NV (Goose Green), VP8KR (QTH unknown), VP8NY (Teal Inlet), VP8NX (Saunders Is), VP8OD (Stanley), VP8OH (Port Howard), VP8OK (Goose Green), VP8ON, VP8PA (Port Howard), VP8PC (Stanley), VP8PE (Hill Cove), VP8PH (North Arm), VP8PK (Hill Cove), VP8PL (S Georgia), VP8PO (Port Howard), VP8PR (Port San Carlos), VP8PS, VP8PT (Stanley), VP8PU (Chartres), VP8PW, VP8PX and VP8PY (New Is), VP8QB (Salvador), VP8QC, VP8QD and VP8QE (Stanley), VP8QF (Rothera Base, Antarctica), VP8QG (Chartres), VP8QJ (Fox Bay East), and VP8QI (Faraday Is, Antarctica). It is interesting to note that the callsign VP8MZ is issued to the British Antarctic Survey for use in the S Sandwich Is.

Expeditions

Full details of the visit by GM3OLK, GM3YOR, G4DXC, G4DSE, GM8NCM, and possibly G8HDR, to Iceland and the Faeroe Is during the summer have now been released. The group will be in OY from 18 to 21 July, and in TF from 23 July to 5 August. Callsigns will be as follows: (cw) GM3YOR/OY and GM3YOR/TF, (ssb) G4DXC/OY and G4DXC/TF, and (vhf) GM8NCM/OY and GM8NCM/TF. Frequencies to be used are listed as follows: (cw) 3,512, 7,012, 14,012, 21,012, 28,012, 144,012 and 423,012kHz; (ssb) 3,736, 7,072, 14,236, 21,272, 28,536, 144,236 and 423,236kHz. Should permission be obtained for operation on 1·8 or 70MHz, frequencies will be 1,836 and 70,072kHz (cw) and 1,912 and 70,236kHz (ssb). No schedules are being accepted, except for meteor scatter operations, and Alistair, GM8NCM, is working on a programme to incorporate all requests. Meteor scatter operation will be on 144·175MHz. As details of a Danish expedition to OY during the period 28 June to 26 July have been received, and as this group intends to operate on 144, 432 and 1,296MHz, activities from OY will be mostly confined to the hf and lf bands.

Eric Rogers, 9H4G (Formerly G3HGX), has been living in Gozo for seven years

Hull University Radio Society is making a trip to Eire for 10 days during July. Activity will be on all bands 1·8 to 28MHz, cw and ssb, and those looking for a contact on 1·8MHz should listen on 1,820 or 1,825kHz. Transmissions on other bands will be centred around 14,210, 21,290 and 28,590kHz. QSLs should be sent via G4FVP (C. L. Davies, 210 Whitehall Rd, Bensham, Gateshead, Tyne & Wear NE8 4PU) direct or via the bureau.

10m QRP

On 5 January this year, G8LZH, using the station belonging to his father, G4EBZ, worked 14 USA stations with the power from the low output socket of an FT200—around ¼W, and possibly less. Earlier the same day over 200Ws had been worked using full power (there was a contest taking place) and the first QRP call was not intended to be serious until the usual 5 × 9 contest reports came back! The exercise was repeated on 25 March during the WPX Contest, and all USA districts apart from W6 and W7 were contacted between 1500 and 1550. W6s and W7s were heard at good signal strength, but it is thought that the G4EBZ signal was lost in the QRM from the other USA stations. The antenna in use was a home-made three-element Yagi, at 60ft and 20ft above ground respectively on the two occasions.

Contests

The All Asia Contests

1000 17 June to 1600 18 June (cw).
1000 26 August to 1600 27 August (phone).
This contest is between Asia and the rest of the world and there are single-operator, single- and multi-band, and multi-operator (single-transmitter) all-band categories. Exchanges consist of RS/T plus a two-figure number indicating the operator's age (ladies send "00"!).

Each contact counts one point, and the multiplier is the total of different Asian prefixes worked on each band added together. Note that KA stations do not count. Logs should indicate new prefixes worked, and separate sheets should be used for each band. A summary sheet showing the scoring and other information, and signed

QTH CORNER

A35HQ	via VE3EDG, D. R. S. Bush, 105 Shipley St, Thunder Bay, Ont, Canada.
A35MB	via DF2RG, G. Jaeger, Ruhseugstr 6A, 8460 Schwandorf, W Germany.
A35NW	via K8NM, D. E. Heil, 5075 Shepherd Rd, Cincinnati, Ohio, 45223, USA.
A4XFE	Steve Christmas, PO Box 8530, Salalah, Sultanate of Oman.
A7XZZ	W. Hutter, PO Box 3735, Doha, Qatar.
F0CH/FC	J. Laib, Eingangstr 39, CH-8580 Amriswil, Switzerland.
H5AA	Private Bag 2001, Montshiwa, Bophuthatswana, S Africa.
HA9IARU	via HA9KOB, Radio Club, Rakoczi Utca 12, 3530 Miskolc, Hungary.
HH2CG	PO Box 428, Port-au-Prince, Haiti.
HH2CL	PO Box 501, Port-au-Prince, Haiti.
HH2SD	via VE3CVZ, F. E. Wallace, 11 Windham Dr, Willowdale, Ont, M2K 1X7, Canada.
HK0BDG	Box 842, San Andres Is, Colombia.
KM6FC	now via K5OA, R. J. Guldry, RFD 1-Box 63-CR, St Amant, La, 70774, USA.
W6OKJ/KS6	Box 2609, Pago Pago, American Samoa, 96799.
GM3WBZ/LX	via GM3WBZ, D. H. Facer, 21 Don St, Grangemouth, Stirlingshire, FK3 8HD.
K4SQT/SU	2424 Riviera Drive, Vienna, Va, 22180, USA.
VK9YS	via K4UTE, W. R. Hicks, 8201 Cassie Rd, Jacksonville, Fla, 32221, USA.
ZK2AT	via 5W1AT (see below).
ZL4LR/A	via W. T. Barr, 305 Alpine Drive, Roswell, Ga, 30075, USA.
ZL4QL/A	via ZL4AV, L. C. Pickford, Talepa Rd, Otatara, RD 9, Invercargill, New Zealand.
4Z4TT	Baruch Scheinberg, Box 22572, Tel-Aviv, Israel.
5W1AT	M. Maessen, Box 1069, Apia, Western Samoa.
9G1JX	via DL7SI, Ralf Siegel, Backnangerstr 11, 1000 Berlin 28, W Germany.
9M6VW	Labuan Signals Regt, Labuan Is, Sabah, Malaysia.

RSGB QSL Bureau, G3DRN, 30 Bodnant Gardens, London SW20 0UD

declaration that rules and regulations have been observed, should also be enclosed. Logs must reach JARL Contest Committee, PO Box 377, Tokyo Central, Japan, no later than 30 September. Results will be sent to those including an irc and sae.

11th World Festival of Havana

0000 3 June to 2400 4 June; same times 10 and 11 June. Celebrates the 11th World Festival of Youth. Both sections are phone and cw, and exchanges consist of RS/T plus serial QSO number. Likely QRGs to find Cuban stations will be 3,530, 7,030, 7,080, 14,030, 14,180, 21,030, 21,230, 28,030 and 28,600kHz. Note that the special prefixes CL2, CL6, CL8 etc will be in use for the first time.

The Venezuelan Contest

0000 1 July to 2400 2 July (cw).
0000 29 July to 2400 30 July (phone).
This is a world-wide contest and all countries may be worked. It covers all bands 3·5 to 28MHz and has single-operator single- and multi-band, and multi-operator single- and multi-transmitter sections. Exchanges consist of RS/T plus serial QSO number (from 001). QSOs between stations in different countries count two points—with one's own country contacts may only be made for multiplier credit. The multiplier is one for each DXCC country, YV call district, and USA call area worked on each band. Final score is total QSO points multiplied by the sum of the multipliers worked on each band. Certificates will be given to those who contact (1) 10 YVs plus 10 different countries, or (2) to listeners who report hearing 50 complete contacts, including at least 10 YVs (both exchanges must be listed). The usual signed declaration and summary sheet should be included with the log, which should be posted before 15 September (cw section) or 15 October (phone section) to: RCV, PO Box 2285, Caracas 101, Venezuela. A remittance of $2 or its equivalent in ircs is requested from those applying for a certificate. In the 1977 contest (cw section) G3ESF won a plaque as top entry in the single-operator all-band class.

The IARU Radiosport Championship

0000 8 July to 2400 9 July.
A maximum of 36 hours only for single-operator entrants. There are single- and multi-operator single-transmitter categories. The contest covers 1·8 to 28MHz, and the same station may be worked one per band regardless of mode. Contacts via Oscar count as for a separate band. QSOs with own country count one point, with other countries in same continent three points, and with all others five points. The multiplier is the number of different ITU zones contacted on each band added together. Exchanges consist of RS/T plus ITU zone (UK is 27). All entries should be sent to IARU HQ, Box AAA, Newington, Conn, 06111, USA, from where contest forms may be obtained. A supply *may* be available from G3FKM but had not arrived at the time of writing.

In the **1977 SP DX Contest** top UK entrants were (ssb section) **G4CVZ**—10,353, G4EJA—3,360, and G3IRM/M—720 points. On 14MHz **G3VOF** scored 5,400, **GW3SLA** 4,824, and G4ETK 2,142 points. In the **cw section G3ESF** scored 21,816, and **GW4FCG** 3,300 points, and on 14MHz **G6NK** 1,488. In the listener category **BRS35931** (who kindly provided this information) earned a certificate with 2,700 points in the ssb section.

Awards

Worked All Brazil

For confirmed contact with all 22 Brazilian states and the Distrito Federal. A special ribbon will be added if all four territories have been confirmed as well (these are Amapa—PU8, Fernando de Noronha-PY0, Rondonia—PW8, and Roraima—PV8). Minimum reports of readability 3 and tone 5 will be accepted on QSLs. A list of QSLs, certified by a national society awards manager or two licensed amateurs, should be sent (accompanied by 10 ircs) to: LABRE Headquarters, Awards Manager, PO Box 07/0004 Brasilia, DF, Brazil, CEP:70000.

Welcome

Apologies for the omission of this paragraph from the last few months' *MOTA*. It is hoped that such a break will not occur again. Those who joined the Society during March included: CT1RQ, DC0MT, DC5CZ, DF4NU, EI3CT, F1OK, F6DLA, HR3JJR, JI1QFF, ON6UG, SM7CEH, VE3EMU, VE6CIY, VP2LCT and ZS6HV.

Band reports

The past month has been marked by several very disturbed periods—the one around 1 May causing complete disruption of the hf bands. According to the *West Coast DX Bulletin*, Zurich smoothed sunspot figures for the months ahead are June (62), July (65), August (69), and September (73). Conditions on 14MHz have been patchy, but with some periods of very strong signals from ZL. 21MHz has been disappointing, and 28MHz rather erratic—but good at times into the Far East.

Thanks are expressed to the following for supplying the information used in compiling this section: G2HKU,

G5JL, G3KSH, GM3LYY, G3RCA, G4EHQ, G4ETN, BRSs 17567, 31301, 33915 and 38280.

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

3·5MHz. **0000** EA8CQ, 4X4HQ, 9G1JX. **0100** J3AAG. **0300** VP9IR, YV5AK. **0500** VP2LDB. **0700** VP2LLF. **2300** OE5CA/YK.

14MHz. **0600** FO8DT. **0700** CE0AE, KC4USV, *KG6JAR*, VK9NI, VR3AK, ZL4LR/A, 5W1AX. **0800** HC8GI, KH6, KL7, KM6FC, VR8O, YI1BGD. **0900** *JT1KAA, KOAX/DU2*, KC6CV, W6OKJ/KS6, VR4s BF, DJ. **1100** 3D2UP. **1300** WD8OUZ/KH2 (Guam). **1400** WA4YVG/VQ9 (QSL to K4GLA), YI1BGD. **1500** JT1BK, P29JS, 9M6VW, 9N1MM. **1600** FB8ZM, 7Q7LW (? genuine). **1700** EA9FL (Box 354, Melilla), FB8XS, KG6JIU. **1800** FR7BV (BP 75, St Louis), KX6BU, VS5XU. **1900** HM2JN, JT1AN, VE1ACJ/SU (QSL to VE1AIZ), VS6s CZ, HG. **2000** A4XGB (QSL to G4CTQ), *FY7YE*, WA3WAQ/TJ, TR8NWL, ZD7MG. **2100** *SU1MI*, TR8AC2 (QSL to WB4RZN), VP1BB. **2200** HH2s SD, V, 9K2EW. **2300** ZL4LZ, 9M2PV.

21MHz. **0800** *HM2JN*. **0900** *A35MB*, JA, UA0, ZL, 5W1BK. **1000** KL7IXZ, VE1ASJ/SU. **1100** JA, P29JS. **1300** HK0BKW. **1400** WA6OXZ/VQ9, W6s. **1600** HS1WR, KC4AAC, 5H3FW. **1700** S79MC, OE5CA/YK. **1800** A4XGY (QSL to K2RU), C5ABK/A, P29JS, WA4YVG/VQ9, W6s, W7s. **1900** A2CMD, HH2SD, HZ1HZ, KL7IVO, ZD9GG, 5H3KS. **2000** C21AA, HK0QA, S79D. **2100** W7ZGA/KG6. **2200** LU, PY, ZP.

28MHz. **0800** *JA, VK6, VS6CZ*. **0900** *CT2*, J28AG, JA, UL7. **1000** EA9FC, JA, VE1AJL/SU. **1100** AP2P, TR8GDC, VK6. **1200** J28AM, P29NKV, *VK8*, ZD8RG. **1300** CE3IT, J2CIA, VU, YK, 8P6CG. **1400** JY5AR, 3B8CV. **1500** VP8PM, 3D6BE, 5H3BP, 5V7AH. **1600** A2CZV, OK2BFP/D2A, XE1J, 5T5, 7P8. **1700** *JA*, VP8NX, QC, OE6DK/YK, 9M2DW. **1800** *KV4, LU, PY*, VU2KT, *ZS*. **1900** CE, LU, PY, *ZD8*, ZP. **2000** HC, HH8AO, *HI*, W1–W4.

Many thanks to those who wrote in with news items, and also to the authors of the following: the *West Coast DX Bulletin* **(WA6AUD), DX'press (PA0TO)**, *CQ Magazine* **(W1WY)**, the *Ex-G Radio Club Magazine* **(W3HQO)**, *DX News Sheet* **(Geoff Watts)**, and *Long Skip* **(VE1AL/3).**

Please send all items for **August** issue to reach G3FKM no later than **28 June**, and for **September** by **11 August. Please note the very early deadline for the August issue.**

HF propagation study

Predicted hpfs (MHz × 10) for June 1978

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	219	208	242	286	288	290	290	290	308	313	268	225	219
Ascension	169	164	184	174	190	294	299	301	307	336	298	229	169
Bahrain	211	199	242	274	276	277	275	274	291	313	266	223	211
Bangkok	197	197	227	242	248	246	239	239	255	260	244	215	197
Barbados	241	211	176	181	204	251	249	253	255	266	286	289	241
Bermuda	234	196	167	161	183	218	234	234	237	241	253	270	234
Bogota	241	209	173	177	214	228	247	243	249	260	275	282	241
Buenos Aires	216	214	191	164	133	196	280	280	280	299	324	296	216
Cape Town	164	114	105	265	298	300	304	307	319	296	220	205	164
Colombo	195	199	241	266	270	270	267	262	282	249	229	200	195
Cyprus	196	186	220	249	248	258	253	251	268	288	265	228	196
Dakar	239	220	210	232	290	294	299	301	307	336	338	275	239
Denver	202	171	164	145	141	155	177	196	206	200	209	221	202
Fairbanks	181	171	171	181	181	190	187	187	183	183	183	183	181
Falklands	149	134	121	119	112	172	286	286	288	310	310	209	149
Gibraltar	153	138	129	166	185	181	180	181	181	199	204	180	153
Hong Kong	192	196	215	223	233	233	229	227	238	230	220	213	192
Honolulu	181	168	168	171	183	196	192	177	200	202	202	196	181
Iceland	105	100	101	120	154	172	182	180	185	178	163	130	105
Jamaica	233	196	167	172	176	221	234	233	238	244	257	274	233
Lagos	225	218	199	263	295	298	303	307	318	351	305	252	225
Las Palmas	220	199	171	210	255	256	253	252	255	232	294	256	220
Lima	242	202	181	186	201	173	261	261	261	274	298	293	242
Los Angeles	196	168	164	164	145	141	174	196	202	200	213	219	196
Malta	172	161	162	201	216	215	211	213	216	238	235	206	172
Mauritius	176	145	230	288	288	294	294	298	317	332	291	227	176
Mexico	221	183	164	167	171	164	213	215	225	228	237	244	221
Moscow	162	158	181	188	202	202	197	195	195	218	216	195	162
Nairobi	171	176	220	289	293	296	298	301	315	284	219	200	171
New Delhi	200	197	233	249	256	256	249	246	265	268	238	219	200
New York	221	188	162	147	155	194	209	211	216	223	223	239	221
Osaka	187	186	197	202	208	210	214	209	216	214	213	200	187
Perth	202	197	239	265	268	267	256	233	181	174	154	143	202
Rio De Janeiro	246	224	210	177	148	284	286	286	288	309	327	290	246
Salisbury	229	192	178	289	295	301	304	310	321	352	299	266	229
Seychelles	188	190	238	286	289	291	293	294	313	232	188	194	188
Singapore	200	197	233	249	256	256	249	246	252	241	219	187	200
Suva (s)	178	171	181	190	194	196	196	200	176	201	196	187	178
Suva (l)	243	224	199	255	205	183	164	164	158	155	290	275	243
Sydney (s)	192	196	215	223	233	233	209	177	169	158	152	213	192
Sydney (l)	242	218	183	192	210	152	139	136	133	120	177	294	242
Teheran	204	189	241	266	270	270	267	262	282	303	263	230	204
Vancouver	183	164	164	171	177	174	183	187	190	202	202	200	183
Wellington (s)	187	183	187	196	206	206	186	181	149	155	206	194	187
Wellington (l)	246	224	201	191	152	139	133	129	126	114	218	285	246

Bands recommended are those between hpf and half hpf.

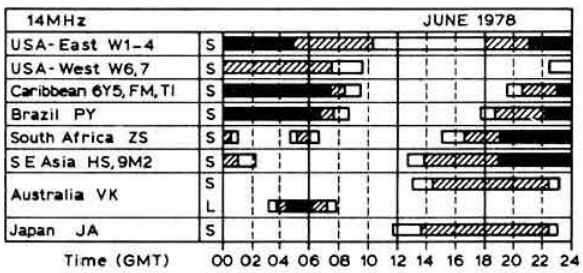
Propagation predictions

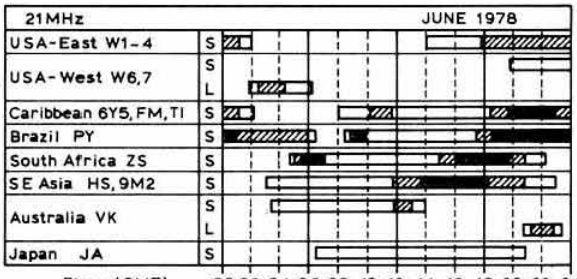
Summer conditions will continue throughout June and into July and August. This means continuing poor dx conditions on the hf bands, especially **28MHz**. On this band even Africa and South America will not be heard with any certainty, but only on days with above average mufs. North America and Japan will only be heard under exceptional circumstances. **21MHz** will also be influenced by poor summertime conditions. North America, Australia and Japan will only be heard on days with above average mufs. Western North America, Japan and Australia will be heard via the indirect path at the times indicated on the chart. Stations in southern Europe will find conditions slightly better than those in the north. A small compensation for the poor dx conditions will be sporadic short skip on 28 and 21MHz over distances of about 500 to 2,000km.

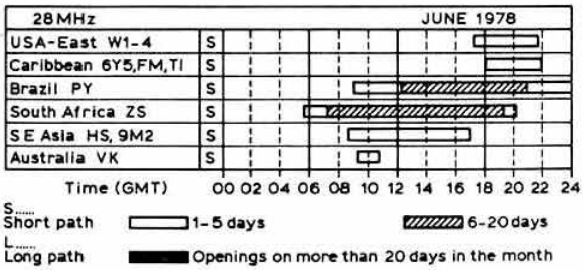
While the F2 mufs fall considerably during the daytime in summer conditions, at night they are much higher than in winter, so that **14MHz** will offer good dx during night time; being open during the latter half of the night to North and South America. The best conditions for South Africa will be between 1900 and 2300gmt.

DX conditions on **7** and **3·5MHz** will be relatively poor during the night, as the nights are short and static is greater on these bands during summer nights. 3·5MHz will not be interrupted by the dead zone in the early hours of the morning.

The provisional sunspot number for March 1978 from the Swiss Federal Observatory was 73·5 with a consistently high daily number throughout the month. On 4 March the number exceeded 100, the first time for many months. The predicted smoothed numbers for July, August and September are 65, 69 and 73 respectively.







4-2-70

Graham Knight, GM8FFX*

Moonbounce

Many stations were active during the April half of the ARRL sponsored International Earth-Moon-Earth Competition with high European activity on both the 144 and 432MHz bands. Peter Blair, G3LTF, at Chelmsford, worked the following stations on 432MHz: F2TU, F9FT, I5MSH, K2UYH, K3NSS, K5JL, SM2AID, SM5BFK and, best of all, JA6CZD in Japan. Peter also heard LX1DB, W6ABN, KH6IHP in Hawaii and XE1RY in Mexico. All Peter's contacts were on cw, with the exception of K3NSS who was also worked on ssb. K3NSS uses an 80ft dish antenna and was the strongest signal received by G3LTF during the 48 hours of the contest.

Dave Price, GW4CQT, at Cwmbran in South Wales, received his special high power licence in time for the contest, enabling him to have a 20min moonbounce QSO with SM7BAE on 144MHz. GW4CQT heard, but did not work, K1WHS, DK1NGA, I4EAT, W6PO and W7FN on 144MHz, and K3NSS on 432MHz. RSGB vhf manager, Ian White, G3SEK, rushed home to Didcot from a committee meeting at headquarters in time to work K1WHS on 144MHz.

Many stations listened during the contest, and Douglas Parker, G4DZU, at Leeds, using a 56-element array, heard SM7BAE, K1WHS and W7FN on 144MHz eme. Peter Bacon, G3ZSS, led a team of licensed listeners who put up a 400ft per leg rhombic antenna especially for the event. Several stations were heard on 144MHz on a Yaesu FT221, and it is hoped that their friendly farmer will allow them to carry out a further eme test during the second half of the contest. Charles Suckling, G3WDG, and Chris Lancaster, G8HDR, made further improvements to the receive set-up at the Oxford University station, enabling them to copy eme signals from several stations on 432MHz, including G3LTF.

K1WHS, one of the outstanding signals on 144MHz moonbounce, uses a 4CX350 to drive a single Eimac 8877 in the final 1kW pa stage. The antenna is a 160-element collinear array, and K1WHS recommends running outside every 20min, even in 0°F weather, to adjust the elevation—he says it is a good way of keeping awake for late night skeds.

Sideband repeater proposal

Details of the GB3SF, Sheffield University, sideband repeater proposal were printed at the request of the VHF Committee in the March *4 – 2 – 70*. Since then more than 150 letters and telephone calls have been received about this proposal. It has also been discussed at the recent Repeater Working Group open meeting and the "Advanced Repeater" lecture at the RSGB VHF Convention. Further publicity has also been given to the proposal in various club and repeater group newsletters and in *Short Wave Magazine*, yet despite this blanket coverage, no one has written in to support the proposer's idea.

The most interesting letter came from Ray Wells, G3RIN, of the Philips Laboratories at Croydon. Apparently Philips have been working on a single sideband system for commercial users for some time. In fact Mr Wells is to present a paper on the Philips system at the July Radio Receivers and Associated Systems Conference at Southampton. This event is being organized in conjunction with the RSGB (see "QTC" last month).

Taking into account the fact that commercial companies have already done a great deal of work in designing and developing a working mobile ssb repeater system, and the views expressed by the membership, the VHF Committee has decided to reject the GB3SF proposals.

SideWinders On Two—SWOT

Ken Martin, W5ARR, of Fort Worth, Texas, recently paid a visit to RSGB headquarters and left behind a large pile of information sheets about SWOT, an association made up entirely of sideband and cw operators. The purpose of the group is to promote the use of ssb and other modes, with the exception of fm and repeaters.

During a recent contact with GM8FFX, Ken Martin described how it was decided to form a group to help protect the dx sectors of the 144MHz band from being taken over by "closed" repeaters. Since the FCC deregulated the rules governing repeaters in the USA, many "private" repeaters have started up on frequencies formerly used by stations chasing dx on ssb and cw.

SWOT was formed in March 1976 and now has 1,200 members, most of whom operate around the dx calling frequency of 145·100MHz. The group publishes a monthly bulletin with dx operating news and articles on Es and auroral propagation. They also gave publicity to the RSGB *VHF/UHF Manual*, quoting from it in a section on antenna polarization. George Jessop, G6JP, will be pleased to know that his views on horizontal versus vertical are heartily endorsed in the SWOT bulletins. SWOT will be keeping *4 – 2 – 70* informed of American dx happenings, and hopes to stimulate further Europe to America moonbounce contacts by printing *4 – 2 – 70* information in America. An exchange of the dates of auroral and Es openings is also planned.

Although SWOT sounds like a new kind of pest control—with some amateurs promoting the idea of letting a citizen's band loose on the amateur vhf bands, maybe we need a SWIPE organization over here in Europe.

Auroral reports

There were 42 auroral events in the first 118 days of 1978, thus keeping up the previously-mentioned average of an aurora every three days since the end of August. The most recent events took place on 1, 2, 8, 9, 16, 17, 18, 26, and 27 March and on 3, 4, 5, 10, 11, 12, 13, 14, 19, 23, 24 and 25 April.

By far the most outstanding event took place on the night of 10–11 April. Richard Diamond, GM4CVI, operating from the GM8FFX QTH near Aberdeen, stayed exclusively on cw throughout the event and worked a total of 41 stations on 144MHz. The dx worked by GM4CVI included three stations in Poland and five

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stations in Finland, significantly GW4CQT was the only British station worked via the aurora.

GM4COK in Edinburgh had just taken delivery of a new NAG144 linear a few hours before the big event started. Best dx for George was OH5LK in QTH locator square NU37g, a distance of 1,836km. Other stations worked included SP5JC in KM56f and DL7QY in Berlin (GM47b). GM4COK noticed two separate signals from G3KJY, both via the aurora but separated by more than 1kHz.

Hugh Irvine, GI3TLT, in Bangor, County Down (XO22e), worked 14 stations in the same event, including LA3WU (CU47d), DJ9BV (EN40c), PA0CSL (CM63d), SM4FXR (HT57g), SM0FFS (JT51f) and, best of all, OH1FA in QTH locator square LU42h. Hugh also worked G3SPJ in London who was 5/5a on 70·200MHz ssb. In fact there has been considerable activity on 70MHz during the recent auroral events. GM3ZBE near Aberdeen, GM3YOR in Glenrothes, GI3RXV, G3TYE in Liverpool and G3SPJ in London have all been active during several April auroral openings. Signals on 70MHz are generally noticed before 144MHz goes auroral, and contacts on this band are often possible for about 30min after the aurora has faded on 144MHz.

Peter Haylett, G3IPV, at Norwich, always seems to catch most of the auroral openings, and his persistence in monitoring 144·050MHz has been rewarded with recent cw contacts with GM3JIJ (WS59a), LA3WU, SM4DHN/4 (GU79j), SM5BEI (JU72c), SM6GFS (GR11j), SM6ESE (GS23g) and SM0BYC in locator square IT70b.

The Propagation Studies Committee is always interested to receive reports of auroral contacts, particularly when the beam headings at both ends of the QSO have been recorded. The 4 April event started at GM8FFX at 1648gmt with GB3LER peaking 5/5a on a 10° beam heading.

In the following report the beam heading used by the dx station is given in brackets. Stations worked included: at 1720gmt, GM8LHE 10° (10°); 1750, GW8FKB 30° (40°); 1800, G8BHH 50° (40°); 1810, LA8UU 30° (20°); 1816, G4BWG 50° (20°); 1819, G8GXP 50° (355°); 1821, SM4AIQ 50° (315°); 1829, SM4ATA 45° (305°); 2106, OZ9SW 50° (30°); 2152, GM8AZS 45° (30°). Reports of this type are most useful for the committee, and Charles Newton, G2FKZ, of 61 Merriman Road, London SE3 8SB, can supply the special Propagation Studies Committee Report Forms on receipt of an sae.

The BBC reported a flare of hydrogen gas hundreds of thousands of miles long which shot out of the sun at 1540gmt on the afternoon of Tuesday 11 April, causing the worst short wave fade out for a considerable number of years. This major solar eruption had little effect on the strength of the auroras on 12, 13 and 14 April; all these events were weak. A call from the British Astronomical Association on 13 April reported a visual aurora sighting at 2100gmt. GM4CVI immediately checked the GB3LER beacon (144·965MHz) and SK4MPI, the Swedish beacon (144·960MHz), for signs of a radio aurora, but no signals were heard at Aberdeen. However, a call on cw produced weak contacts with LA and SM, but these were short-lived, lasting for only 20min. It is most interesting to note that for the second time this year auroral contacts have been possible even when the usual auroral beacons cannot be heard. The beam heading for these contacts was 5°, suggesting an auroral curtain well to the north of Aberdeen.

Eric Ludwig, F9LT, writes from Les Clayes-sous-Bois, France, to request a copy of all the auroral events recorded by RSGB observers since last August. F9LT has been taking note of the Geoalert transmissions made by FTA91 on 91·75kHz since that date, and offers to study the correlation between the geomagnetic/flare data and the RSGB auroral reports. F9LT has also been in touch with the Meudon Observatory and is investigating the possibility of making the FTA data more readily available to amateurs. The present transmission can be received in some parts of the UK on a suitable low frequency receiver but there are no transmissions at weekends. A review of all the auroral events has been sent to F9LT and we await his next report with interest.

Lars Ericson, SM0CPA, in Bromme, Sweden, is particularly interested in 432MHz auroral openings. He reports that the following stations had 432MHz auroral contacts during last year: LA9DL, OH3TH, OH3XU, OH4OB, SM2AID, SM2CKR, SM3AKW, SM3HZV, SM4DHN, SM4FXH, SK6AB, SM7BAE, SM0CPA, SM0DFP, SM0FFS, SP5JC, UR2RD and UP2BBC. Lars notices that weak 144MHz auroras are often strong on 432MHz, and vice versa. Doppler shifts of up to 3kHz have been noted, and the stronger the event the greater the doppler shift. Lars runs 150W to a 96-element beam and would be pleased if UK stations could listen for SM stations on 432·050MHz during the next auroral openings. In the UK, GM3ZBE has worked G3LQR and DK1KO via 432MHz aurora. Have any other contacts been made on this band?

Transequatorial success on 144MHz

The transequatorial tests to South Africa (TESSA) have borne success, with ZE2JV working to both Cyprus and Greece on 144MHz. Ray Cracknell, ZE2JV, worked 5B4WR, over a distance of 5,978km, between 1800 and 1810gmt on Monday 10 April. 5B4WR heard ZE2JV at RST 227, and ZE2JV heard 5B4WR at RST 219F (F = doppler flutter). 5B4WR was also heard at the same time by ZE2JE at RST 529—12dB over the noise.

On Wednesday 12 April ZE2JV worked SV1AB between 1756 and 1806gmt over a distance of 6,275km. SV1AB heard ZE2JV at RST 529 and ZE2JV heard SV1AB at RST 219F. The doppler flutter reported by ZE2JV caused variations of frequency of up to 10kHz and affected the readability of signals to a considerable extent. Martin Harrison, G3USF, of Keele University and a member of the RSGB Propagation Studies Committee, comments that this doppler flutter must have been caused by "something moving pretty fast somewhere".

ZE2JV also has a beacon on 144·118MHz, and this was heard by 5B4BW on 9 April between 1726 and 1810gmt. On the same day ZS3AK copied the Lannion 50MHz beacon between noon and 1250gmt at strengths exceeding S9. SV1DH in Athens heard ZE2JV at midday on 17 April. In fact, during the period 8 to 20 April at least one station heard transequatorial signals on each day. No te· signals were heard by ZE2JV or 5B4WR on 21 and 22 April, dates on which there were no auroral reports. There were, of course, auroral openings on the two days on which the te contacts occurred.

4 – 2 – 70 has also been in touch with Dennis Heightman, G6DH, another te specialist from way back in 1947. Dennis, who discovered solar noise pre-war, congratulates 5B4WR and ZE2JV on their achievements over the last 21 years—their 144MHz success is the culmination of daily study and observation. G6DH is very interested in the doppler shift noticed on the recent 144MHz contacts. Dennis had historic contacts with ZS1P and ZS1T more than 30 years ago, using 100W input of cw and a.m. on the old 50MHz band, but he never noticed doppler shift on te signals. He hopes to be back on vhf soon and will certainly be there if we get 50MHz back again.

This intriguing doppler effect will obviously be the subject of further investigations, and details of this phenomenon have been sent to Edgar Mueller, YV5ZZ, who has had more than 40 transequatorial contacts in the last six months. More te information will be given in next month's *4 – 2 – 70*.

Expeditions

The expedition season is almost upon us and many readers have telephoned and written with details of proposed trips to far away places and rare QTH locator squares. An expedition to St Kilda in VR square was recently announced on GB2RS as being due to start at midnight on 31 March and ending at noon on the following day. This was an April Fool prank by a station not a million miles from Purley. It is hoped that the following details are accurate but please do not blame GM8FFX if you do not work Iceland, the Faeroes and Andorra. All the stations listed below are known to be reliable and should make the expeditions detailed.

Andorra: PE0MOT will be active on 144·225MHz from 15 July until 5 August. Skeds can be arranged by telephoning 050137490 or, by arrangement during the expedition, on Oscars 7 or 8. A separate expedition to Andorra by ON5UN, ON6UG and ON1DV starts on 5 August and lasts until 13 August. The callsign C31OX will be used and skeds can be arranged by contacting Seyssens Erwin, 10 J. F. Willems Straat, B-9000 Ghent, Belgium. G8NRP of 12 Conduit Road, Abingdon, Oxfordshire, will be in France and Andorra from the end of June and is on the lookout for meteor scatter skeds.

Eire: The Cambridge University group will be in Eire from 23 July until 6 August. Contact G6UW, QTHR. Hull University group is planning a summer expedition to Eire, and operators G3PQY, G8OMQ, G8MXH, G8JQD, G8KIJ and G4FVP have applied for two EI callsigns. High power will be used on all three vhf bands, and meteor scatter skeds are sought by the group, which can be contacted at 210 Whitehall Road, Bensham, Gateshead, Tyne and Wear NE8 4PU. The Edinburgh and District ARC also plans an expedition to Eire in July and can be contacted via GM8MJV, QTHR.

XL square: Tony Bettley, G8KWC, and xyl Glenys, G8KWD, will be holidaying in Pembroke from 18 June until 1 July, making QTH square XL obtainable.

Shetlands: G8NOF, G8MME and PE1AVU will be operational from the Shetland Islands on both 144MHz and 432MHz with high power and large antennas. For skeds write to G8MME, 3 Willow Close, Lymm, Cheshire.

REAL DX 1978

70MHz aurora	G3SPJ-GI3RXV	570km
70MHz tropo	GM3WOJ-GU3HFN	590km
144MHz tropo	GM8MBP-DF5GX/P	1,300km
144MHz aurora	G3ZIG-UR2RQT	1,800km
144MHz ms	GM8NCM-SM3BIU	1,340km
144MHz te	LU5DJZ-KP4EOR	6,120km
144MHz eme	G3SEK-K1WHS	4,100km
432MHz tropo	VK6KZ-VK3ZBJ	2,460km
432MHz eme	G3LTF-JA6CZD	13,600km

Faeroes: OZ7IS, OZ3TZ and six others will be in OY between 20 June and 26 July. Full details are in the May *4 – 2 – 70*. The Glenrothes group will also be in the Faeroes before going on to Iceland, but this expedition is already fully booked for meteor scatter skeds, including one from TF to America. Further details from GM8NCM, QTHR.

The grapevine

ZE2JE runs 300W on 144MHz . . . VHF manager G3SEK looking for a 48 key Wheatstone . . . GM8DMZ monitored a station supposedly working the April Fool expedition to St Kilda—maybe there was somebody there after all . . . Which well-known repeater builder's wife locked him in the garden shack for a few hours? . . . G3LEQ's *Talkthrough* guaranteed a large circulation, especially if people keep photo-copying more and increasing the distribution—albeit with slight alterations . . . Is the Glenrothes group's sked with America from Iceland a strong possibility? . . . Amplifiers with pairs of 4CX250Bs soon to be commercially available for both 144 and 432MHz . . . G3TYE, managing director of Polar Developments, just back from a flag waving, transverter selling trip to the USA . . . GM8NCM glad his new NAG144 amplifier has arrived in time for the Glenrothes expedition to the Faeroes and Iceland . . . GM8OWX too busy photographing the 14 April visual aurora for St Andrews University to even have time to listen for a radio event . . . After the G3RKL sideband repeater proposals, many correspondents suggest cw repeaters as the next idea . . . GI8EWM has produced a plan to do away with variable controls like volume etc. He suggests switched resistor networks with Volume 1 to Volume 99 *à la* RKL system . . . G9BF to be resurrected next month.

Late news

Further large-scale auroras took place on 31 April, and on 1,2,3 and 4 May, during which contacts were made on 70, 144 and 432MHz. DK2ZF heard G3SPJ on 70MHz and will transmit during future auroras on 144·120MHz for crossband contacts. On 144MHz, OH, UC2 UP2, UR2 and UQ2 were among the dx worked by G and GM stations on cw. Full auroral report next month. Great interest at Alexandra Palace in a new transverter for the FT901 which operates on all three vhf bands and in a solid-state Microwave Modules 100W 432MHz linear amplifier. □

swl news

Bob Treacher, BRS32525 *

News from abroad

Once again I am more than pleased to have had some correspondence from a couple of swls who are more than a few hundred miles from any of us. First, Eric Trebilcock, BERS195, writes from Melbourne, where it is the middle of autumn. He comments on 28MHz conditions and on the large number of European signals heard. Some rare prefixes occur in his log that many Europeans would be glad to have, eg HM0B, VS5AM, 9M8HG, KH6ABH and KG6JJH. Eric can hear the ZL beacon ZL2MHF on 28,230kHz virtually every day, but he has also heard N4RD and 5B4CY lately.

The second letter is from Craig Stoodley, SWL-8-CS-782, who lives in Yellowknife, which is in the VE8 region of Canada. He sends information on the Canadian SWL International Club. It is a fairly new club but already they have a good quality monthly news bulletin and over 90 members in all continents. A couple of ircs to the Canadian SWL International Club, Box 142 Thunder Bay, Ontario, Canada P7C-4V5, will bring any further information required by return.

Dx-mania

Still on the dx wavelength, there are many reports this time regarding the activity from YI. YI1BGD has been heard on 14MHz ssb around 14,210kHz operating from lists prepared by YU1NYP and JY5HH. The manners of many Europeans certainly left a great deal to be desired, and this senseless behaviour must have left the Iraqi authorities scratching their heads trying to understand what it was all about.

While on the subject of expeditions, the 8Z4 trip is scheduled for 1–7 June, and VU2DK has been heard saying that he will activate VU7 (Laccadive Is) when he can arrange a boat. Neville Spry reports hearing that the Kermadec cards have been despatched, so all those who QSLd direct will be anxiously awaiting the postman. HH2MC has been heard telling stations that he hopes to be operating from Navassa Is later this year, possibly in July.

More dx thoughts

George Wiltshire, BRS39060, reports that he has recently entertained K4SQT, who has been active for some months as K4SQT/SU and who brought with him a large batch of QSLs to be despatched via the bureau. However, several valid points came out of discussing QSLing habits, as seen through the eyes of a rare dx station, which it would be interesting for everyone to note. A large number of swls send cards direct but still fail to enclose even one irc for a reply. The most worrying comment, however, was that a number of swls send more than one QSL—one for hearing the station on Monday, one for Wednesday and yet another for Friday; all for contacts heard on the same band, at around the same time of day and using the same equipment. It does seem rather pointless.

Please, only QSL if it is worthwhile—make the report as full as possible, send an irc if QSLing direct (it makes the difference), and if you are a keen dx chaser and need a QSL from SU on 28MHz, mention of this in the report might just get you what you need. Remember, if your report is helpful there is an even-money chance that the return QSL will arrive. Robert Small mentions that he and his father, G3ALI, had been visited by VO1FG. For those who are not 3·5MHz enthusiasts, VO1FG is arguably the best signal out of VO1. He was in G-land visiting relatives who also live in the Ipswich area.

1978 HF Countries Table

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS17567	160	161	186	41	80	5	633	ssb
BRS35943	127	128	165	74	111	4	609	ssb
BRS29641	123	137	168	73	71	4	576	ssb
BRS25429	126	82	122	56	100	13	499	ssb
A8841	74	96	179	55	81	0	485	ssb/cw
BRS35454	106	109	147	46	66	6	481	ssb/cw
BRS32286	121	100	116	35	56	0	428	ssb
BRS34740	73	85	99	50	50	7	364	ssb
A9191	87	60	93	31	44	0	315	ssb
A9107	37	50	83	20	44	5	239	ssb
BRS20185	56	38	72	17	41	2	226	ssb
BRS34658	10	42	81	32	55	4	224	ssb
BRS37782	40	46	69	17	32	3	207	ssb
BRS39162	44	50	62	9	24	4	193	ssb
BRS27421	0	0	108	45	39	0	192	ssb
ARS39720	24	46	65	14	19	0	168	ssb
ARS39965	24	37	55	9	16	3	144	ssb/cw
ARS38280	39	46	38	10	1	2	136	ssb
ARS39018	5	39	17	15	32	1	109	ssb

Other news

Crosbie Rodgers, BRS32286, had been busy organizing his radio club's open day at which they had hf, vhf and Oscar stations on the air. Other attractions included a junk sale, bring and buy stand, and a sponsored world record attempt, in aid of RAIBC, on the longest two-way radio contact, for submission to the *Guinness Book of Records*. They were also expecting visitors from five clubs in and around the Solway area.

Several new reporters this time. Dave Greenhalgh, ARS39965, has only been listening since February and uses a Lafayette HA350 with a W3EDP antenna system which seems to pull in some good dx traffic. Stephen Turner, ARS37620, writes from Cheshire, where he uses an ex-army R208 receiver but is always keen to borrow his father's 9R59DS for dx work. Robert Dowdell, BRS29641, uses an FRG-7 with a variety of antennas and has certainly produced a good score for the table since January.

Eric Hall, BRS27421, is an "old-timer". His interest dates back to the 'twenties. He is not a QSL card collector but does have one from 6HS—in those days there were no "G" prefixes. Eric currently obtains great pleasure from listening on the bands with his BC348L and is at his rig most days from 0700 to 1700.

Ken Steele, BRS36883, had trouble with his receiver and has been QRT for a while as a result. He is still waiting for VK and ZL confirmations but hopes to receive a number of cards direct in the near future. He is also experimenting with different antenna systems at his Derby QTH.

Keith Kerr, BRS35943, enjoyed a long stint at the rig

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

during the Easter holidays. He ruefully bemoans missing out on 3C1, TZ, VK9X and ZL/C while at university, but was a shade happier after logging CE0AE, VR6TC, VK2AGT/LH, KM6FD, BV2B and 3D2UP. He also comments on good 28MHz conditions and suggests that because of his unwillingness to QSY from that band he may have missed even more good ones on the other bands, but "You pays your money and takes your choice!".

Robert Small, A8841, apart from the FO0 and YI expeditions, has had another good month. 5N2 on 3·5MHz and 9Y4 on 7MHz were unexpected new ones, but again the bulk of his dxing has been on 14MHz. A7XZZ, TR8AC2 (QSL via WB4RZN), ZL4LR/A and 7Q7LW being the best. He has also heard all 52 USA states thanks to WB0VQA in South Dakota. Robert has had a good month with QSL returns too—courtesy of OK2BFP/D2A, VP2VEH, VR4BF and FB8YF. The FB8 pleased him most as he has now received four FB8 QSLs inside six months—FB8XS, FB8WE, FB8ZL and now FB8YF.

David Gould, BRS3784, is the proud owner of a realistic DX160 solid-state receiver, which he uses into 132ft of long wire. He is nearly 400ft asl at his Birmingham GTH and is sure the added height has helped VK, ZL, VS6, A4, 4S and KL7 into his logbook!

Our last correspondent is Clive Williamson, BRS39136, who has G3ZUL to thank for getting him interested in the hobby. He is studying for the RAE, courtesy of G3NOV classes, and he and G3ZUL have recently revived the radio society at the school where they both work. If anyone can offer them a secondhand receiver for use at the school, perhaps they could contact Clive at 14 Lawn Street, Stourbridge DY8 3UQ.

Because of another bumper mailbag it is only possible to mention by station number contributions from BRS37782, ARS38280, BRS20185, BRS34658, ARS39965, BRS39162, A9191 and A9107.

Keep the mail flowing—hopefully it makes this page even better reading! Deadline for the **August issue**—including all-time scores—is **17 June.** □

sstv scene

P. Burnett, G4BLL*

Enthusiasm for the scan-conversion mode of transmitting and displaying sstv shows no sign of diminishing, and with developments in this field progressing at such a rate it is difficult to keep track of them.

DL2RZ has introduced a companion keyboard, the KB-420, for use in conjunction with his SC420 scan-converter. The KB-420 generates alphanumeric displays which are stored in the memory of the SC420 and may be "overlaid" on any existing picture information (for caption work) or simply displayed on a plain black or white background. A most useful electronic cursor is provided which indicates, in the form of a small bright area of the field, exactly where the next character will appear on the screen. A total of 56 (seven lines) or 32 (four lines) characters per sstv frame are available and are selectable by means of a key-switch. This unit represents an important step forward in the intelligent application and use of the keyboard for sstv purposes. Further information may be obtained from Volker Wraase Elektronik, Postfach 6522, 23 Kiel 14, Ellernbrook 6A, West Germany.

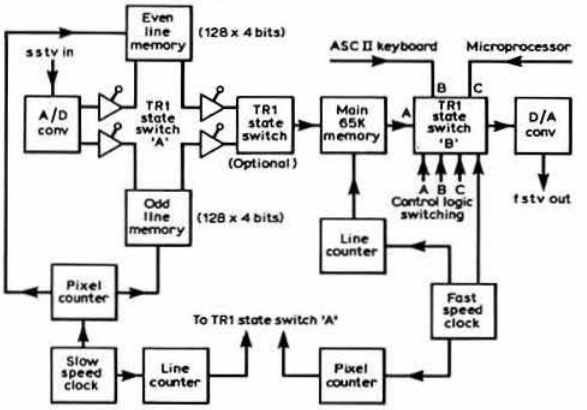

Fig 1. Simplified block diagram of W4ATK converter

The Robot 400 continues to dominate the scan-conversion scene in this country, with more and more units appearing on the bands. One home-built copy using 64—1K RAMs for the memory system has been successfully completed, and at least two others using 4K RAMs are known to be actively under construction. Progress with home-built scan-converters will be reported in the next *SSTV Scene*.

Dave Smith, WB6ZFT, technical and sales director of Robot, recently paid a flying visit to England when Robot 400 owners G3IAI, G3WW and G2BAR took the opportunity to meet him and discuss some of the design features and performance of the 400. Slow-scanners will be interested to note that no significant changes in the 400 circuit are planned for the foreseeable future.

A simplified block diagram for the W4ATK converter, as mentioned in the last column, is shown in Fig 1. Data from microprocessor or keyboard source is accepted by the 65K memory, which is controlled primarily by tri-state switching circuits. Incoming sstv is converted from analogue to digital and clocked alternately into odd and even line buffer memories. The tri-state switching allows one buffer to be slowly loaded with sstv while the other is read-out at fast-scan rate. At the end of each line the process is inverted. This is repeated until a complete picture is stored in the main memory. Unfortunately, to date, a full circuit diagram has not been forthcoming and it is not known if the design has yet appeared in print. If anyone has any further information, *SSTV Scene* would be pleased to convey the details for the benefit of all interested sstvers.

The proposal to change the 14MHz sstv operating frequency, reported last time, has received an emphatic "thumbs down" sign. The consensus of opinion being that this might well lead to an increased level of QRM and even deliberate jamming of sstv signals. At present, 14·230MHz is the internationally established and recognized frequency, and many phone-only stations realizing this are prepared to avoid the frequency and even QSY in favour of an sstv station.

The demonstration of sstv by G2BAR on BBC TV (mentioned last time) would appear to have caught the imagination of many operators, including G4AWJ—thanks for your letter Gordon, we would be pleased to hear of your progress to date.

SWL Simon Robinson is in the process of constructing a monitor (when O-level studies allow) and would be grateful for information on the availability of 5FP7 tubes. If anyone can help please contact him at "Repton", Batt House Road, Stocksfield, Northumberland NE43 7QZ.

Has anyone accepted the challenge from W9NTP to co-operate with his "moving sstv" experiments?

Finally, to return to scan-converters, with future development undoubtedly towards their role as a central processing unit, cw, rtty and sstv enthusiasts will find themselves "travelling the same road". This will represent just one more step towards acceptance of video display capability for the "complete" amateur radio station. □

* 12 Standroyd Drive, Colne, Lancs BB8 7BG

WHITE ROSE RALLY 1978

A selection of photographs taken by Peter Thacker, G8NOT, at the White Rose Rally held on 19 March.

General view of the West Hall. Like the East Hall, this was packed by midday

White Rose RS members Peter Furminger, G3MZF, and Margaret Denby, G4GYL, at one of the raffle ticket stands persuading David Smith, G4DAX, to take a chance, ably supported by lucky winners Walter Gardner, G3HRV, and Eric Coward, G4EYQ.

Left to right: customers at the RSGB bookstall: Brian Dunn, G4FQW; Mike Shannon, G4GJN, and Lee Campbell, G3YKD; being attended to by Hilda Laughton, xyl of G3LBO; Diana Hughes, G4EZI; Libby Lennox, G8NVO; and Joan Harris, xyl of G8MFK

"Have got a Fool-Proof Time-Out Indicator Here!"

ELECTION OF RSGB REGIONAL REPRESENTATIVES

The following nominations for RSGB regional representatives to serve for the period July 1978—June 1981 have been received. The composition of RSGB regions is given on page 483 of this issue.

Region 1 – W. M. Furness, G3SMM
Region 2 – R. C. Andreang, G4CMT; D. Smith, G4DAX
Region 3 – H. S. Pinchin, G3VPE
Region 4 – T. Darn, G3FGY
Region 5 – F. C. Handscombe, G4BWP; R. E. G. Kendall, G8BNE
Region 6 – *(F. S. G. Rose, G2DRT, to continue in office; appointment held 12 months or less)*
Region 7 – D. A. G. Pedder, G3LFX
Region 8 – D. N. T. Williams, G3MDO
Region 9 – H. J. Leonard, G4UZ
Region 10 – R. G. Barrett, GW8HEZ
Region 11 – *(No nomination received)*
Region 12 – F. Baxter, GM3VEY; F. Hall, GM8BZX
Region 13 – *(No nomination received)*
Region 14 – *(I. L. McKechnie, GM8DOX, to continue in office; appointment held 12 months or less)*
Region 15 – H. J. Campbell, GI8FOK; D. M. Jones, GI3KVD; I. Kyle, GI8AYZ
Region 16 – M. S. Appleby, G3ZNU; M. J. Coan, G4EOL; K. F. Eastty, G3LVP; K. R. Naylor, G8FUF
Region 17 – L. Hawkyard, G5HD
Region 18 – W. Ricalton, G4ADD
Region 19 – *(R. J. C. Broadbent, G3AAJ, to continue in office; appointment held 12 months or less)*
Region 20 – *(No nomination received)*

Ballots will therefore be necessary in Regions 2, 5, 12, 15 and 16, and corporate members resident in those regions are invited to vote for one of the candidates in their respective regions.

Votes should be sent on a postcard in the following form addressed to: The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE, to arrive not later than Friday 23 June. Mark the postcard (or envelope containing it) "Regional election" in top left-hand corner.

Form of voting card

ELECTION OF REGIONAL REPRESENTATIVES, 1978-81

I,....., being a fully paid up corporate member of the RSGB resident in Region....., wish to record my vote in favour of
Mr.....
as representative for Region .....
Signed.....
Callsign or BRS number .....
Address .....
.....

In those regions for which no nomination has been received, RRs will be appointed by Council which will be pleased to consider any recommendations from members in those regions so that suitable appointments can be made. Any such recommendations should be received by 23 June.

ELECTION OF RSGB AREA REPRESENTATIVES

The following nominations for RSGB area representatives to serve for the period July 1978—June 1981 have been received. The list also includes area representatives who have held office for 12 months or less and who have indicated their willingness to continue in office for the above period.

Acton, Brentford and Chiswick—W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London W3 8LB.
Airdrie, Coatbridge, Hamilton and Motherwell—D. H. Plumridge, GM3KMG, 7 Waterside Gardens, Hamilton, Lanarkshire.
Belfast—J. T. Barnes, GI3USS, 95 Crawfordsburn Road, Bangor, Co Down BT19 1BJ.
Berkshire—C. F. H. Young, G4CCC, 18 Wincroft Road, Caversham, Reading, Berks.
Bournemouth and Christchurch—G. D. Cole, G4EMN, 6 St Anthony's Road, Bournemouth, Hants BH2 6PD.
Canterbury, Herne Bay and Whitstable—M. Dennison, G3XDV, 5 Lambs Walk, Whitstable, Kent.
Cheshunt—A. Smith, G4FAI, 28 Lambs Terrace, Edmonton, London N9 9UG.
Cornwall—B. H. Body, G8JML, Penolver, Scarcewater Vean, St Clement, Truro, Cornwall.
Coventry—W. F. M. Hahn, G3UOL, 91 The Chesils, Styvechale, Coventry, W Midlands.
Derby—M. Shardlow, G3SZJ, 19 Portreath Drive, Darley Abbey, Derby DE3 2BJ.
Glasgow—T. P. Hughes, GM3EDZ, 41 Westerlea Drive, Bridge of Allan, Stirlingshire.
Grampian—A. J. Wills, GM8KMO, 1 Police Houses, Moray Street, Elgin.
Greater Manchester North-west—J. M. Horrocks, G8GTP, 17 Wood Grove, Whitefield, Manchester M25 7ST.
Guernsey—J. E. Martin, GU3YIZ, Bonne Chance, Marais Lane, Vale, Guernsey.
Harwell—C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Oxon OX12 7DQ.
Highlands—G. Pople, GM4DKL, 25 Cromarty Drive, Milton, Kildary, Ross-shire.
Lichfield, Cannock, Aldridge and Sutton Coldfield—P. A. Miles, G3KDB, 28 Scotch Orchard, Lichfield, Staffs WS13 6DE.
Lisburn—R. Montgomery, GI4GDV, 11 Limehurst Way, Low Road, Lisburn, Co Antrim BT27 4YF.
Liverpool & District—C. Cartmel, G4EST, 31 Redvers Drive, Liverpool L9 8BS.
Lothian—J. McVicar, GM8GEC, 31 Lochend Road, Musselburgh, Midlothian.
Northamptonshire—S. J. Purser, G8GHZ, 2 Dobson Close, Great Houghton, Northampton NN4 0AX.
North Devon—G. Hughes, G4CG, Crinnis, High Walls, Barnstaple, Devon.
Northumberland—E. F. Shield, G8GVN, 14 Wellwood Street, Amble, Morpeth, Northumberland NE65 0EL.
NW Kent—P. F. Jobson, G3HLF, 41 The Avenue, Gravesend, Kent.
Norwood and South London—G. Cluer, G4AVV, 24 Patterson Road, Upper Norwood, London SE19 2LD.
Nottingham—I. R. Brothwell, G4EAN, 56 Arnot Hill Road, Arnold, Nottingham NG5 6LQ.
Peterborough & District—L. Critchley, G3EEL, 36 Waterloo Road, Peterborough, Northants.
St Albans—B. Pickford, G4DUS, 130 The Drive, Rickmansworth, Herts.
South-east Kent—K. A. Crouch, G8KEN, 14 Victoria Road, Capel-le-Ferne, Folkestone, Kent CT18 7HB.
South-east Somerset—R. H. G. Crabb, G4GHI, Wickham Farm, Marston Magna, Yeovil, Somerset BA22 8DT.
Southport & District—N. Horrocks, G2CUZ, 34 Sandbrook Road, Ainsdale, Southport PR8 3JE.
Swansea—P. Jones, GW8CMA, 6 Gwelfor, Killay, Swansea, Glam.
Torbay—L. H. Webber, G3GDW, 43 Lime Tree Walk, Newton Abbot, Devon.
Tunbridge Wells & District—J. C. Greenhow, G3PEY, 19 Dorset Road, Tunbridge Wells, Kent.
Weymouth, Dorchester and Portland—G. M. Taylor, G8HVY, 159 Littlemoor Road, Preston, Weymouth, Dorset DT3 6AF.
Woodspring, South Avon—J. Thorn, G3PQE, 43 Hill Road, Weston-super-Mare, Avon BS23 2RY.
Worthing, Brighton—R. A. Harvey, G3YHM, 26 Birkdale Road, Durrington, Worthing, Sussex.

No area having received more than one nomination, no elections for area representatives will be necessary.

council proceedings

A brief report of the Council meeting held on 18 March 1978

Present: Dr D. S. Evans (President, in the chair), Lord Wallace, Mr D. H. Adams, Mr A. M. Allan, Dr E. J. Allaway, Messrs J. Anthony, P. Balestrini, J. Bazley, T. P. Douglas, W. F. McGonigle, B. O'Brien, R. F. Stevens, G. M. C. Stone, C. J. Thomas (members of Council), D. A. Evans (general manager/secretary), A. W. Hutchinson (editor), Mrs H. M. Allin (minutes secretary).

Apologies for absence were received from Messrs D. J. Andrews, P. F. D. Cornish, C. H. Parsons and W. A. Scarr.

Form of agenda

The President drew attention to the new form of agenda which would enable the work of the Society's committees to be discussed in greater depth.

Financial report

In the absence of the treasurer, the general manager reported that it had been agreed to hold an interim audit within the next six weeks, as a preliminary step towards ensuring a smooth audit at the end of the financial year.

The surplus of income over expenditure was being maintained as a result of the increase in recovered subscriptions and new members, advertising revenue, sale of books and a decrease in overall expenditure.

General manager's report

Mr Evans spoke of the continuing heavy pressure of the work which was being dealt with at HQ. Correspondence and membership queries were up to date, although recent staff sickness had caused some critical periods. The new telephone system should be installed in May and this would alleviate some of the problems.

The proposed move of the packing department in to the front basement had been approved and structural work would proceed soon.

Repeater jammers

The general manager reported that he had received several written reports of repeater jamming activities, but to date none of the amateurs involved was a member of the Society.

Mr O'Brien said this subject had been discussed at length by the M & R Committee and RRs and ARs had been asked to pass on information about prosecutions so that a list could be compiled at HQ.

It was stressed that the Society should act only in cases of definite convictions and not merely on hearsay.

The President reported on a case recently where two jammers were located and eventually reported to the police. Mr Stevens said that the Home Office was reluctant to prosecute because those giving evidence were police rather than officials of the Post Office or Home Office.

Dr Evans commented that one possible reason for lack of action in the case under discussion was that the policemen involved may not have been technically qualified to give evidence against the jammers.

Mr Stevens said the Society should be seen to be doing something positive or it would be thought that the Society was sympathetic towards offenders. The delays in Whitehall were placing the Society in an embarrassing position.

Considerable discussion took place on various possible courses of action.

Review of committee business

Mr Anthony raised the question of new committee meetings being held prior to approval of the new committees at Council's first meeting of the year.

After discussion it was felt that Council should in future discuss committee membership during its last meeting of the year, officers of each committee to be endorsed by Council after election by the committee.

Education—Meetings held on 7.1.78 and 11.3.78

Mr Anthony mentioned a proposal for the establishment of an RAE centre in Derby, and a recommendation would be put to Council in due course.

HF—Meeting held on 13.3.78

Mr Bazley drew Council's attention to terms of reference for the HF Committee and HF Manager drawn up at the first meeting of this committee.

After some amendments the terms of reference were accepted by Council. The committee members are: E. J. Allaway, G3FKM; D. J. Andrews, G3MXJ; J. Bazley, G3HCT; S. H. Jesson, G4CNY; D. Thom, G3NKS; C. J. Thomas, G3PSM (corresponding).

HF Contests—Meeting on 2.2.78

IARU—Meetings on 19.1.78, 28.2.78 and 16.3.78

The President said that a letter had been sent to Philipp Lessig, DK3LP, president of DARC, inviting him to visit RSGB in April, the visit to coincide with the next meeting of IARU Working Group, when delegates for the Hungary conference would receive their final briefing.

Interference—No comments

Membership & Representation—Meeting on 11.2.78

The question of reduced/waived subscriptions had been considered and the following statistics at February 1978 noted: waived 195; reduced 647. This accounted for a loss in subscription income of £2,864 and the position would be further considered.

Microwave—Meetings on 28.1.78 and 12.3.78

The committee members are: J. Anthony, G3KQF; D. S. Evans, G3RPE; B. Chambers, G8AGN; H. Griffiths, G4CNV; D. Hayter, G3JHM; *K. S. Hutchinson, G4ALN; H. W. Rees, G3HWR; C. W.* Suckling, G3WDG; M. H. Walters, G3JVL.

Mobile & Exhibition—Meeting on 13.1.78

Mr Balestrini said the committee was happy with arrangements being made by Mr Hawkyard, G5HD, the exhibition organizer, for the Alexandra Palace Exhibition.

Propagation Studies—Meeting on 13.1.78

It was noted that Messrs C. J. Thomas and A. Taylor were attending the IARU Region 1 conference in Hungary as representatives of IARU, not RSGB.

Raynet

There were no minutes of the last meeting due to the secretary having recently suffered a heart attack.

Mr Balestrini outlined his reasons for declining chairmanship of the Raynet Committee. He felt that 10 years was long enough for one person to hold this position. Also his terms of reference as emergency communications manager stated that preferably he should not be chairman of the committee, and Mr Balestrini felt that the two functions could clash at times.

Technical & Publications—Meeting held on 11.1.78

Mr Stevens reported that considerably larger quantities of books were being sold, and reprints and new editions were being undertaken.

Agreement had been obtained from Ron Ham to make use of material he had collected in the book on the technical development of amateur radio, on which Mr G. R. Jessop, G6JP, was working.

Telecommunication Liaison Committee—Meeting on 2.2.78

The following recommendation of the committee was approved "Should any member of the Society be successfully convicted for offences calculated to bring the name of the amateur radio service into disrepute, the details of the case should be brought to the attention of Council".

VHF—Meeting on 14.1.78

Mr Douglas reported that a repeater co-ordinator had now been appointed within this committee to assist HQ and provide information for "4-2-70". Mr Stone said that 685 persons had paid to attend the VHF Convention; in addition to the trade representatives and 18 trade exhibitors. It was planned to hold a similar event on 10 March 1979.

VHF Contests—Meetings on 26.1.78 and 22.2.78

Mr Stone reported that an open session on contests had been held at the VHF Convention. The adaptation of rules was constantly under review.

Council/committee members' links with commercial activities

The President stated that Mr C. J. Thomas had associations with a commercial organization and this raised the general question of such associations making the Society vulnerable to criticism, especially when one had access to certain confidential matters.

After discussion it was proposed by Lord Wallace that candidates for election should declare their interests in any particular firm and withdraw from meetings where confidential matters were under discussion. This was seconded by Mr Thomas and agreed unanimously.

Correspondence

The general manager had received a letter from the Edinburgh & District ARC, proposing that a GM4HAM shield be presented to the highest placed Scottish station in the RSGB's 2m open contest held

around September. The letter would be passed to G4BEL, chairman of the VHF Contests Committee, for consideration of the administration necessary for such an award.

Two proposals from the ARC of Nottingham were discussed. One referred to the Articles of Association and suggested various amendments, and the other asked for the AGM to be held during the weekend. The letters would be referred to the M & R Committee.

Membership and representation

It was resolved:

(i) to accept reduced subscriptions from 11 members;
(ii) to waive the subscriptions of two members;
(iii) to grant affiliation to: Mitre-Bedford Amateur Radio Club, WA1PHY, Bedford, USA; North Kent Repeater Group, Sidcup, Kent; RAF Akrotiri Radio Club, ZC4AK, BFPO 57; Walsall Amateur Radio Club, Walsall, West Midlands.
(iv) to approve the election of Mr R. J. C. Broadbent, G3AAJ, as regional representative for Region 19.

your opinion

RECIPROCAL LICENSING WITH THE REPUBLIC OF ZAMBIA

The Editor
Radio Communication

Sir– I am writing on behalf of the Radio Society of Zambia to inform your members through the "Your Opinion" column that although a reciprocal licensing agreement exists between the UK and the Republic of Zambia it is not being honoured at the Zambian end. Any licensed amateurs coming to Zambia have almost no chance at all of getting a 9J2 call for the foreseeable future due to the uncertain political situation here.

C. R. Bayliss, 9J2CB G3WKZ, (secretary)

COST OF AMATEUR EQUIPMENT

The Editor
Radio Communication

Sir—At our last group meeting several members expressed concern at the rising cost of amateur radio gear. This is a subject frequently "aired" so it appears to concern many in the UK apart from the GMs.

Examples of the remarks are: Why does a piece of gear selling for 700 dollars in the USA cost £700 in the UK? Why is the trade-in allowance on nearly-new top quality gear so poor? Why is there never a sale of radio gear?—even the sophisticated London stores have annual sales. Why is there no price competition among the retailers of similar radio equipment? Why do companies which readily accept credit cards seem amazed when a cash discount is asked for by a personal shopper? Just how much does an FT101 or TS820 cost in Japan? Does the ARRA hold a monopoly which operates against the financial interests of radio amateurs?

The cost of equipment nowadays must discourage many potential enthusiasts while a cut in price might stimulate the old-timers to buy a few more bits and pieces.

Ayr Amateur Radio Group.

VHF CONVENTION

The Editor
Radio Communication

Sir—The VHF Committee and all concerned are to be commended for their work in organizing another highly successful vhf convention this year. The trade exhibits were geared to the vhf/uhf devotee, and the lecture programme was of a high standard. It covered a wide spectrum of interest and catered for the varying technical skills of those attending, myself included!

It is also a measure of the convention's success that it was almost impossible to park, at the Winning Post, by 11am (official start time) and that the lecture rooms were so full that I was unable to gain entry to any of them. I have long since learned the benefit of taking my own food to this venue, in order to avoid the long queues, slow service, poor choice and expensive prices. However, it came as something of a shock, for myself and the three other amateurs with whom I had travelled from Yorkshire, to discover that we were unable to attend the lectures that we had come to hear.

For all of us, and I am sure many more, it was a 16-hour day and a journey that we will not be contemplating next year. Is it not time that this event was incorporated into a larger occasion; Alexandra Palace, perhaps?

Please do not misunderstand my intentions, as I do not in any way wish to malign the excellent organization work of those involved. The point I wish to make is that the RSGB VHF Convention is now extremely successful, if not too successful, and that it is time to think again.

R. J. Constantine, G3UGF

obituaries

The Society records with regret the deaths of the following radio amateurs:

Mr M. Brown, G2YP
Morrie Brown, who died on 26 April, had recently returned from Australia where he had been active under the callsign VK2OR. He was well known in the UK and Australia for his experimental work on hf antennas.

Mr D. C. French, BEM, G3HSE
Mr French, who died on 13 April, aged 79, was a prominent and active member of the Society for many years.

Mr L. Honeywill, G4PJ
Les Honeywill died on 15 April. He was well known on 80m and 160m for his booming voice and for his kindness on and off the air. He was a well-liked local personality and encouraged many youngsters to join the ranks of radio amateurs.

Mr P. Lowth, ZE7JX
Peter Lowth, who had previously held a VQ2 callsign, was well known for his top band activities throughout the world, having many contacts with W1BB via this mode. As an ex-telegraphist, he was a very keen cw man, although in later years he had eased up on hf activities in preference for top band, Oscar and vhf in general.

Mr D. Poole, G3AQW
Danny Poole died on 7 April, aged 65. He was a life member and former area representative of the RSGB, and a member of the RAIBC. He was an enthusiastic member of the North Staffs Raynet Group from its inception, and a well-known personality in the Stoke-on-Trent area. His activities in recent years had centred on vhf and uhf operation.

Mr J. Proctor, G2AKC
Mr Proctor, who died at the beginning of March, was one of the old timers of the G5SN net.

Mr S. T. R. Redward, BRS30948
Sid Redward died on 8 March aged 47. He was an enthusiastic swl, although business pressures restricted his activities, and a member of Yeovil Amateur Radio Club for several years.

We have also been advised of the deaths of:
Mr G. W. Hayward, G8BD, on 18 February;
Mr R. Lester, GD3UYI;
Mr P. W. Martin, G3PWM, on 18 February;
Mr D. S. Stringer, G3SWA, on 5 January.

Looking ahead

11-14 July—Radio Receivers and Associated Systems Conference, Southampton University. Details from Peter Elliott, IERE, 99 Gower Street, London WC1E 6AZ
15 July—BARTG Convention, Harpenden Public Hall, Harpenden, Herts.
29 July—Region 15 ORM, Belfast.
17 September—IOW "get-together", Alverstone Manor, Details from G3KPO.
24 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent. Details from GW3KYA.
2-4 November—ARRA Exhibition, Granby Halls, Leicester.

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	Mode	Town
Sundays				
0900	G3WNR	145·600 omni-direct	F2/F3	South Shields, T & W
1015	G3CGD	1·875	A1/A3	Cheltenham, Glos
1030	G3OHM/A	144·180	A1/A3J	Birmingham
1030	G3NPB	1·875	A1	St Ives, Cornwall
1100	G2FXA	1·900	A1/A3	Stockton-on-Tees
1130	G3BLS	1·920	A1/A3	Osney, Oxford
1200	G3HVI	144·750 omni-direct	A2/A3	Stoke-on-Trent, Staffs
1230	GU4CHY	144·500 to north	A1/A3J	St Peter Port, CI
1500	G4EHW	144·250 to south-west	A1/A3J	Peterborough
1815	G4DVZ	1·915	A1/A3J	Leeds, Yorks
1930	G3LDW	144·160 omni-direct	A1/A3J	Birmingham
Mondays				
1135	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
1830	G3VBI	1·910	A1/A3	Goole, South Humberside
1830	G3LR G3NCZ	145·525	F2	Accrington, Lancs Blackburn, Lancs
1830	G3ZQS	1·930 145·525	A1/A3J (usb) F2	Darwen, Lancs
1900	G3ZRZ	1·975	A1/A3	Blackpool, Lancs
1900	G4FKZ	3·575	A1/A3	Chedderton, Lancs
1900	G4BNV	144·170 horizontally to south-east	A1/A3J	Ottery St Mary, Devon
1930	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
1930	G3ZYY	145·525 horizontally to south-west	F2/F3	Plymouth, Devon
1930	GI3SXG	144·110	A1/A3J	Newtownards, Co Down
2000	G3IBJ	1·910	A1/A3	Southampton, Hants
2000	G3XWZ	1·910	A1/A3J	Mansfield, Notts
2000	GM4ELV	3·570		Arrochar, S/Clyde
2030	G3ASR/A	1·875 144·175 omni-direct (lsb) vertical	A1/A3J A1/A3J	Harrow, Middlesex
2030	G3YMJ	1·975	A1/A3J	Harlow, Essex
2130	G3LQI	145·300	F2/F3	Lancing, Sussex
Tuesdays				
1135	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
1830	G4BNA	3·590	A1	Swindon, Wilts
1830	G3LR G3NCZ	145·525	F2	Accrington, Lancs Blackburn, Lancs
1830	G3ZQS	1·930 145·525	A1/A3J (usb) F2	Darwen, Lancs
1930	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
2000	G3IQF	1·875	A1/A3	Marlow, Bucks
2000	G4AEU	1·910	A1/A3	Southampton, Hants
2000	G4EZA	145·525 omni-direct vertical	F2/F3	Colchester, Essex
2030	G3IRM	1·975	A1/A3	Bury St Edmunds, Suffolk
2030	G4FFC	145·575 to south	F2/F3	Pertenhall, Beds
2030	G3OHM/A	144·180	A1/A3J	Birmingham
2045	G4AEU	145·550 omni-direct vertical	F2/F3	Southampton, Hants
2200	G3AWL	144·110 to south	A1/A3J	Peterlee, Co Durham
Wednesdays				
1135	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
1830	G3LR G3NCZ	145·525	F2	Accrington, Lancs Blackburn, Lancs
1830	G3ZQS	1·930 145·525	A1/A3J (usb) F2	Darwen, Lancs
1900	G3ULY	1·826	A1/A3J	Culgaith, Cumbria
1900	G4FKZ	3·575	A1/A3	Chadderton, Lancs
1930	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
1930	G3ZYY	145·525	F2/F3	Plymouth, Devon
2000	G8QU	1·970	A1	London N22
2000	G3BPE	1·975	A1/A3	Bexley, Kent
2000	G3SWP	144·200 omni-direct	A2/A3J	Doncaster, South Yorks
2000	GM4DSZ	144·230 to south-south-west	A1/A3J	Aberdeen
2015	G3WVJ	1·845	A1/A3	Staines, Middlesex
2100	G3HVI	144·750 omni-direct	A2·A3	Stoke-on-Trent, Staffs
2130	G3VWL	144·160	A1/A3J	Worthing, Sussex
Thursdays				
1135	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
1830	G4BNA	3·590	A1	Swindon, Wilts
1830	G3NC	1·968	A1	Swindon, Wilts
1830	G3LR G3NCZ	145·525	F2	Accrington, Lancs Blackburn, Lancs
1830	G3ZQS	1·930 145·525	A1/A3J (usb) F2	Darwen, Lancs
1900	G3BLS	1·920	A1/A3	Osney, Oxford
1900	G3ZRZ	1·975	A1/A3	Blackpool, Lancs
1930	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
1930 (1st and 3rd weeks of month only.)	G3ASR/A	1·875 144·175 omni-direct (lsb) vertical	A1 A1/A3J	Harrow, Middlesex
1930	G3ZYY	145·525	F2/F3	Plymouth, Devon
2030	G3KGU	1·915	A1/A3	Theydon Bois, Essex
2130	G3LQI	145·300	F2/F3	Lancing, Sussex
Fridays				
1135	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon
1830	G4CRI	3·525	A1	Helston, Cornwall
1830	G3LR G3NCZ	145·525	F2	Accrington, Lancs Blackburn, Lancs
1830	G3ZQS	1·930 145·525	A1/A3J (usb) F2	Darwen, Lancs
1900	G3NPB	1·875	A1	St Ives, Cornwall
1900	GU4CHY	144·500 to north	A1/A3J	St Peter Port, CI
1900	G4FKZ	3·575	A1/A3	Chadderton, Lancs
1930	G3PQF	144·360 to north-east	F2/F3	Farnborough, Hants
2130	G3VWL	144·160	A1/A3J	Worthing, Sussex
2200	G3AWL	144·110 to south	A1/A3J	Peterlee, Co Durham
Saturdays				
0930	G2FNK	1·930	A1/A3J	Staines, Middlesex
1135	G3RAF	1·810 3·550 145·250 omni-direct	A2 A2 A2	Locking, Avon

contest news

432MHz Open Contest results

The 432MHz Open attracted 17 fewer entries than last year in spite of its being scheduled as the major 432MHz for 1978. Only 16 portable and 12 fixed stations sent in logs, two more than the minimum requirement to support the two sections.

Very poor conditions prevailed for most of the time and the lower than usual scores may have discouraged many stations from sending in a log. A few PA0s were worked by stations near the east coast, but with one exception the best dx was well under 500km. Comments were very few; complaints about bad signals were minimal, and the general impression created was one of lukewarm enthusiasm by the faithful.

The leading stations are to be congratulated upon their victories. Certificates of merit go to the winners and runners-up in each section, and the 1951 Council Cup Trophy to the leading station overall.

G2HIF

FIXED STATIONS

Posn	Callsign	Points	QSOs	QRA	Best dx	Km	Pwr out
1	G3VPK	608	94	AL14	GD2HDZ	430	160W
2	G3WOH	315	48	YN47	G8BIS	310	200W
3	G8GP	283	73	ZL50	GD2HDZ	413	40W
4	GD2HDZ	176	16	XO68	G3YCW/P	430	300W in
5	G8OGL	161	49	ZL47	G8FIS/P	325	10W
6	G8IWA	138	25	ZN18	PE1BHE	365	10W
7	G4FOX	108	32	ZM26	GW3UBX/P	116	10W
8	G8CTT	86	32	AL41	GW3UBX/P	274	10W
9	G4FRE	81	23	ZM33	G3VPK	174	10W
10	G3TAL	46	14	ZK14	G8OHM/P	180	100W
11	G3FIJ	40	10	AL05	GW4ASR/P	315	10W
12	G8ITS	34	24	ZL40	G3NNG/P	102	40W

PORTABLE STATIONS

Posn	Callsign	Points	QSOs	QRA	Best dx	Km	Pwr out
1	G3PMH/A	643	126	AM71	PA6THT	460	400W
2	GW3UBX/P	563	83	YM44	GJ8KNV/P	356	75W
3	G3NNG/P	524	103	ZL33	PA0EZ	466	400W
4	G8FIS/P	471	56	ZO55	PA0EZ	465	100W
5	G3YCW/P	456	102	AL33	GD2HDZ	420	300W
6	GW4ASR/P	450	60	YL23	G3DAH	325	100W
7	G8OHM/P	381	79	YM50	GJ8KNV/P	347	50W
8	G3PQY/P	380	58	ZN18	PA0WOS	421	100W
9	G4DDC/P	378	103	ZL18	PA0EZ	385	200W
10	G6YB/A	343	57	YL49	PA0EZ	517	400W
11	G3GQC/P	312	66	ZN62	G3AUS	180	300W
12	G8AYY/P	276	63	ZM71	G3BW	305	10W
13	G4ERP/P	248	58	ZL01	G3BW	313	8W
14	G8GMC/P	212	50	ZL53	G8FIS/P	330	10W
15	G3UUP/P	176	64	ZL26	GW4ASR/P	177	10W
16	G8JAY/P	134	37	YM36	G3VPK	240	10W

Checklogs acknowledged with thanks from G4DGU and G3NAQ.

LISTENER SECTION

Posn	Station	Points	QSOs	QRA	Best dx	Km
1	A9090	110	30	ZM63	GD2HDZ	290
2	BRS33823	57	25	ZL27	G6YB/A	—
3	BRS15822	44	22	ZL40	G3GQC/P	—

1,296MHz Open Contest results

It is difficult to say how the timing of this event—the Saturday evening before the 432MHz Open—influenced the number of entries, but lengthwise it was about right for the level of activity. Like the 432MHz contest, it would undoubtedly have attracted more entries had it been held later in the year. Conditions were flat; no Continental stations were worked and no best dx reached 250km. While the general level of activity on 1,296MHz continues to increase only very slowly, the band remains popular among its devotees. Several contestants would like to see the 1,296MHz cumulatives restored.

The band is still a long way from realizing its full potential, but as more stations go for higher power and bigger antenna gains, the longer distance contacts become more commonplace.

The March & District Radio Amateur Society gained a convincing victory, with more than twice the score of their nearest rival. They receive the VHF Contests Committee Cup. Certificates go to the leaders and runners-up in each section.

G2HIF

Posn	Callsign	Points	QSOs	QRA	Best dx	Km	Pwr out
1	G4BEL/A	2,638	34	AM71	G8LEF	222	40W
2	G3SBV/P	1,124	23	AL51	G4DGU	101	60W
3	G4DDC/P	1,118	21	ZL18	G3DAH	147	40W in
4	G3FZL	846	20	ZL50	G6XM	117	10W
5	G8GP	828	21	ZL50	G4DGU	89	10W
6	G3COJ	774	18	ZL37	G8ACE/P	71	25W
7	G3RQZ	750	21	ZL50	G4BRS/P	94	40W
8	G3GQC/P	722	14	ZN62	G4BEL/A	175	100W in
9	G3UUP/P	700	16	ZL26	G3SBV/P	78	6W
10	G3PQY/P	657	11	ZN18	G3GQC/P	105	30W in
11	G3VCT	618	15	ZL37	G4BEL/A	66	4W
12	G3HCW	308	9	ZN24	G4FXW	45	60W in
13	G4CGS	273	7	ZN11	G3PQY/P	83	6W
14	GW4ASR/P	240	2	YL23	G3AUS	130	4W
15	G8CTT	232	7	AL41	G4BEL/A	66	2W
—	G3MCS	670*	15	—	—	—	3W

*estimated from radial score

Affiliated Societies Team Contest 1978 results

This year's ASTC event—the third under the present "team" rules—has proved once again the popularity of the new-style contest. To the casual listener, the cw section of 3·5MHz on the afternoon of 15 January must have sounded like complete bedlam; however, order and discipline reigned supreme (we are, of course, self-trained in the art of communication by wireless telegraphy) and, as a result, the leading scores are well up on previous totals. About 18,000 QSOs were made during the four-hour session in a bandwidth of 80kHz—that is nearly one QSO per minute per kilohertz! Club entries have increased from 51 in 1977 to 61 this year, and the number of individual logs has jumped from 218 to 291.

The leading society, and this year's recipient of the Edgware Trophy, is the Stockport Radio Society, whose "A" team—G3WPF, G3NOM, G4BUX, G3PEK/A and G3FYE—amassed 6,442 points to give them a clear lead over the runner-up, the Southgate Radio Club, with 6,165 points. In third place is the Addiscombe ARC which scored 5,740 points.

With the exception of two clubs, this year's "top 10" is similar to last year's, but with the positions somewhat changed. Stockport has moved up from 6th in 1977 (and 33rd in 1976) to the number one position; Southgate has retained the second slot, while Addiscombe is up from fourth to third. The two newcomers to the top 10 are the Government Communications ARC, moving from 15th to 6th place, and the White Rose RS in 7th position—they did not enter last year but were 8th in 1976. The two "drop-outs" are Cray Valley, falling from 5th to 24th; and Reigate, who were 9th in 1977 but did not enter this year, although several of their members were active during the contest.

The leading individual, by a substantial margin, is G3WPF, of Stockport, with a checked score of 1,592 points from 192 QSOs—that is an average of over 48 QSOs/hour. Runner-up in the individual listing, as he was last time, is G3RTE with 1,385 points from 150 contacts.

Equipment

As in previous years, Japanese equipment dominated the scene, although a number of KW2000 transceivers, Drake and Heathkit rigs also featured. There were a couple of homebrew transmitters in use, as well as the odd CR100 and HRO. G3MCK again used his co/pa transmitter to make a reasonable score. Antennas varied from dipoles and inverted-Vs to trapped verticals and short lengths of wire.

The logs

Most of the logs were legible, and complete with a properly compiled cover sheet, but as usual there were a few which were either difficult to read, and/or presented on odd pieces of paper, with the "in" and "out" columns reversed, or in red ink. These may seem like minor irritations, but when one is working through a pile of logs (and it was a large pile this year!) those which do not conform to the normal standard take longer to deal with as they are more difficult to process. Log and cover sheets are now available free of charge from RSGB HQ (please enclose sae), so there should be no excuse next year! It would help the contest adjudicator if (a) the name of the club was written on the cover sheet on each of the individual logs, and (b) the overall cover sheet (with the membership declaration) listed the callsigns and claimed scores of all the stations in the club entry.

Points have been deducted from most claimed scores, mostly because of incorrect claiming of the AFS bonus, or the bonus not being

confirmed by receipt of the corresponding log—there were quite a few stations participating in the contest whose clubs did not submit entries and in those cases the AFS bonus has not been allowed. Wrong callsigns also cost some entrants a lot of points—more careful checking of the logs before submission would improve the accuracy in many cases. One G2-plus-3 lost a considerable number of points because his callsign was consistently misread by other entrants.

A few facts and figures

	1976	1977	1978
Winning club score	4,191	5,488	6,442
Leading individual score	1,155	1,403	1,592
Number of stations scoring over 1,000 points	16	29	45

Comments

"Just the right duration not to cause domestic distress. More contests of that duration and timing please."—G3YDX.

"Please leave rules exactly as now—changes could not improve such a successful contest."—G3YMC. (Similar comments were made by many other entrants.)

"How about a 2m phone version to involve the Class B licensees?"—G3ZLQ (VHF Contests Committee to note!)

"Greatly appreciated the courtesy and consideration shown by most operators to a fairly new G4 participating in his first cw contest."—G4GGV.

"My first contest for over 10 years!"—G4DC.

Final

Judging by the large number of entrants who expressed complete satisfaction with the contest as it now is, there would appear to be no need to change the rules in the immediate future. Only the timing comes in for comment, a few would prefer Sunday morning to the afternoon, but on balance the HF Contests Committee believes that the present timing is best. Incidentally, the result of last year's invitation by G3IAS to clubs was the receipt of a solitary postcard expressing a preference for the present timing!

Having mentioned G3IAS in the preceding paragraph, this is probably an ideal opportunity to present an open "vote of thanks" to Andrew for his efforts in connection with this contest. The new-style AFS team event was very much his idea, and the popularity and success of the present-day contest is largely due to his enthusiasm and his management of the rules and results in recent years.

SOCIETY TOTALS

Posn	Society	Total	Stations contributing to score					Number of entries
1	Stockport RS (A)	6,442	G3WPF	G3NOM	G4BUX	G3PEK/A	G3FYE	5
2	Southgate RC	6,165	G3RTE	G3YDX	G3KTZ	G3XTJ	G3RWL	5
3	Addiscombe ARC	5,740	G3RQZ	G4ALE	G3SJX	G3UFY	G4CDY	5
4	Bracknell ARS	5,045	G3YMC/A	G4ALG/A	G4BRK/A	G4AUC/A	G3YHG	7
5	Crawley ARC	5,020	G3JKF	G3TR	G3YVR	G3TIR/A	G3GRO	6
6	Govt Comms ARC (A)	4,954	G8DV	G3SSO	G3LEJ	G3MZV/A	G3SNN	5
7	White Rose RS	4,577	G3XUD/A	G3ZBA	G3PSM	G4DXA	G3YEE	8
8	Maidstone YMCA ARS	4,505	G3ZWH	G3ZSU/A	G3ORH	G4DUT	G4AXD	6
9	Hereford ARS	4,419	G4CNY	G3WRA	G3WRQ	G4FFD	G3RJB	6
10	Surrey Radio Contact C	4,282	G3MCX	G3BFP	G6LX	G3RJW	G4FUU/A	9
11	Grimsby ARS	4,070	G3VIP/A	G3HTI/A	G3RSD	G4EBK	G2AJB/A	8
12	Edgware & D RS	3,955	G3SJE	G3PSP	G3GC	G3VW	G4AEM	5
13	Sutton & Cheam RS	3,650	G4CWH	G3LCH	G3DNJ	G3CWL	G2DMR	7
14	Stourbridge & D ARS	3,544	G6OI	G4IP	G4GME	G3JEI	G4GGU	5
15	Shefford & D RS	3,527	G3FJE	G4DRS	G2DPQ	G3DOT	G5CAX	5
16	Martlesham RS	3,510	G4BPO	G3RPB	G3TZE	G3TLY	G3ZNU	6
17	RNARS Portsmouth	3,425	G3JFF	G3LIK	G3JZV	G4FIV	G3BTO	7
18	Verulam ARC	3,350	G4BOU	G3JKS	G4DUS	G3LXP/A		4
19	Cheltenham ARA	3,299	G5BK/A	G3LP	G3ZKN	G3JFH	G3CJ	7
20	Echelford ARS	3,280	G3KKQ	G2FNK	G3ZXA	G3MCK	G3YCQ	7
21	Catterick Garrison ARC	3,200	G4CJU	G3IBB	G3EJF	G4EXV	G3FMW	5
22	Leicester Coll ARS	2,985	G3ORY	G4FIE	G3SDC	G4ARI	G3LVZ	6
23	Dunstable Downs RC	2,900	G4ENA	G3HJF	G3HAL	G3BLP	G3USE	5
24	Cray Valley RS	2,895	G4FAM	G2MI	G3XRX	G3JJC		4
25	Thames Valley ARTS	2,855	G3JEQ	G2KI	G3GHS	G8SM	G3BPM	6
26	Southdown ARS	2,851	G3MHF	G3KLX	G8SC	G3WQK	G3YYF	7
27	Stockport RS (B)	2,710	G3KAF	G3RUG	G4BJU/A	G4ECI	G4FAS	5
28	Leicester RS	2,700	G3LRS	G3HYH	G4ERT	G3ZJS		4
29	RNARS *HMS Belfast*	2,625	G4EOK	G4FRN	G4DJN	G3PZP	G4BVA	7
30	Glenrothes & D ARC	2,580	GM3ZSP	GM4GRC	GM4EJI	GM4BRM	GM3PFQ	6
31	Conway Valley ARS	2,567	GW3GRY	GW3CW	GW3JI	GW3MDK	GW3YLZ	5
32	ARC of Nottingham	2,565	G3SJJ	G4ECY	G4DVW	G3WFV	G4AFJ	5
33	Crawley Court ARG	2,557	G3OGY	G3HQX	G3RDQ	G3LMH	G3HRH	5
34	Reading ARC	2,482	G3WGV	G3AKF	G4ELY	G4AOL/A	G4ELD	5
35	Wirral ARS	2,360	G2FOS	G3NWR	G3UJX	G3EGX		4
36	Horsham ARC	2,340	G3TNO/A	G3SWC	G4FUP			3
37	Oxford & D ARS	2,245	G4AZN	G3ZZR	G8IB	G3BLS		4
38	Torbay ARS	2,147	G3TLK	G4ELZ	G3SNU	G4FKU	G3LHJ	5
39	Hornsea ARS	2,140	G4DC	G4BHF	G3TLI/A	G4CHH		4
40	Leyland Hundred ARG	2,105	G3XII	G3VYV	G3HKU	G3WYY		4
41	Maidenhead & D ARC	2,095	G3FVC	G3TWG	G3ZLQ	G4GGV	G4EZT	5
42	Swansea ARS	2,060	GW3OAY	GW3INW				2
43	Govt Comms ARC (B)	2,045	G3AUU	G3AGF	G4BEZ	G3LGF	G3IFB	5
44	Oxford Univ RS	1,930	G4BUO/A	G3OUR/A	G3YGF/A	G5BUW		4
45	Stevenage & D ARS	1,900	G3OVT	G4DDX	G3TIK			3
46	Farnborough & D RS	1,715	G3VAA	G3SVL	G3MKG	G3TMQ		4
47	Yeovil ARC	1,490	G3EDW	G3CMH	G3BEC	G4FYS	G4GNV	6
48	Kingsway Tech Coll RAC	1,483	GM4AGS	GM3ZXE	GM4BAG	GM4CUZ		4
49	Clifton ARS	1,365	G4DBW	G3JKY				2
50	Merthyr Tydfil ARC	1,310	GW3MPB	GW4FXF				2
	RNARS Rosyth	1,310	GM3UM	GM3KPD	GM3HUN			3
52	Bromsgrove & D ARC	1,252	G4AAL	G4DHH	G2CLN	G3RBL		4
53	Dover RC – SE Kent (YMCA) RC	1,115	G3OWQ	G3MLO	G3YXX/A	G4EGQ	G4EQJ	5
54	West Kent ARS	1,100	G3AIO	G4FDC				2
55	Bury RS	982	G3BRS	G4FOT	G4FQE	G3GYU		4
56	RNARS Yeovilton	790	G2KV					1
57	RNARS Chatham	660	G3WP	G3JPX	G4CZD			3
58	South Manchester RC	605	G3FVA					1
59	Stockport RS (C)	545	G4FTP	G3DNX	G4FFW	G3NUQ		4
60	RNARS Plymouth	430	G3VNG	G3UVS				2
61	RNARS Faslane	347	GM4ELV	GM4FVQ				2

Checklog acknowledged with thanks from G3OLB

Posn	Callsign	Score	Society
1	G3WPF	1,592	Stockport RS (A)
2	G3RTE	1,385	Southgate RC
3	G3NOM	1,370	Stockport RS (A)
4	G3FJE	1,335	Shefford & D RS
5	G3YMC/A	1,300	Bracknell ARS
	G4ALG/A	1,300	Bracknell ARS
	GW3OAY	1,300	Swansea ARS
8	G3YDX	1,290	Southgate RC
9	G3ROZ	1,265	Addiscombe ARC
	G4FAM	1,265	Cray Valley RS
	G8DV	1,265	Govt Comms ARC (A)
12	G4BUX	1,260	Stockport RS (A)
13	G3XUD/A	1,255	White Rose RS
14	G4CNY	1,250	Hereford ARS
15	G3KTZ	1,240	Southgate RC
	G3SJJ	1,240	ARC of Nottingham
17	G3MCX	1,235	Surrey Radio CC
18	G4EOK	1,230	RNARS *HMS Belfast*
19	G3SSO	1,227	Govt Comms ARC (A)
20	G3JEQ	1,220	Thames Valley ARTS
21	G4BPO	1,190	Martlesham RS
22	G3XTJ	1,165	Southgate RC
23	G4ALE	1,160	Addiscombe ARC
24	G3SJX	1,155	Addiscombe ARC
25	G3PEK/A	1,150	Stockport RS (A)
26	G6OI	1,137	Stourbridge ARS
27	G3BFP	1,135	Surrey Radio CC
28	G3JKF	1,120	Crawley ARC
	G3WRA	1,120	Hereford ARS
30	G3UFY	1,115	Addiscombe ARC
31	G3ZWH	1,105	Maidstone YMCA ARS
32	G3RWL	1,085	Southgate RC
33	G4BOU	1,080	Verulam ARC
34	G3KKQ	1,075	Echelford ARS
	G4CWH	1,075	Sutton & Cheam RS
36	G3FYE	1,070	Stockport RS (A)
	G3TR	1,070	Crawley ARC
38	G3RPB	1,060	Martlesham RS
	G4BRK/A	1,060	Bracknell ARC
40	G4CDY	1,045	Addiscombe ARC
41	GM3ZSP	1,035	Glenrothes & D ARC
42	G3TNO/A	1,020	Horsham ARC
	G4DRS	1,020	Shefford & D RS
44	G5BK/A	1,015	Cheltenham ARA
45	G3VIP/A	1,000	Grimsby ARS
46	G3YVR	995	Crawley ARC
47	G3ZSU/A	985	Maidstone YMCA ARS
48	G3ORY	980	Leicester Coll ARS
49	G3JFF	975	RNARS Portsmouth
50	G3ORH	970	Maidstone YMCA ARS
51	G3LRS	960	Leicester RS
52	G4ENA	955	Dunstable Downs RC
53	G3KAF	950	Stockport RS (B)
54	G4AAL	940	Bromsgrove & D ARC
55	G3SJE	930	Edgware & D RS
56	G6LX	925	Surrey Radio CC
57	G3TIR/A	920	Crawley ARC
	G4AZN	920	Oxford & D ARS
59	G3GRO	915	Crawley ARC
60	G2FOS	905	Wirral ARS
	G3JKS	905	Verulam ARC
62	G4CJU	890	Catterick Garrison ARC
63	G3LCH	885	Sutton & Cheam RS
64	G3ZBA	880	White Rose RS
65	G3LP	875	Cheltenham ARA
66	G3TLK	870	Torbay ARS
67	G2MI	860	Cray Valley RS
	G3LEJ	860	Govt Comms ARC (A)
	G3MGL	860	Crawley ARC
70	G3MZV/A	850	Govt Comms ARC (A)
71	G3PSM	837	White Rose RS
72	G3PSP	835	Edgware & D RS
	G4DXA	835	White Rose RS
74	G3IBB	830	Catterick Garrison ARC
75	G3WGV	825	Reading ARC
	G4DUT	825	Maidstone YMCA ARS
77	G3LIK	820	RNARS Portsmouth
78	G3HTI/A	810	Grimsby ARS
79	G3SWC	800	Horsham ARC
	G3WRQ	800	Hereford ARS
	G4DUS	800	Verulam ARC
82	G3RSD	795	Grimsby ARS
83	G3EDW	785	Yeovil ARC
84	G3OGY	780	Crawley Court ARG
85	G3YEE	770	White Rose RS
86	G4BUO/A	765	Oxford Univ RS
	G4DBW	765	Clifton ARS
88	G3GC	760	Edgware & D RS
	G4FIE	760	Leicester Coll ARS
	GW3INW	760	Swansea ARS
91	G4EBK	755	Grimsby ARS
92	G3SNN	752	Govt Comms ARC (A)
93	G2KV	750	RNARS Yeovilton
94	GW3MPB	745	Merthyr Tydfil ARC
95	G3OVT	740	Stevenage & D ARS
96	G3DNJ	730	Sutton & Cheam RS
	G3SDC	730	Leicester Coll ARS
98	G3VW	725	Edgware & D RS
99	G2AJB/A	710	Grimsby ARS
	G3XII/A	710	Leyland Hundred ARG
101	G3JZV/A	705	RNARS Portsmouth
	G3NWR	705	Wirral ARS
	G4AEM	705	Edgware & D RS
104	G4AUC/A	700	Bracknell ARS
105	G4GME	695	Stourbridge ARS
	G4IP	695	Stourbridge ARS
107	G3HYH	690	Leicester RS
	G4DC	690	Hornsea ARS
	GW3GRY	690	Conway Valley ARS
110	G3MHF	685	Southdown ARS
	G3YHG	685	Bracknell ARS
112	G2FNK	680	Echelford ARS
	G3VYV	680	Leyland Hundred ARG
	G4CVN	680	Bracknell ARS
	G4DDX	680	Stevenage & D ARS
116	G3ZZR	675	Oxford & D ARS
	G4ERT	675	Leicester RS
118	G3IYT	670	Grimsby ARS
119	G4FFD	664	Hereford ARS
120	G3RJW	650	Surrey Radio CC
	G4BNT	650	Grimsby ARS
122	G3VAA	645	Farnborough & D RS
123	G3SVL	640	Farnborough & D RS
124	G3AUU	630	Govt Comms ARC (B)
125	G3HJF	625	Dunstable Downs RC
	G3HQX	625	Crawley Court ARG
	G3RUG	625	Stockport RS (B)
128	G4AXD	620	Maidstone YMCA ARS
	GW3CW	620	Conway Valley ARS
130	G3FVC	610	Maidenhead & D ARC
131	G3KLX	607	Southdown ARS
132	G3FVA	605	South Manchester RC
	G8SC	605	Southdown ARS
134	G3AGF	600	Govt Comms ARC (B)
	G3EJF	600	Catterick Garrison ARC
	G3JKY	600	Clifton ARS
	GM4GRC	600	Glenrothes & D ARC
138	G2KI	585	Thames Valley ARTS
	G3AIO	585	West Kent ARS
	G3RJB	585	Hereford ARS
	G3TWG	585	Maidenhead & D ARC
142	G3RDQ	577	Crawley Court ARG
143	G3ZXA	575	Echelford ARS
	G4FRN	575	RNARS *HMS Belfast*
	GM3UM	575	RNARS Rosyth
146	G3WQK	569	Southdown ARS
147	G3AKF	567	Reading ARC
148	G3LXP/A	565	Verulam ARC
	GW4FXF	565	Merthyr Tydfil ARC
150	GW3JI	560	Conway Valley ARS
151	G3BRS	555	Bury RS
	G3OUR/A	555	Oxford Univ RS
	G4BJU/A	555	Stockport RS (B)
154	G3JEI	552	Stourbridge & D ARS
155	G3XRX	545	Cray Valley RS
	G4ELY	545	Reading ARC
157	G4BEZ	540	Govt Comms ARC (B)
158	G4BHF	520	Hornsea ARS
	G4FUP	520	Horsham ARC
	GW3MDK	520	Conway Valley ARS
161	G3MCK	515	Echelford ARS
	G4FDC	515	West Kent ARS
163	G3ZKN	512	Cheltenham ARA
164	G3WSZ	510	White Rose RS
	G4BJB	510	Bracknell ARS
166	G3CWL	505	Sutton & Cheam RS
	G3TLI/A	505	Hornsea ARS
	GM4AGS	505	Kingsway Tech Coll RAC
169	G3HAL	500	Dunstable Downs RC
	G3JFH	500	Cheltenham ARA
171	G2DPQ	487	Shefford & D RS
172	G3UJX	485	Wirral ARS
173	G3TIK	480	Stevenage & D ARS
174	G3HKU	475	Leyland Hundred ARG
175	G3TZE	470	Martlesham RS
	G4ECY	470	ARC of Nottingham
	G4FIV	470	RNARS Portsmouth
	GM3ZXE	470	Kingsway Tech Coll RAC
179	G3YGF/A	465	Oxford Univ RS
	G4GGU	465	Stourbridge ARS
181	G4DVW	460	ARC of Nottingham
182	G2DMR	455	Sutton & Cheam RS
	G3BTO	455	RNARS Portsmouth
184	GM3KPD	450	RNARS Rosyth
185	G3GHS	445	Thames Valley ARTS
186	G3BLP	435	Dunstable Downs RC
	G3YCQ	435	Echelford ARS
188	G3ZLQ	425	Maidenhead & D ARC
	G4CHH	425	Hornsea ARS
	GM4EJI	425	Glenrothes & D ARC
191	G3TLY	420	Martlesham RS
192	G4ELZ	417	Torbay ARS
193	G3CMH	415	Yeovil ARC
194	G4DJN	400	RNARS *HMS Belfast*
	G4EXV	400	Catterick Garrison ARC
	G8IB	400	Oxford & D ARS
197	G3CJ	397	Cheltenham ARA
198	G3FMW	385	Catterick Garrison ARC
	G3USE	385	Dunstable Downs RC
	G3YYF	385	Southdown ARS
201	G3ZJS	375	Leicester RS
202	G3DOT	370	Shefford & D RS
	G3ZNU	370	Martlesham RS
204	G3SNU	365	Torbay ARS
205	G4AOL/A	360	Reading ARC
206	G4FKU	350	Torbay ARS
207	G3OWQ	345	Dover RC, SE Kent (YMCA) RC
	G4CVL	345	Echelford ARS
	G4ECI	345	Stockport RS
210	G3MLO	340	Dover RC, SE Kent (YMCA) RC
211	G4FUU/A	337	Surrey Radio CC
212	G3LMH	325	Crawley Court ARG
	G4FBB/A	325	White Rose RS
	G8SM	325	Thames Valley ARTS
215	G5CAX	315	Shefford & D RS
216	G3WP	310	RNARS Chatham
	G4AQR	310	Cheltenham ARA
	G4CCX	310	Surrey Radio CC
	G4FYF	310	Surrey Radio CC
220	G2FWA	305	Cheltenham ARA
	G3BFE	305	RNARS Plymouth
222	G3WFV	295	ARC of Nottingham
	GM4BRM	295	Glenrothes & D ARC
224	G3EUE	290	Surrey Radio CC
	G3MKG	290	Farnborough & D RS
	G3PZP	290	RNARS *HMS Belfast*
	G3YSZ	290	Southdown ARS
228	G4DHF/A	285	Grimsby ARS
	GM3HUN	285	RNARS Rosyth
230	G3BPM	280	Thames Valley ARTS
231	G4ARI	275	Leicester Coll ARS
	GM4ELV	275	RNARS Faslane
233	G4GGV	270	Maidenhead & D ARC
234	GM4BAG	268	Kingsway Tech Coll RAC
235	G3EGX	265	Wirral ARS
	G3XUS	265	Southdown ARS
237	G3BLS	250	Oxford & D ARS
	G3HRH	250	Crawley Court ARG
	G3LGF	240	Govt Comms ARC (B)
	G3LVZ	240	Leicester Coll ARS
239	G3WYY	240	Leyland Hundred ARG
	G4BOF	240	Hereford ARS
	GM4CUZ	240	Kingsway Tech Coll RAC
244	G3JPX	235	RNARS Chatham
	G4FAS	235	Stockport RS (B)
	G4FTP	235	Stockport RS (C)
247	G3YCT/A	230	Leicester Coll ARS
	G4FOT	230	Bury RS
249	G3JJC	225	Cray Valley RS
	G3UVS	225	RNARS Plymouth
	G4ADM	225	Sutton & Cheam RS
	GM3PFQ	225	Glenrothes & D ARC
253	G3VNG	205	RNARS Plymouth
	G4EZT	205	Maidenhead & D ARC
	GM3YBQ	205	Glenrothes & D ARC
256	G4DHH	200	Bromsgrove & D ARC
	G4FTI	200	White Rose RS
258	G4EOI	195	Sutton & Cheam RS
259	G3BEC	190	Yeovil ARC
	G4FAW	190	Martlesham RS
261	G5BQR	187	Shefford & DRS
262	G3YXX/A	185	Dover RC, SE Kent (YMCA) RC
	G4ELD	185	Reading ARC
264	GW3YLZ	177	Conway Valley ARS
265	G4EGQ	165	Dover RC, SE Kent (YMCA) RC
266	G2NG	160	Thames Valley ARTS
	G4CVT	160	RNARS Portsmouth
268	G3DNX	155	Stockport RS (C)
269	G4FFW	150	Stockport RS (C)
270	G3LHJ	145	Torbay ARS
	G5BUW	145	Oxford Univ RS

Posn	Callsign	Score	Society
272	G3TMQ	140	Farnborough & D RS
273	G4BVA	130	RNARS *HMS Belfast*
	G4GFU	130	Maidstone YMCA ARS
275	G4FQE	120	Bury RS
276	G4CZD	115	RNARS Chatham
277	G4AFJ	100	ARC of Nottingham
278	G4BOI	85	RNARS *HMS Belfast*
279	G4EQJ	80	Dover RC, SE Kent (YMCA) RC
	G4FYS	80	Yeovil ARC
281	G3GYU	77	Bury RS
282	GM4FVQ	72	RNARS Faslane
283	G3FWR	70	Surrey Radio CC
284	G2CLN	60	Bromsgrove & D ARC
285	G3RBL	52	Bromsgrove & D ARC
286	G3IFB	35	Govt Comms ARC (B)
287	G3TKO	30	RNARS *HMS Belfast*
288	G3WVJ	20	Echelford ARS
	G4GNV	20	Yeovil ARC
290	G3XFW	15	Yeovil ARC
291	G3NUQ	5	Stockport RS (C)

Thanks also to all participants for taking part, and for their comments (these are always read with great interest), for without them there would be no contest! The HF Contests Committee looks forward to hearing from them all again next year.

G3NKS

March 144/432MHz Contest results

This somewhat experimental contest was enjoyed by most and it brought a large postbag of comments and suggestions for rule changes. These have been discussed and it has been decided to run another contest next year, but with the following modifications to the rules: (a) single-operator stations would have the choice of one six-hour or two three-hour breaks, times of these to be at their own discretion. (b) 144/432MHz multi-operator stations only, would be permitted to run two stations concurrently using different callsigns, one on 144MHz and the other on 432MHz. It is hoped that these changes will encourage more activity on both bands.

Unfortunately conditions for the contest were not the best, so the Continental activity was not fully appreciated. However, as can be seen from the tables, the event generated a lot of activity on the 432MHz band and this was thought to be advantageous in easing the QRM on the heavily used 144MHz band.

Congratulations and certificates go to winners and runners up in each section.

G4BEL

144/432MHz Single-operator

Posn	Callsign	Points Total	Points 144	Points 432	QSOs 144	QSOs 432	QRA
1	G4ASR/P	4,886	1,311	3,575	231	115	YM47
2	G8GP	2,320	—	2,320	—	98	ZL50
3	G3SPJ	2,172	752	1,420	138	65	AL41
4	G3LRP	2,055	—	2,055	—	65	ZN33
5	G3WHK	1,945	850	1,095	202	67	ZL49
6	G8HHI	1,543	418	1,125	74	53	ZL56
7	G8BIS	1,320	185	1,135	29	49	AL43
8	G5UM	1,195	—	1,195	—	53	ZM35
9	G8CDL	915	400	515	90	34	ZL08
10	G4EDV/P	788	268	520	44	18	YO54
11	G4EEV	653	513	140	66	8	ZO58
12	G8ART	570	5	565	1	31	ZM45
13	G8IWA	559	319	240	46	16	ZN18
14	G4CGS	402	7	395	1	21	ZN11
15	G8FDL	267	87	180	25	14	YN38
16	G8CTT	190	—	190	—	18	AL41

144/432MHz Multi-operator

Posn	Callsign	Points Total	Points 144	Points 432	QSOs 144	QSOs 432	QRA	No. of ops
1	GW8BHH/P	7,733	3,653	4,080	414	111	YM44	5
2	GW4ALE/P	5,068	1,423	3,645	205	101	YM75	8
3	G8KUC	5,026	2,856	2,170	378	54	AL56	3
4	G3VCP/P	4,761	3,421	1,340	429	42	AL45	5
5	G3LCH/P	4,153	1,573	2,580	245	95	ZN71	3
6	G6YB/A	3,700	985	2,715	158	77	YL49	4
7	G3XZW/P	2,978	2,403	575	293	19	YK05	4
8	G8OHM	2,450	105	2,345	21	86	ZM41	5
9	G3WTP/P	2,195	885	1,310	177	70	ZM68	5
10	GJ3DVC/P	2,006	1,401	605	141	13	YJ60	5
11	G8AZA	1,907	1,162	745	140	25	ZO69	2
12	G8HGN	1,716	341	1,375	93	65	AL31	3
13	G3OUL	1,637	427	1,210	83	42	YN46	3
14	G3WKF/P	1,375	—	1,375	—	27	XK56	4
15	G8OGL	1,159	894	265	147	22	ZL47	2
16	G3AHD	1,139	889	250	139	20	YN46	9
17	G4EEE	1,021	606	415	139	23	ZL55	3

144MHz Single-operator

Posn	Callsign	Points	QSOs	QRA	Pwr o/p	Best dx km
1	G8KMW	2,463	352	AM51	200	540
2	G8JAG/P	1,839	244	YO65	18	530
3	GW4GTE	1,597	240	YN65	350	440
4	G8IQO	1,411	151	AK12	250	625
5	G4FES	1,389	195	YK04	200	725
6	G3NAQ	1,248	236	ZL34	100	480
7	GI8KIA	1,147	87	XO21	160	723
8	G8LZA	932	257	ZL59	100	375
9	G2HIF	923	158	ZL33	120	479
10	G8KWC	669	127	ZL32	60	518
11	G4ERX	646	115	AL22	30	465
12	G8MFJ	588	133	ZL41	70	500
13	G8NRP	577	125	ZL24	3	419
14	G8LGL	566	110	YL46	80	529
15	G8NSL	537	103	YM59	50	525
16	G8LVM	536	114	ZM14	10	475
17	G8NPM	524	112	AL33	40	430
18	G8KSS	447	87	YL38	3	420
	G8JVM/P	447	95	ZL31	3	458
20	G8KPZ	408	125	AL52	60	498
21	G8BIJ	381	95	ZL48	12	362
22	G4DDL	343	102	ZL47	3	340
23	G8NXM/A	311	46	XK56	14	400
24	G8CUG	305	72	ZL58	8	375
25	G8BJG	283	65	AL41	10	310
26	G8NQP/A	270	60	ZL71	5	273
27	G3FPK	265	27	ZL60	50	650
28	GW8NSF	200	45	XN59	12	437
29	G8JEQ	147	57	AL31	20	325
30	G8FAT/M	133	20	ZL39	12	360
31	G8NNJ	109	43	AL31	16	225
32	G8OMI	91	25	ZM71	12	180

144MHz Multi-operator

Posn	Callsign	Points	QSOs	QRA	Pwr o/p	Best dx	No. of ops
1	G3PIA/P	4,340	560	ZL33	400	702	4
2	G3PMH/A	3,855	506	AM21	400	575	4
3	GW3OXD/P	3,537	461	YM54	150	500	4
4	G3UNU	3,191	480	ZM04	400	527	4
5	G3ZIG/A	3,101	360	AM27	400	680	5
6	GW4GMO/P	2,678	386	YL05	150	570	3
7	GW8CSA/P	2,574	389	YN75	400	626	7
8	G3FKI/P	2,421	415	AL21	100	545	4
9	G4ERP/P	2,258	374	ZL01	200	505	6
10	G8LTA/P	2,113	370	ZM24	80	300	4
11	G4GTH/P	2,097	292	YK19	100	578	3
12	G6HH/P	1,668	258	AK03	10	490	11
13	G8MZV/P	1,619	287	ZL11	40	480	3
14	G8BBC	1,450	344	ZL40	20	510	2
15	GU8NIS	1,401	150	YJ48	200	638	7
16	G3ERN	1,335	277	AL41	150	517	8
17	G8MWA/P	1,230	264	AL53	37	478	5
18	G4DSP/A	1,220	196	ZM10	120	495	5
19	GM4BWT/P	1,145	121	YP09	150	755	—
20	G8KSP	1,105	246	AL41	80	545	3
21	G6UW	1,014	168	AM61	50	480	7
22	G3ZBI	976	197	ZM03	100	560	6
23	G8LWU	932	182	ZM43	50	456	3
24	G3LRS	889	194	ZM25	400	370	—
25	G3OHM	842	175	ZM41	300	480	5
26	G8NAT/P	828	153	ZM38	50	510	5
27	G4CLB	795	198	ZL38	60	505	4
28	G8NIY	707	188	ZL10	300	462	3
29	G8KBQ	612	100	YL48	250	560	2
30	GW4ARC	592	107	YN53	12	450	4
31	G4EKT/A	487	88	ZN40	24	367	3
32	G4BRA/A	447	117	ZL57	40	354	2
33	G4DUR	82	28	ZO13	11	290	3

Listeners Contest results

Posn	Station	Points Total	Points 144MHz	Points 432MHz	QRA
1	RS15822	538	468	70	ZL40
2	RS34310	386	371	15	ZL80
3	RS20323	127	127	—	YN47

Checklogs received from G3WQG, G4BXN, G3CRC/P, GD5DZ, G8JGK, G8LYH, GI8OJG.

70MHz Open Contest rules

1900–2300/0700–1500gmt, 12–13 August 1978

All entries and checklogs to: VHF Contests Committee, c/o Mr R. Taylor, G4BEL, 12 The Rampart, Haddenham, Cambs CB6 3ST.

The VHF Manager's Trophy will be awarded to the leading station. The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11–22.

Listeners' contest. Rules 1–3 will apply.

3·5MHz Field Day 1978 rules

Members who enjoy low-power contests are invited to take part in this year's 3·5MHz Field Day.

1. The general rules for RSGB hf contests, published in the January 1978 issue of *Radio Communication*, will apply.

2. Eligible entrants. RSGB members resident in the British Isles. A maximum of two operators per station is allowed.

3. When. 0900gmt to 1600gmt, Sunday 16 July 1978.

4. Contacts. CW (A1) only in the band 3·510–3·560MHz.

5. Exchange. RST plus serial number starting at 001, location (defined by a place name), and county code (see p63 *Radio Communication* January 1978).

6. Scoring. Portable or mobile stations: 15 points per contact.
Fixed stations: 5 points per contact.

7. Power. The maximum power to the pa stage must not exceed 10W. The power for all parts of the station must be derived from dry batteries, accumulators, or "natural" sources (eg solar cells or wind generators). The practice of float charging batteries from petrol or diesel generators is not permitted. Entrants must specify how the power input limit was adhered to, especially when commercial equipment capable of running well in excess of 10W was used.

8. Antenna. The maximum height must not exceed 35ft above ground level.

9. Logs. Column (5) to be headed "Callsign of operator".
Column (6) to be headed "Location and county of station worked".

10. Address for entries. RSGB HF Contests Committee, c/o D. Thom, G3NKS, 37 Whittington Road, Benhall, Cheltenham, Glos GL51 6DB.

11. Awards. The Houston-Fergus Trophy will be awarded to the entrant with the highest checked score. Certificates of merit will be sent to the entrants placed second and third.

7MHz Contests 1978 rules

Licensed radio amateurs and SWLs throughout the world are invited to take part in the RSGB's 7MHz contests. Log and cover sheets may be obtained from RSGB, 35 Doughty Street, London, WC1N 2AE; UK members should enclose a large stamped, self-addressed envelope.

TRANSMITTING SECTION

1. The general rules for RSGB hf contests, published in the January 1978 issue of *Radio Communication*, will apply.

2. Eligible entrants. British Isles; RSGB members only.
Rest of world: All licensed amateurs.

3. Periods. Phone: 1200gmt 21 October to 1200gmt 22 October, 1978.
CW: 1200gmt 4 November to 1200gmt 5 November, 1978.

4. Sections. Single-operator only.

5. Bands. Phone: 7·04 to 7·10MHz.
CW: 7·00 to 7·04MHz.

6. Exchange. RS(T) plus serial number starting at 001.

7. Scoring. (a) British Isles stations with:
European stations: 5 points per QSO.
Non-European stations: 15 points per QSO.
British Isles stations may not work each other for points, or bonus points.

(b) European stations with:
British Isles stations: 5 points per QSO.

(c) Non-European stations with:
British Isles stations: 15 points per QSO.

8. Bonus points. (a) British Isles stations: 20 Points for each different country worked (RSGB list applies) with VE, VK, W/A/N/K, ZL and ZS call areas counting as countries for this purpose.
(b) Overseas stations: 20 points for each different British Isles prefix worked, ie G2, G3, G4, G5, G6, G8, GD2, GD3, GD4, GD5, GD6, GD8, GI2, GI3, GI4, GI5, GI6, GI8, GJ2, GJ3, GJ4, GJ5, GJ6, GJ8, GM2, GM3, GM4, GM5, GM6, GM8, GU2, GU3, GU4, GU5, GU6, GU8, GW2, GW3, GW4, GW5, GW6, GW8. The prefix GB will not count for bonus points.

9. Final score. QSO points plus bonus points.

10. Logs. Log sheets to be headed: date/gmt, callsign of station worked, RS(T) and number sent, RS(T) and number received, bonus points, QSO points. A summary sheet is required showing the countries or prefixes worked.

11. Declaration. Each log must be accompanied by the following declaration, "I declare that my station was operated in accordance with the rules of the contest, and in accordance with the terms of my licence". The declaration must be dated and signed.

12. Address for entries. RSGB HF Contests Committee, c/o D. Thom, G3NKS, 37 Whittington Road, Cheltenham, Glos GL51 6DB, England.

13. Closing date for receipt of logs.
Phone contest: 16 December 1978.
CW contest: 2 January 1979.

14. Awards. The Thomas (G6QB) Memorial Trophy will be awarded to the leading British Isles entrant in the cw contest. Certificates will be sent to the entrants placed first, second, and third, in the British Isles, European, and non-European sections of each contest.

15. Dispute. In the case of any dispute, the ruling of the Council of the RSGB shall be final.

RECEIVING SECTION

Rules as transmitting section except as superseded below.

1. The general rules for RSGB hf receiving contests, published in the January 1978 issue of *Radio Communication*, will apply.

2. Eligible entrants. British Isles: RSGB members only.
Rest of world: All SWLs.

3. Scoring. (a) British Isles SWLs should only log overseas stations in contact with British Isles stations. European stations logged score five points, non-European stations 15 points.
(b) Overseas SWLs should only log British Isles stations participating in the contest. European SWLs may claim five points per QSO logged, non-European SWLs 15 points per QSO logged.

4. Bonus points. As transmitting section.

5. Logs. Log sheets to be headed "date/gmt, callsign of station heard, RS(T) and number sent by station heard, callsign of station being worked, bonus points, QSO points". NOT MORE THAN 20 QSOs MADE BY ANY ONE BRITISH ISLES STATION MAY BE LOGGED, and the CALLSIGN OF THE STATION BEING WORKED MAY ONLY REPEAT ONCE IN EVERY SIX CONTACTS LOGGED.

6. Declaration. As transmitting section plus "I certify that I do not hold a transmitting licence".

SSB Field Day 1978 rules

1. The general rules for RSGB hf contests, published in the January 1978 issue of *Radio Communication*, will apply.

2. When. From 1500gmt Saturday 2 September to 1500gmt Sunday 3 September 1978.

3. Eligible entrants. Any group of RSGB members resident in the prefix zones G, GU, GJ, GD, GI, GM and GW. This is a multi-operator contest.

4. Operation. Must be from one portable station, not located in a permanent building and not using a mains supply. No equipment or antennas may be installed on the site prior to 24 hours before the start of the contest. This does not apply to the storage of equipment.

5. Contacts. SSB only in the 3·5, 7, 14, 21 and 28MHz bands.

6. Scoring. Each completed contact with Europe scores five points, outside Europe 15 points. The total number of points on each band is added to give a grand total. The total number of countries worked on each band is added to give a grand total. The final score is the grand total of points multiplied by the grand total of countries.

7. Logs. Separate logs for each band are required, together with a check list showing the countries worked on each band. Points will be deducted for NOT complying with this rule.

8. Entries. To be sent to RSGB HF Contests Committee, c/o J. Bazley, G3HCT, Brooklands, Ullenhall, Solihull, West Midlands B95 5NW.

9. Awards. Certificates will be awarded to the three highest-scoring groups, and to the leading check log from each continent.

10. Would groups welcome the introduction of a separate section with restrictions to antennas and equipment along similar lines to National Field Day?

DF Qualifying Event Rugby

Date: 18 June 1978.

Map: OS Sheet 152 1:50,000 series, Northampton and Milton Keynes.

Assembly: 1300bst for start at 1320 bst.

Location: Bucknell Wood, ngr 658448.

Intending competitors requiring tea are asked to notify Mr D. E. Newman, Haynes House, 78 High Street, Whittlebury, Towcester, Northants NN12 8XJ (tel 0327 857 350) not later than 12 June.

DF Qualifying Event Coventry

Date: 9 July 1978.
Map: OS Sheet 151 1:50,000 series, Stratford-on-Avon.
Assembly: 1300bst for start at 1320bst.
Location: Chesterton, 6miles SE of Warwick, ngr 355583.

Intending competitors requiring tea are asked to notify Mr G. Whenham, Lavernock, Chapel Street, Bishops Itchington, Leamington Spa, Warks (tel 0926 612806) not later than 2 July.

DF Qualifying Event Dartford Heath

Date: 23 July 1978.
Map: OS Sheet 188 1:50,000 series, Maidstone and the Weald of Kent
Assembly: 1300bst for start at 1320bst.
Location: Unclassified road off the A227, opposite Shipbourne Church, ngr 594522.

Intending competitors requiring tea are asked to notify Mr P. G. Wells, 25 St David's Road, Hextable, Swanley, Kent BR8 7RJ (tel 0322 62726) not later than 16 July.

Contests calendar

17-18 June	Microwave (Rules in May issue)
18 June	DF Qualifying Event, Rugby (Details in June issue)
24-25 June	Summer 1·8MHz (Rules in May issue)
1-2 July	VHF NFD and SWL (Rules in April issue)
9 July	DF Qualifying Event, Coventry (Details in June issue)
16 July	3·5MHz FD (Rules in June issue)
23 July	DF Qualifying Event, Dartford Heath (Details in June issue)
30 July	144MHz QRP (Rules in May issue)
6 August	DF Qualifying Event, South Manchester
12-13 August	70MHz Open and SWL (Rules in June issue)
20 August	DF Qualifying Event, Slade
2-3 September	SSB FD (Rules in June issue)
2-3 September	144MHz Open and SWL
10 September	RSGB Region 1 VHF
17 September	DF Final, Basingstoke
October-November	432MHz Cumulative
7-8 October	432/1,296/2,304MHz
14-15 October	21/28MHz SSB (Rules in May issue)
21-22 October	7MHz SSB (Rules in June issue)
22 October	70MHz Fixed
4-5 November	7MHz CW (Rules in June issue)
4-5 November	144MHz CW
11-12 November	2nd 1·8MHz
3 December	144MHz Fixed

Mobile rallies calendar

10 June—Scottish Amateur Radio Mobile Rally, The Palace of Art Bellahouston Park, Glasgow. Details from GM4FDM.

11 June—Elvaston Castle Mobile Rally, Elvaston Castle Country Park (five miles SE of Derby on B5010), from 11am. Talk-in stations G3EEO/P on 1·8MHz, G3ZBI/P on 144MHz fm S22, G8KGC/P on 432MHz fm SU8, S22, and GB3DY, the Derbyshire repeater, on RB10, will be available from 10am. Attractions include IBA Oracle demonstration, grand prize draw, lucky programme prize, RSGB bookstall, local repeater groups' stand, childrens' rides and entertainment, tombola, road safety exhibits, ATC demonstration, gymnastics display, gas-filled balloons, many other sideshows and full catering facilities. Rally free, but local authority car parking fee of 25p. Further details from G4CTZ, QTHR, tel Derby 71875.

18 June—Plymouth RC Mobile Rally, TAVR Centre, Lambhay Hill, The Hoe, Plymouth, Devon (near the Citadel). Details from G4EWZ.

18 June—RNARS Mobile Rally, HMS Mercury, Petersfield, Hants. Details from G4DIU, tel Havant 79464.

25 June—Longleat Mobile Rally, Longleat Park, Warminster, Wilts. Rally starts at 10am, and Dain Evans, PhD, BSc, FIM, G3RPE, RSGB President, will be in attendance. 144 and 3·5MHz talk-in stations will be operating. Prizes worth £150 to be won, plus a star prize of an HW202 144MHz transceiver kit, kindly donated by Heath (Glos) Ltd. All facilities of Longleat Park available to the family, with trade stands, and RSGB books available at rendezvous tent bookstall. Plenty of parking space adjacent to the new rally site, which is only a short walking distance from Longleat House. Details from G4FRG.

9 July—Upton Radio Rally. Details from M. Monro, G8DLL, 127 Monarch Drive, Worcester, tel Worcester 423276.

16 July—Hornsea ARS Mobile Rally, Hornsea School, Hornsea, North Humberside. Details from G8KFK.

16 July—RAIBC Picnic, Broadlands, Romsey, Hants. Details from G4COM.

23 July—Cornish Mobile Rally, Penweathers School, Truro. Details from Harry Adcock, 1 Bowglas Close, Ludgvan, Penzance TR20 8HD.

23 July—Anglia Mobile Rally, Stanway School, Winstree Road, Colchester, 10am. Details from G4DKI, QTHR, tel Colchester (0206) 67512.

30 July—Scarborough RS Mobile Rally, Scarborough Technical College. Details from G3RTN.

6 August—RSGB National Mobile Rally, Woburn Abbey.

13 August—Derby Mobile Rally.

20 August—Preston ARS Mobile Rally, Walton-le-Dale County High School, Bamber Bridge, Preston (one mile from M6, junction 29). Talk-in on S22. Usual attractions including bring and buy stand. Plenty of free parking. Doors open at 11am. Details from G8KTM, QTHR.

27 August—Torbay Mobile Rally, venue to be arranged. Details from G3UIQ, tel Newton Abbot 3025.

10 September—Stalybridge Festival Mobile Rally, Cheetham Park, Stalybridge, Cheshire. To be held in conjunction with the Stalybridge 1978 Festival. Details from G8KQP, QTHR.

10 September—Telford Mobile Rally, Town Centre Malls, Telford, Salop (approached via A5 exit off M6, A442 from N and S, or M54 from W). Free admission and free parking for 5,000 cars. Jointly organized by Telford & D ARS and Salop ARS, the rally attractions will include trade stands, exhibitions, "flea market" for private sales, licensed bar, refreshments and toilets, club stands; and a free coach ride to Ironbridge Open Air Museum, the largest of its kind in Europe. Further details from G8DIR, tel Shrewsbury 64273, or G3UKV, QTHR.

17 September—Peterborough R&ES Mobile Rally, Walton School, Mountsteven Avenue, Peterborough. Details from G3EEL, QTHR, tel 65423/62881.

24 September—Harlow & DARS Mobile Rally, Netteswell Comprehensive School, Harlow. Details from G8FRG, 232 Pennymead, Harlow. tel 0279 32486.

1 October—Great Lumley Mobile Rally, Community Centre, Great Lumley, Tyne & Wear. Trade stands, etc. Details from G8JLQ, QTHR.

Special event stations

G2NM, 24-25 June
Chichester & DARC has organized a station to celebrate the 50th anniversary of Empire Broadcasting.

GB3DTS, 8-9 July
The Barking Radio & Electronics Society will be exhibiting at the Dagenham Town Show at Central Park, Wood Lane, Dagenham. In addition to GB3DTS, rtty and AMSAT-UK, there will be extensive cctv coverage of the continuous arena displays. Further details from N. Dowsett, tel 01-594 6584.

The following special callsigns will also be on the air during June:

1-30 June	**GB3SFM**	Ryde, *HMS Mercury*, Longleat
3 June	**GB3SHS**	Bolton
9 June	**GB3STD**	St Dunstan's
	GB3SMR	Scottish Mobile Rally
	GB3RCS	Catterick
10 June	**GB3VRC**	Potters Bar Carnival
	GB3VER	St Albans
17 June	**GB3LAS**	Birmingham
	GB3YCC	York
18 June	**GB3RN**	*HMS Mercury* Mobile Rally
	GB3PCR	Plymouth
24 June	**GB3LEO**	St Ives
25 June	**GB3LMR**	Longleat Mobile Rally

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for 75p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

The closing date for each issue is the 1st of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue.

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS.

Do not post to RSGB HQ or Advertising Representative

FOR SALE

Excellent dx/vhf QTH, 400ft asl, overlooking Bristol Channel, superior detached chalet bungalow, gas central heating, 2/3 beds, large lounge, sep shack, 40ft tower; woodlands, golf course, riding stables, M5 access nearby; £24,500. G5UG, QTHR. Tel Weston-super-Mare 25961.

KW2000B, comp with psu, manual, Shure mic, spare valves, £175. G3SQM, QTHR. Tel Hambleden 443.

2m Yagi, 14-el, as new, £16. Set 12 SAJ110 ic dividers, £6. Organ pedal contacts, set 30, £8. Xtals, HC6U, all kHz, 18940, 71103, 12025, 8525, 26025, 19025, 15677·5, 75p ea. G3LWT, QTHR. Tel Hungerford (048 86) 3396.

National Panasonic GX600, fm/lw/mw, 3·9–30, bfo, df, antenna, timer, £50. MFJ ssb filter, £8. SSTV filter, £10. P. Barker, 11 Dipton Gardens, Tunstall Estate, Sunderland SR3 1AN. Tel Sunderland 226883.

KW 75Ω low pass filter, £7. Well-made mains psu, outputs 150V stabilized, 300V and 1,250V, suit LG300, £15 ono. Modern naval morse key, "click stop" gap adjustment, key click filter, free standing, £7. G3JFC, QTHR. Tel Crayford 522489.

Equipment of late G3UXN: Drake TR4 sideband tx/rx; AC4 psu; RV4 remote vfo; MN2000 antenna matching unit; Yaesu FT101B sideband tx/rx; KW1000 linear amp; Icom TC215 144MHz tx/rx; Modular Electronics ME202/25 144MHz linear; RCA AR88D, orig handbook; Heathkit SSB610 'scope unit; HRO rx, orig psu, six coils; Panda PR120 cw/a.m. tx, all band atu; BC221 frequency meter, calibration cards, handbook; Codar AT5 tx, ac psu; Codar PR30 160/10 preselector; 60ft Versatower, crankup, 3-el Triband and 10-el 144 beams; collection of radio equipment from 1920s or earlier; offers and enquiries to G3ABU, QTHR. Tel 08047 3401.

Yaesu FR50B and FL50B, 50W, hf, ssb, cw, a.m., tx 80–10m, rx 160–10m, xtal calibrator, both immac cond, hardly used, prefer buyer collects, £150. G8FPB, QTHR. Tel Nottingham 301097.

Vanguard, rf strip, 6-way xtal socket and switch, £4. Cambridge mic, amp, a.m. squelch boards, audio o/p trans, £1. Xtals: 8·0625, £1.50; 8·03625, £1. Sig gen E692, circa 1936, charts, offers? Garrard SP25 Mk 4 pinth and cover, £15. P and p extra. G8DLT, QTHR.

Europa B, 28/144, as new, £60. Sphinx cw/ssb tx (1964 CQ WW 160 winner), control unit, £50. New 432MHz linear, QQVO3/20 fully ventilated screened rf unit, no psus, £30. Buyer collects or carr at cost. G3GRL, QTHR. Tel Mansfield 20324.

FL200B tx, 240W p.e.p., good wkg order, £100. Will deliver reasonable distance. G3VDY, "Glenfarg", Selside Road, Horton-in-Ribblesdale, N Yorks BD24 0HT.

Roller coaster, mint unused cond, £5. *Wanted:* Quad Spider. G4CJY, QTHR. Tel 0494 30018.

Microwave Modules 144/432 varactor tripler, in good wkg order, with circuit diagram, £20 ono. Sentinel 144 converter, 2–4MHz i.f., £10. G8JJE, QTHR.

45ft commercial tower, non-tiltable, 4ft square at bottom tapering to 6in at top, £75. SAE for details, rotating gear may be available as extra. G3ION, QTHR. Tel Southampton (0703) 769 706.

SEL teleprinter, type LO 133, with punch and reader, modern unit similar to Creed 444, good clean cond, £45 ovno. Sentinel 2m converter, 28–30MHz, £10. KW dummy load, as new, £10. Pawley, 37 Denison Road, Feltham, Middx. Tel 01-751 2262.

Avometer, Model 9 Mk 4, good cond, with leads, less leather case, £65 ono. G3MA, QTHR.

Drake TR4C, £380. R4C, £280. AC4 with MS4. £70. DC4, £55. Or offers. G4CHP, QTHR. Tel 0508 470365.

Yaesu FRDX400 amateur bands rx, 160 to 10m, WWV, cb, spare valves, £130. Telford TC10 2m ssb and fm tx, £75. Datong speech clipper board, £12. SWR10 single meter swr bridge, £4. First two items buyers inspect and collect. G8KAX, QTHR (Essex).

QR666 gen cov rx, fitted fm tuner, xtal calib, full manuals, best offer. C828 1/10W mobile tx/rx hb synthesizer, carrying case, nicads, all 2m in 1kHz steps, £150, or part exch C146, KP202 etc. G4GHO, 5 Seymour Road, Broadfield, Crawley, Sussex.

FT101 Mk2, 160m, fan, 600Hz and MFJ filters, Holdings speech clipper, Bauer paddle, Asahi power/swr bridge, G-whip Tribander, 10m section and 160m, 80m and 40m coils, two whips, multimobile 40m coil and whip, offers? Chris Page, G4BUE. Tel Hassocks 2394 anytime.

KW2000B, psu, manual, Datong rf clipper, cw filter, Shure 201 mic, £220. G4GOU, 64 Oaklands Lane, Smallford, St Albans, Herts. Tel 0727 52768.

Liner 2, mains psu, preamp fitted, exc wkg order, any trial or sked, £115. G3MYY, QTHR (SW Essex). Tel 0277 821341.

FT101, as new, fan, spare o/p valves, manual, 160m mod kit, unused battery lead, £265. 2m Pye linear, two 4CX250Bs, blower, psu, 300W p.e.p., o/p potent, spare 4CX250B, £150. AR88D, mint, £100. Hudson 50W fm 5ch base stn, £50. All gwo. G3UPB. Tel 089 425 3323 or 022 870 474 evenings.

Gel-cell unspillable lead/acid batteries with Gel electrolyte, size approx 7in by 4in by 2in, 6V 7·5Ah, three months old, as new, cost new £23+ ea, two available, offers. GM8JUY, QTHR. Tel 0236 21022 (home), 0236 20111 extn 397 (office).

Clearance of late G2IM components: valves, resistors, fixed and variable capacitors, valve holders, meters, old type xtals, BC221, etc. SAE for detailed list. R. Radford, 22 Bishops Avenue, Elstree, Herts.

432MHz ssb transverter, MMT 432/28, £62. G3UBX, QTHR.

"Rad comm" '73, '75, '76; *SWM* '75, '76; *PW* '73, '75, '76; *Constructor* '75; £2 per year. BC221P, mains, orig charts, manual, £20. Buyers collect. G8KLI. Tel 021-472 4678.

Heathkit GR78 rx, 200kHz—30MHz continuous cov, good cond, £60. *Wanted:* AR88, must be in good cond. Paul Griggs. Tel Penn 3164.

KW107 atu, new cond, few months use only, £95. Carr paid. GI3ZCK, QTHR. Tel 0232 56221 ext 36, 9am to 5pm.

Eddystone Edometer (gdo), Heath SB640 vfo, 6K8 6SJ7 metal valves. Taylor, 8 Heythrop Drive, Middlesbrough.

JVC radio tv cassette, as new; Murphy and Winthronics new radio cassettes; small quantity new valves; Wien digital clock radio; Worlstar multi-band radio, mint; all letters answered. L.D. Ireland, "Carnhell", Camborne, Cornwall. Tel Praze 236, anytime.

Video monitor, 9in mono, s/state, 11in by 8in by 10in, mains, circuit, etc, £40. Sony 9in tv TV9-306UB, mains or 12V, wkg (just), circuits, £15. Europa 2m transverter, 28MHz in, 6–40pa, £48. PSU for above, spkr, ex-KW2000, £30. Buyers collect. Tel 01-648 5895, anytime.

Tandberg portable reel-to-reel tape recorder, PRO Reporters Model 2, 3-speed, mixing facilities, before and after monitoring, line-out etc, c/w mic windshield and carrying case, as new, battery and instructions, £60. T. Waller. Tel 0224 24715.

FR50B, £55. Marine rx 659/670, £20. Hartley oscilloscope, type 13A, £20. Prinz T1 Super 8 movie camera, £20. Carr extra. Stewart, GM8OKA. Tel 0290 21378.

Liner 2, fitted preamp, exc cond, low spurious, has been successfully used with 6–40A linear, £100. G8KGF, c/o 4 Cannon Street, Swindon SN1 3DD. Tel Swindon 2284, Monday–Friday 4–5pm only.

AR88, spkr, fm disc, £55. Panda Cub, much modded, cw only, £15. TCS12 rx, £15. Creed 7B teleprinter, covers, £15. BC221, £16. CD568 'scope, needs attn, £10. LB Vanguard, control box, mobile mount, etc, £20. Valve 2m converter, £4. Ex-radar 'scope, £5. Plessey stabilized ht psu, £4. 19in by 5ft 6in rack, £4. Tape recorder, wkg, £4. B44 on 70·26, £8. Prefer buyers collect. *Wanted:* KW2000A or similar. G4FUP, QTHR. Tel Southwater 730575.

F460 uhf base stn, wkg cond, vgc, offers around £100. Standard C828M, 11 xtals, h/b psu, exc cond, little used, £145 ovno. Pye PF1 tx/rx, nicads. G8JWN, QTHR. Tel 0472 56362, after 1800 for details. For C828M ring G8NUW. Tel 0472 57717, after 1800.

G3PLX vdu kit, all ics and pcbs, incl ready-built KBD diode matrix, also cursor kit, 7MHz xtal, edge connectors, uhf video modulator, £60. Twin meter swr 50Ω bridge, £6. Wilson 15m 4-el Yagi, £40. To be collected. GM3XNE, QTHR. Tel 0294 67326.

Class D wavemeter, int mains-driven psu, £10 ono. Quantity *Practical Wireless* and *Electronics*, '69 to '77, £5 ono. G8JED, QTHR. Tel Paul, Lincoln 21159.

Three-section lattice tower, approx 30ft total, £30 ono. High-band Pye Cambridge, comp with xtal, control unit, all cables, mic, wkg on a.m., £25 ono. G8KQB. Tel Carterton 841741. (No callers please).

FT2FB 12ch 144MHz tx/rx, fully xtalled with 11 simplex and R6, £130. R7 xtals for FT2FB, £3. NR56 144MHz monitor rx, £40. G8LXY, QTHR.

Shure 444 dynamic mic, high imp, data sheet, £10. G3GPB/A. Tel 0293 33571.

Pye Bantam, 3ch, £35. Stabilized psu for Bantam, £12. Hudson AM-108, vgc, unmodified, handbook, £12. Codar PR30, self-powered, £6. Codar PR30, needs psu, £4. Truxox tape deck, spare capstan motor, £10. G3PCA, QTHR. Tel 01-478 3741.

Slow-scan tv monitor, £45. G8CQE, QTHR. Tel 01-656 5285.

Trio TS520, £320; FT101E, with 600Hz cw filter, £375; both mint cond. Cooper, GM3VMB, 17 Castlepark, Fairlie, Largs, Ayrshire.

Icom IC22A, as new, in orig packing, toneburst, xtals S0, S20–24, R3-7, R7 rev, £135. Murata CFR 455H filter, £6. Feakes. Tel East Stoke (063 685) 230, evenings.

AR88 rx, with S-meter, orig cond, new valves, manual, £80 or swop. FR50B rx, 160–10m, calib, manual, £65 or swop. *Wanted:* Datong FL1 filter. J. P. Wright, 16 Headington Road, Earlsfield, SW18. Tel 01-946 1570, evenings.

KW2000, plus dc psu, £110. 829B with base, £5. *Wanted:* FT200, FP200. G3UUU. Tel 0223 834411.

TS700, unmodified, as new, orig packing, £300. G8GTY, QTHR. Tel Chesterfield 36496.

Storno 600, boot mount, 12ch, 10 xtalled, standard control box, full length leads, mic, xtal t/burst; second control box with full autoscan, lock in, lock out, etc, mic, xtal t/burst; exc cond, handbook, £155. Buyer collects. Tel 01-648 5895, anytime.

CCTV transistorized camera c/w plug-in modules, 25mm Cosmicar lens; metal cased 12in matching monitor; all professional built, c/w circuit sketches and leaflet; camera fault. Buyer views and collects. Offers. GM3VXR, QTHR. Tel Motherwell 65443.

Eddystone S770R, as new, with manual, £80 ono. G3AQY, QTHR (Lincs). Tel 0472 87268.

Trio TR7010, extra xtals, as new, boxed, £140. Trio TR7200G, S0, S20, S21, S22, S32, R3, R4, R5, R6, R7, auto toneburst, vgc, boxed, £140. *Wanted:* (or exch) IC202, IC215. G4BLJ, QTHR. Tel Brighton (0273) 503980.

Technical Associates rx bandpass filter, £10. G4BMX, QTHR. Tel 045-388 3808.

FDK Quartz 16 fm mobile tx/rx, boxed, exc cond, fitted 10ch, R3–R7, S0, S20–S23, toneburst, £120. G8OKG, QTHR. Tel 0632 482798.

LG300, comp with two rf units, Labgear psu and modulator, remote control, £35; RA1 rx, £25. AR88, spare valves and coils, part of manual £30; all in going order. G2FMJ, QTHR. Tel Potters Bar 55960.

Good home wanted for a Liner 2, preamp, mobile mount, handbook, £100 ono. Also its' shack mate, IC22A, 11ch, fitted toneburst, mobile mount, handbook, £115. G8KKA, QTHR. Tel Midsomer Norton 412874.

Mosley Atlas vertical antenna, £18. Hi-Mond BK100 bug key, new, £8. Valves: 4/125A, two, £5 ea; TT22, £3. Collect or carr at cost. Burgis, 11 Morningside Avenue, Portchester, Fareham, Hants.

Drake R4C, two extra filters, one year old, moderate use, marvellous rx, surplus to requirements, £390. G3REO, QTHR. Tel Coniston 329.

FDK Multi 11 tx/rx, almost new, in box, ⅝ whip antenna, magnet mount, five months old, real bargain, £130 the lot. Mike Kushner, 19 Malvern Drive, Stony Stratford, Milton Keynes. Tel Milton Keynes 564547.

150W a.m./cw Minimitter Mercury tx, pair TT21 in final, 80–10m, int psu, in good order, £20. *Wanted:* 2CQ Q-multiplier/loudspkr unit for Drake 2C rx. G4CHL, QTHR. Tel Gravesend 68233.

FT200, FP200, KW atu, lp filter, KW 50Ω load, mic, will split, £270 ono. Buyer collects. GW8CNG, QTHR.

18AVT/WB, £40. 6-el 2m Jaybeam, Stolle automatic rotator, 30ft aluminium pole, £45. 60kHz tuned whip, Rugby MSF, 50Ω, General Radio frequency meter and xtal calibrator 160kHz–60MHz, mint, £25. Fletcher, 62 Moorbridge Lane, Stapleford, Nottingham NG9 8GU. Tel 0602 397446.

Pye U450L uhf base stn, wkg cond, xtals on 433·2, £50 ono. Will deliver locally. G8BDM, QTHR.

FT101, 10–80m, matching spkr, little used, £250. KW E-Zee match/Asahi swr combo to suit, £25. Trio 2200G, mint, 5ch, nicads, charger, etc, £100. G3WPX, QTHR. Tel 0380 86 259.

FT101E with 350Hz cw filter, hardware, etc, boxed, 10 months old, genuine reason for sale, £425 ono. Please ring G4GIM. Tel Worcester (0905) 354727, evenings or weekends.

Europa B 2m transverter, £60. 2m Jaybeam, 6-el quad, £12. Technical Associates audio compressor, £12. Prefer buyers inspect and collect. G4CHK, QTHR. Tel Swindon (0793) 45269.

MMV432 70cm tripler, £15. MMV1296 23cm tripler, £28. G3HBW converter, 144–28MHz, £5. 70cm monitor rx, using Pye Europa board, mains/12V, RB4/SU8/RB14, circuit, £32. PM2–15 pa module, unboxed, £14. *Wanted:* TR3200G, 5XY/2M, MMT144/28 transverter, MBM48/70, PMH2/70, Arac AR10. G4FRE, QTHR.

Liner 2, with PA-3 preamp, exc cond, little used, comp with mobile mount, h/book and orig packing, £105 ono. Carr by arrangement. G3MOE, QTHR. Tel Cheltenham 24217.

TD224 rtty vdu, £150. Microwave Modules transverter, 70cm, 432–28–8, £100. Motorola D1 kit, full ram, £100. SWTPC dual floppy discs with software, built and tested, £800. 4K ram, built and tested, with sockets, £75. Barrel printer, with circuits, £75. G4DAW, QTHR. Tel Northampton 714821, anytime.

CSE top-band comp a.m./cw stn, transistor tx and rx, spkr, mobile ant and mic, carrying box, instructions/circuit, wkg order, sell comp only, £40 ono. Buyer collects. G3THC, QTHR. Tel Milton Keynes (0908) 316730, evenings and weekends.

Yaesu FT/FP200, all 10m, G3LLL clipper, pair new output valves, manual, orig packing, £240 ono. Trio 2200GX, little used, 9ch, nicads, case, manual, etc, £125 ono. Stolle 2010 rotator, £25. G3VSD, 2 Moss Close, Helmshore, Rossendale, Lancs BB4 4JQ.

Europa B and spare valves, mint, £65. Hudson 2m fm base stn, solid-state rx, most popular channels, £50. AR30 rotator, brand-new, never used, £35. All plus carr. GU4CHY, QTHR. Tel 0481 25815.

FRG7, £125; KW108 monitorscope, £45; Tech Assoc BP2 audio bandpass filter, £20; all items perfect, unmarked. G8WS, QTHR. Tel Maidenhead 23239.

Heath HW32A/HP13A, manuals, £85 ono. Creed 92 tape sender, manual, £12. Two multi-turn dials, £4. 10·7MHz filters, 44S/LQU/901B, £3 ea. Pye FM10, new, offers? All postage extra. G3LDI, QTHR. Tel Wymondham 603463.

Europa, vg, int transmit/receive antenna relay with PL259 o/p socket, spare pa valve, all leads, £55. *Wanted:* HW32(A), ac psu, in good cond. G4BZE, QTHR. Tel Exeter 51646.

FR50B rx, incl 160m, all 10m, plus 2m, xtal calibrator, exc cond, £80. Avo AVT portable valve tester, B9 output socket, adaptor for B5 valves, beautifully made, offers. GM3TBV, QTHR. Tel Blairgowrie 2520.

FTDX401, little used, in mint cond, manual, spare valves, orig packing, a really top-class tx/rx, for only £285. G4EWG, QTHR. Tel Constantine 588.

FR101S, 10m, comp, exch for FT221, etc. *Wanted:* TR2200GX and good oscilloscope. G3TBF. Tel 045 382 4853.

Trio TSO 510 tx/rx, remote vfo 5D, ac psu/spkr, cw filter fitted, recent new pas and alignment by Lowe, exc cond, £185 ono. G3RDT, QTHR. Tel Chichester 87704.

HAC K Plus rx, covers 9–170m, comp with batteries, spare valves, cond as new, £12. VLF tuner, good cond, £6.50. Hayman, 66 New Road, Abbeywood, London SE2. Tel 01-310 7355, after 7pm.

Liner 2 ssb tx/rx, psu, mobile mount, mic, exc cond, £115 ono. Morrison, 14 Woodcote Road, Tettenhall, Wolverhampton. Tel 0902 755634.

Yaesu FT2FB, 144·480, 144·500, 145·000, S20–S24, R0, R5, £125. Yaesu YC355D, 220MHz counter, mains/12V, £120. Ferguson Courier 12in portable tv, mains/battery, £40. G8FFI, QTHR. Tel Cosham 86184.

Trio 9R59DS, £35; also Lafayette HE30, £15; both rxs in exc cond. G3EFC, 2 Hartland Road, Barrow-in-Furness, Cumbria LA14 4ER.

QM70 Cobra transverter, 2m–70cm, hardly used, mint cond, £55. Xtals for SU8, (suit above with TR7200G or similar), £3. Hamgear preselector, immac, £9. G4GTJ. Tel Burnley 36146.

Big shack clearance: *PW* '66–71, *PE* '65–74, *RC* '66–71, *EE* '71–75, 20p ea plus large sae. Also many more incl *TV, SWM, ETI, RM, WW*, sae for details. Robin Bayley, 8 Field Lane, Kemberton, Nr Shifnal, Salop TF11 9LR.

FT200, FP200, £210. TS700, £270. G4DSC, QTHR. Tel 0765 2230.

Collectors' items: old Pye Trimeasy battery sig gen type 94 631, 100kHz–25MHz; QP240 valve; miniature early 1in National Company 'scope, 115V; 1924 *Practical Electricians Pocket Book*; three suitcases of early valves, some new; cash offers. G3MBL, QTHR. Tel 01-445 4321.

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Barlow Wadley XCR30, ac psu, £130 ono; consider part exch any good 2m fm rig. GM3LVG, QTHR. Tel Cumbernauld 20850.

Starphone M5, uhf, mobile, 5ch, xtalled SU20, RB6, RB10, auto toneburst, £95. G3USB. Tel Sheffield 890970.

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Collector seeks early radios, xtal sets, Osram Music Magnet 4 rx, Eddystone All World 2 rx, Eddystone four-pin coils, horn spkrs, Blue Spot inductor dynamic spkr, bright emitter valves, components, magazines, catalogues, books, circa 1922–1939. Norman Richardson, 2 Edna Road, Maidstone, Kent.

Heath SB600 or HS24 spkr, must be Heath spkr; Trio TX310; meter movement, model 425, Taylor 83C or old meter, good movement. *For sale:* Emsac CN3 4m 28·30, with factory-built psu, offers? GI6VU, QTHR.

"Rad Com" back issues, Jan '72 to Feb '78. G3SRZ, 30 Fore Street, St Blazey, Cornwall. Tel Par 3375.

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EC80 or 6Q4 valves, up to ten. BRS12959, 4 Branksome Hill Road, Bournemouth.

AR77E manual, loan or buy. G8NMX, QTHR. Tel 061-485 8760.

Blower for push pull 4CX250Bs, size important, please let me have dimensions in first instance.G8FEQ, QTHR.

Oscilloscope, bandwidth 5MHz, prefer dual beam, will collect within 50 miles. Ian Rhodes. Tel Dronfield (Nr Sheffield) 418790, after 6pm.

Heathkit SB10 sideband adaptor with handbook, for DX100U tx, prefer factory-assembled unit. G4GXQ, 6 Longsight Lane, Cheadle Hulme, Cheshire SK8 6PW.

Vibroplex bug; B40 rx. *For Sale:* Zenith Photo Sniper outfit; or exch. GW4ANO, QTHR. Tel Abersoch 2675.

TV Regonda b/w 6in VL100, case red, must be mint cond, your price paid if right, will collect but must be within reasonable distance. Paul Allen, 19 Wright Close, Wheathampstead, Nr St Albans, Herts. Tel Wheathampstead 3688.

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BC221 frequency meter, psu, calibration manual. Karagianis, 20 Lea Road, Sonning Common, Oxon RG4 9LJ. Tel Kidmore End 2085.

Heathkit OS2 'scope in fb cond, plus handbook. G3LOL, QTHR.

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2M TX & RX CRYSTAL AVAILABILITY & PRICE CHART

CRYSTAL FREQUENCY RANGE USE(TX or and HOLDER OUTPUT FREQUENCY	4MHz TX HC6/U	6MHz TX HC25/U	8MHz TX HC6/U	10MHz RX HC6/U	11MHz RX HC6/U	12MHz TX HC25/U	14MHz RX HC25/U	18MHz TX HC25/U	36MHz TX HC6 & 25/U	44MHz RX HC6/U	44MHz RX HC25/U	48MHz TX HC6 & 25/U	52MHz RX HC25/U	72MHz TX HC25/U
144·030 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·4/433·2 ..	a	b	a	b	b	c	b	c	b	b	b	b	b	b
144·480 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·800 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
144·850 ..	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·000/SO .	a	a	a	a	a	a	a	a	a	a	a	a	a	b
145·050/R2T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·075/R3T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·100/R4T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·125/R5T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·150/R6T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·175/R7T	a	a	a	b	b	a	b	a	b	b	b	b	b	b
145·200/R8T	a	a	a	b	b	a	a	a	b	a	a	b	a	b
145·300/S12	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·350/S14	b	b	c	b	b	c	c	c	b	c	c	b	b	b
145·400/S16	b	b	b	b	b	b	b	b	b	b	b	b	b	b
145·500/S20	a	a	a	a	a	a	a	a	a	a	a	a	a	b
145·525/S21	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·550/S22	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·575/S23	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·600/S24	a	a	a	a	c	a	a	a	b	a	a	b	a	b
145·650/R2R	b	b	b	a	b	b	a	b	b	b	a	b	a	b
145·675/R3R	b	b	b	a	b	b	a	b	b	b	a	b	a	b
145·700/R4R	b	b	b	a	b	b	a	b	b	b	a	b	a	b
145·725/R5R	b	b	b	a	b	b	a	b	b	b	a	b	a	b
145·750/R6R	b	b	b	a	b	b	a	b	b	b	a	b	a	b
145·775/R7R	b	b	b	a	b	b	a	b	b	b	a	b	a	b
145·800/R8R	a	a	a	a	a	a	a	a	b	a	a	b	a	b
145·95 .	a	b	a	a	b	b	b	b	b	a	b	b	b	b

Prices: (a) £2.36, (b) and (c) £3.20 + VAT (H).
AVAILABILITY: (a) and (c) stock items, normally available by return (we have over 5,000 items in stock). **(b)** Four weeks normally but it is quite possible we could be able to supply from stock. **N.B.** Frequencies as listed above but in alternative holders and/or non-stock loads are available as per code (b).
ORDERING. When ordering please quote (1) Crystal frequency, (2) Holder, (3) Circuit conditions (load in pf). If you cannot give these, please give make and model of equipment and channel or output frequency required and we will advise if we have details.

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With the ever increasing popularity of Japanese equipments we have further expanded our range of stock crystals. We can now supply for **YAESU** FT2F, F2F2FT, Ft2 Auto, FT224), most of the **ICOM** range and the **TRIO-KENWOOD** range. We can also supply from stock crystals for the **HEATHKIT** HW202 and HW17A.
YAESU FT221 CRYSTALS NOW IN STOCK, ALL AT **£2.95** + VAT (H). All popular channels—For repeater use advise xtal frequency required as earlier models have different shift xtals to later FT221R. We can also supply the crystal to give NORMAL "tune to RX" working (as FT221R). For 70cm we can supply the 1·6MHz shift xtal for direct use with a **MICROWAVE MODULES** MMT432/144 which we can supply for **£151.00** + VAT (H). **SPECIAL OFFER:** If ordered with transverter 70cm shift crystal FREE!!

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We are stocking the following channels RB0 (434·60/432·00), RB2 (434·66/433·05), RB4 (434·70/433·10), RB6(434·75/433·15), SU8 (433·20), RB10 (434·85/433·25), RB14 (434·95/433·35), SU18 (433·45) and SU20 (433·50)—TX and RX for use with: PYE UHF Westminster (W15U), UHF Cambridge (U10B), Pocketfone (PF1) and STORNO CQL/CQM 662 all at **£2.36** plus VAT (H). For the U450L Base Station we have the TX crystals for all the above channels plus the RX crystals for SU8 at **£2.36** plus VAT (H). The RX crystals for RB2, RB4, RB6, RB10, RB14, SU18 and SU20 for use in the U450L Base Station, together with the TX and RX crystals for the remaining SU channels (SU12-433.30-RTTY, SU16-433·40 and SU22-433·55) for all the above equipments are available at **£3.20** plus VAT (H) delivery as per class (b) 2m items.

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ALL + VAT 12½% EXCEPT MONITOR SCOPE, CLOCK, COUNTER, WATTMETER, + 8%

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MMC144/LO 2m converter	£20
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ATV435/51 converter	£24
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All 2m converters can be supplied with IF outputs of 2–4–12–14–18–28MHz 70cm models with IF outputs of 28–14–18– or 144MHz.

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IC22A 10W mobile	£145
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All transceivers + 12½% VAT

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2m with ph 259	£3.85 each
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SPECIAL OFFER. Constant current Ni-Cad chargers. Adjustable charge rate for AA or C type Ni-Cads. Ideal for C202/215, C146A, Trio, etc. Price **£8.35** + 8% VAT. p & p 50p.

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The "convenience feature" refers to the HF aerial socket on the Europa C which switches straight through to the transceiver when the Europa is switched off and giving no "plugging" change over between HF and 2 metres.
Power 200W input—Drive 200MW—NF 2dB—Gain 30dB. Complete to plug into Yaesu equipment. Price: **£100·00** + VAT = **£112·50**. Ex stock.
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"The best pre-amp—bar none." "It makes MP a readable signal from nothing." "It has removed the holes out of my journey to work." "I now have a choice of four repeaters instead of one." Comments like these substantiate our belief that our pre-amps provide the best value for money.

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THE SENTINEL STANDARD 2 METRE PRE-AMPLIFIER
The same circuit as above, but without the rf switching. Price: **£8·75** + VAT = **£9·85**. IN STOCK. These pre-amplifiers are in stock for Marine Band and Satellite Band. Other frequencies to order.

PA3 2 METRE PRE-AMPLIFIER
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THE SENTINEL AUTO HF PRE-AMPLIFIER
With a change over relay which is operated by your transceiver relay for direct connection in your aerial co-ax. Price: **£10·50** + VAT = **£11·81**. IN STOCK.

THE SENTINEL STANDARD HF PRE-AMPLIFIER
Same circuit as above, less relay. Price: **£8·00** + VAT = **£9·00**. IN STOCK.
These prices are for Belling Lee sockets. For SO239 sockets add **£1·50** + VAT = **£1·69**.

THE SENTINEL 2 METRE POWER AMPLIFIER AND PRE-AMPLIFIER
The power amplifier provides 40 watts output when driven by a 10 watts transceiver. The pre-amplifier is the same as our Sentinal Auto 2 metre pre-amplifier. It contains an rf operated switch with a delay for SSB and operates on all modes.
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We also have a 2 watt in, 12 watt out version.
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Very popular and versatile little unit. Handles 15–5000 Ohms. BALANCED or UNBALANCED. SO239 and 4mm terminals for co-ax or wire feeders. And rated up to 1kW. Price: **£34·50** + VAT = **£36·85**. IN STOCK.

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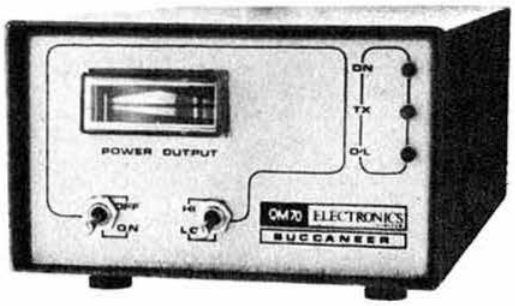

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CO-AX CABLE type UR57 75 ohm 10mm dia only 2·2 db loss > 145MHz, 4·2 db loss @ 432MHz (both figures quoted per 100ft.). Due to large purchase we can offer at a very low price of **£12.00** + £2.00 carriage per 100 yard drum. Brand new and unused.

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