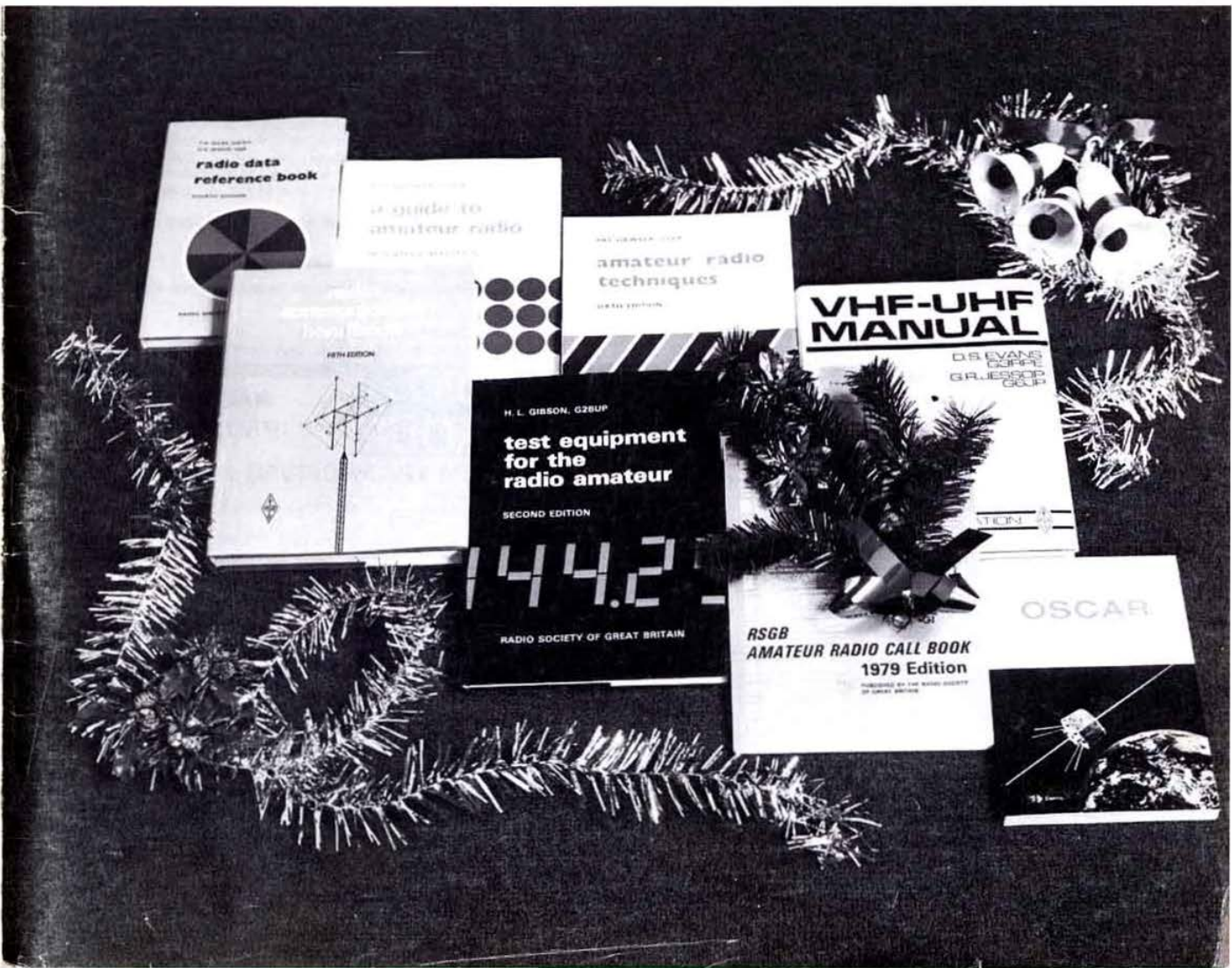
December 1978

radio communication

journal of the Radio Society of Great Britain

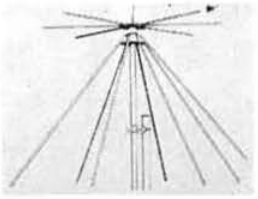
RSGB BOOKS FOR CHRISTMAS

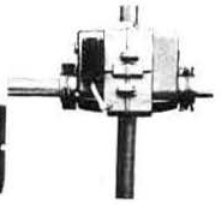
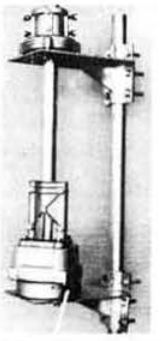


NEW RANGE OF READY-TO-OPERATE EQUIPMENT AVAILABLE

VHF COMMUNICATIONS

NEW NORTHERN AGENT APPOINTED

We are pleased to announce that Sota Communication Systems Ltd of Liverpool are now also appointed agents in the U.K. It is expected that they will attend many of the Northern and Scottish rallies with a display of items available.

VHF Receiver—UKW101B—10 channel scanning hand-held 2m receiver with telescopic whip, nicads & charger, channel display by 7-segment LED—**£102.50** + xtals £2.50 ea.

Airband Receiver—UKW8/AM—8 channel scanning receiver covering 118·136MHz for mains or 12V operation—**£151.00** + xtals £4.95 ea.

1296MHz Transverter from 28MHz·300mW o/P, 28dB gain on receiver, 12 volt operation—**£180.00.**

144MHz Linear Amplifier—80W o/P for 10W drive, selectable bias for FM/SSB—**£112.50.**

Discone Aerial covering 80·480MHz, 3·4dB gain—**£43.45.**

Polarisation Switching Box for horizontal, vertical, diagonal and circular polarisation from 2m crossed yagis—**£51.80.**

Elevation Rotator KR500 for elevating beams when using OSCAR, EME etc. **£137.15.**

Rotator Platform set—to increase loading on KR400 and KR600 type rotators, a pair of platforms with an additional alignment bearing—**£53.40.**

ALL PRICES INCLUDE VAT BUT PLEASE ADD £1.00 CARRIAGE.
New Express Telex Service now available for items to be ordered from Germany—Write to VHFC at Wallington for details.

NOW AVAILABLE—the AUTUMN 1978 edition

Which includes articles on
2m Synthesisers in CMOS
Frequency Multipliers
Interdigital Filters
Meteosat Reception
23cm Power Amplifier

Send £1.30 for a copy of this edition or £4.80 for complete 1978 volume
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 AND ENQUIRIES FOR ALL ABOVE ITEMS SHOULD BE SENT TO EITHER

VHF Communications
Dept. 802, 20 Wallington Square, Wallington Surrey SM6 8RG
OR
Soto Communication Systems Ltd
26 Childwall Lane, Bowring Park, Liverpool L14 6TX

COMPONENTS FOR

AMATEUR RADIO BULK BUYING GROUP

RADCOM PROJECTS

MULTIMODE 1600 TRANSCEIVER

(Oct/Nov 1977 Rad Com)
Special price for complete kit, **£220.00.**
Receive only kit also available, **£195.00.**
PCB, **£13.55;** QC1246AX, **£31.50;** Less carrier xtals, **£27.50;** 8545kHz xtal, **£3.00;** 400ns delay line, **£1.70;** MD108, **£6.65;** RS12V Relay, **£2.25;** Toroid **30p. Minikit 3** (R's and C's). **£23.45.**

G3ZVC SSB TRANSCEIVER (Sept·1974 RadCom.)

PCB, **£2.80.** Toroid, **95p.** MD108 Ring Mixer, **£6.65.**
QC1246 AX Filter, **£31.50** or YF·90F Filter, **£22.50** (Not recommended for HF Band use in this project).
SPECIAL PRICE FOR COMPLETE KIT, £86.85 or **£78.30.**
Also available—but not included in kits: *Reprint of article,* **15p** plus SAE, 25Ω Loudspeakers—2½", **£3.10.** Metal Cabinet, **£2.00.** Min. 50Ω coaxial connectors—PCB mount socket, **63p** and plug, **£1.17.**

G3TDZ FM TRANSCEIVER (March 1978 Rad Com)

Most parts available:
PCB's: Audio, **£2.00;** Rx, **£4.85;** Tx, **£2.55;** 9MHz Osc, **95p.**
KITS available as follows:
Receiver (less 10·245 xtal & 455kHz coil), **£43.35;** Transmitter, **£25.65.**

G3TDZ ADD-ON POWER AMP

(June 1978 Rad Com) Complete kit including aluminium case, **£14.10.**

G3XGP MINI D.F.M. (June 1973 Rad Com)

PCBs: I/P Amp, **£1.70.** Display, **£1.90.** Clock: 1MHz, **£1.80.**
Special price for complete kit (1MHz Clock version), £47.95 (+**50p** for 30MHz Ic's).
Also available, but not included in kits:
Reprint of article (June 73) **20p** *plus SAE;* 74196, **£1.62.**

All prices include VAT but please add 30p post. Data—Catalogue now 45p + large 18½p SAE.
DEPT. 802, 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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Contributions **(including Members' Ads)** and all correspondence concerning the **content** of *Radio Communication* should be addressed to:

The Editor, RSGB,
88 Broomfield Road,
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Essex CM1 1SS

Tel 0245 84938

Office hours: 0845-1645

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Closing date for contributions unless otherwise notified: 1st of month preceding month of publication

YAESU MUSEN

A VERY MERRY CHRISTMAS

AN FT901DM HOME STATION

The FT901DM Transceiver offers unparalleled receiver performance combined with state-of-the-art transmitter design. The receiver features rejection tuning, dual filter variable bandwidth tuning, and audio peak frequency tuning for maximum rejection of unwanted signals. The transmit side includes a built-in Curtis 8043 IC Keyer, RF speech processor, and a ten-second "TUNE" position timer which prevents damage to your finals due to excessive "key down" periods during tune up. Other advanced features include frequency memory for instant recall or split operation, an advanced noise blanker and offset tuning for either transmit or receive frequencies. Yaesu's up-to-date modular construction utilizing plug-in circuit boards minimizes service time. All modes (USB, LSB, CW, FSK, AM, and FM) and all bands (160-10 metres plus MSF receive) are provided.
A full list of matching accessories is becoming available to complement the FT901. In the illustration above (looking from left to right) we have: the FC901 Antenna Tuner/Power/SWR meter, the FV901DM External VFO, (with 40 memory channels), auto scanning and three speed manual electronic tuning, the FT901DM itself, the FTV901 transvertor (covering 4m, 2 and 70, with repeater shift etc. etc.) and the SP901P external speaker with phone patch (Normal speaker SP901 available). Not shown is the YO901 monitor scope, which in addition to AF, IF, and RF monitoring offers panoramic (spectrum analyser) facilities.

FT901DM STAR FEATURES

Squelch on FM
Variable width IF
Power/IC/ALC meter
Output Power Control
Analogue Readout to 1kHz
12V DC Inverter in-built
Semi Break-in & Side Tone
Full line of accessories
Rejection Tuning
Built-in Speaker
180W PIP 80W AM/FM
RF Speech Processor
100-230V AC 50 or 60Hz
Digital Readout to 100Hz
PLL Frequency Generation
100-25kHz Crystal Calib.
AGC Slow/Fast/Off
Keyer IC built-in
Variable Audio Peak
RF Negative Feedback
Advanced Noise Blanker
Vox Front Panel Control
AMGC Side Noise Eliminator
±5kHz Clarifier (T, R, & TR)

FT901DM CONSERVATIVE SPECIFICATIONS

FREQUENCY RANGE
160-10M (2MHz on 28)
CB (27·0-27·05) MSF RX
MODES
SSB (A3, USB & LSB), CW (A1), FSK (F1), FM (F3), AM (A3h)
VOLTAGE REQUIREMENTS
100-117/200-234V 50/60Hz
13·5V DC (Negative Earth)
CURRENT REQUIREMENTS
AC 45W RX, 70W SRX; 320W TX
DC 1A RX, 5A SRX, 21A TX
SIZE
13·5" × 6" × 13·5"
WEIGHT
40lb
ANTENNA IMPEDANCE
50-75 ohms

PASSBAND TUNING
2·4kHz to 300Hz Cont.
BANDWIDTHS (with filters*)
SSB 2·4kHz (1·7:SF)
CW* 0·6kHz (2·1:SF)
AM* 6·0kHz (2·1:SF)
FM 12kHz (2·1:SF)
CROSS MODULATION IMMUNITY
80dB (20kHz off 20dB Sig. at 14Mhz)
DESENSITIZATION
90dB (20kHz off 20dB Sig. at 14MHz)
SENSITIVITY
0·25μV for 10d S/N
IMAGE RESPONSE
1·8-21MHz better than −60dB
28MHz better than −50dB
IF REJECTION
Better than −70dB

THIRD ORDER DISTORTION
Better than −31dB
TRANSMITTER POWER
180W PIP A1, A3,
80W IN A3h, F3, F1
CARRIER SUPPRESSION
Better than −40dB
UNWANTED SIDEBAND
Better than −50dB (at 1kHz)
SPURIOUS OUTPUTS
Better than −40dB
STABILITY
300Hz Cold, 100Hz/½Hr (AWU)
NEGATIVE FEEDBACK
6dB at 14MHz
MICROPHONE IMPEDANCE
500-600 ohms

YAESU MUSEN

TO ALL RADIO AMATEURS

CPU2500R

THE ULTIMATE IN 2m FM

CPU2500RK illustrated

The CPU2500RK is the ultimate in 2 meter FM transceiver design. Basically it is a 25 Watt transmitter, a highly sensitive receiver, and a 5kHz step digital synthesizer. This is only half the story. C.P.U. stands for Central Processing Unit and it is this micro-computer that governs the synthesizer functions. Plus and minus 600kHz repeater shifts are of course available and you can programme in any other split (up to 4MHz)! Four normal memory channels with back up facilities are provided as is an automatic, short UK burst, and a long manual European mainland repeater actuation tone system. Frequency control is possible either by rotating the main tuning knob (optically coupled as made famous in the FT227R), by using the up/down push buttons on the front panel, by using the up/down push buttons on the microphones or by tapping in the desired frequency(s) on the keyboard microphone. Should you wish to use the scanner it will stop on an occupied or the first vacant frequency, looking at the memory channels or across the band. The CPU2500R comes in four versions as detailed below:

CPU2500R Standard mic 25W/CPU2500RK Keyboard mic 25W/CPU2500RS Standard mic 10W/CPU2500RKS Keyboard 10w.

CPU2500R STAR FEATURES

C.P.U. Controlled Tuning
5kHz Synthesized steps
Six digit frequency readout
L.E.D. readout of memory channel
Photo encoded knob tuning
Push Button electronic tuning
Scans up or down band
Seeks empty or busy channels

Four normal memory channels
Additional memory for 'odd' split
Can scan memory channels only
±600kHz plus any split (to 4MHz)
Standard mic with scanner controls
Keyboard microphone optional
Sub audio tone squelch option
Manual and Auto tone burst

10 or 25 Watt Tx options
High or low ($\frac{1}{10}$) power
Low noise Mosfet, RF
Lamps for 'On Air'
Lamp for 'Busy Channel'
Full VSWR Protection
Reverse Power line protection
Side Connector for Keyboard

CPU2500R CONSERVATIVE SPECIFICATIONS

FREQUENCY RANGE
144 to 146 or 148MHz
FREQUENCY STEPS
5KHz
VOLTAGE REQUIREMENTS
13·6 volts ± 10%
CURRENT CONSUMPTION
0·5A RX, 6·0A H-2·5A LTX(25)
CASE SIZE
7"W × 2¾"H × 10½"D

SENSITIVITY
0·3μV for 20dB QS
SELECTIVITY
12kHz −6dB (2:1SF)
INTERMEDIATE FREQUENCY
10·7 and 455kHz
AUDIO OUTPUT
1·5W at 10% T.H.D.
A.F. OUTPUT IMPEDANCE
8 ohms

POWER OUTPUT
25/3 or 10/1 Watts
SPURIOUS EMISSIONS
Better than −60dB
MODE
FM (F3) Variable Reactance
DEVIATION
5kHz set (16kHz max.)
TONE
1750Hz (Auto and Man.)

AMATEUR ELECTRONICS UK
508-514 ALUM ROCK ROAD
ALUM ROCK,
BIRMINGHAM, 8

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GREAT VALUE
GREAT PERFORMANCE

...AND FRIENDLY SERVICE!

Den Tron MLA 2500
160–10m. 2kW PEP
£695 inc. VAT
In Stock Now

- ★ 1kW DC continuous
- ★ ALC circuit
- ★ 3 speed cooling
- ★ Military specifications
- ★ 234v./117v. AC
- ★ 2 of EIMAC 8875 tubes
- ★ R.F. Wattmeter RMS/PEP
- ★ Size 5¼" × 14" × 14"
- ★ Weight 47lb.
- ★ Ideal for SSTV/RTTY
- ★ 3rd order down 30dB +
- ★ 40 watts drive for 1kW

Den Tron Military MT 3000A
160–10m. 3kW
£275 inc. VAT
In Stock Now

- ★ Antenna selector (5)
- ★ Exciter dummy load (250W)
- ★ 3kW continuous
- ★ 3 core balun
- ★ Tuner by-pass switch
- ★ Compact 5¼" × 14" × 14"
- ★ Watt meter 200W/2kW
- ★ Forward/Reverse Watts
- ★ Matches any antenna
- ★ Military construction

FRG7 RECEIVER

Choose From The Yaesu Range:

FRG7: £210
FRG7000: £364
FT901DM: £960
FT901DE: £781

ADONIS MICROPHONES... KEEP PEOPLE TALKING!

M802G (illustrated) is the top of the range. Beautiful solid construction yet slim lines and the famous electronic "Touch to Talk" are but a few of its features. In addition, a 3-way switch provides normal operation, medium or high compression. A meter built into the base monitors the compression. The high quality condenser insert is enclosed in a noise cancelling housing and 3 switched outputs are provided so that the microphone can be fed to 3 different transmitters. Each output has its own output level control. If you want a microphone to match that new rig then we have the answer.
£59 including VAT. M502G **£39.95** inc. VAT.
(SO2 is less meter & 3-way switch)

IN STOCK AGAIN
NAIGAI 2200 Linear
£481
(carriage £4.50)

- ★ 230v AC
- ★ 4CX-350F tube
- ★ Receiver pre-amp
- ★ 10-13 watts drive
- ★ SWR meter built-in
- ★ 500W PEP input
- ★ 400W FM/CW input
- ★ Fan cooled
- ★ 12v DC output
- ★ Covers 144–146MHz

FDK MULTI 2700
£499

SEND FOR 4-PAGE BROCHURE

FRG7000 RECEIVER

FT901DM TRANSCEIVER

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THE MOST ADVANCED FM RIG!

£289 inc. VAT (Remote display **£19.95**)

Over 25 watts of high quality FM output at your finger tips. Consider its features and learn why more people are trading up to the 800D. ★ Frequency control is electronic from the centre master control—no rotating dial switches to wear out. ★ Remote frequency control is available from the new "up/down" microphone buttons. ★ Bright LED readout gives true frequency display in 5kHz steps. ★ True frequency counter reads both transmit and receive frequencies in use. ★ Instant normal or reverse repeater operation—no returning! ★ Xtal controlled tone-burst. ★ Variable power control 1 watt to 25 watts (30 watts typical). ★ Dual non-volatile memory that lasts even with power off! ★ 144-148MHz coverage for 70cms transverting. ★ Additional programmable frequency shifts. ★ Simple auto-scan modification available. ★ Remote digital "head-up" display for dash board mounting. ★ Plug-in modular construction for ease of servicing. ★ Solid block power module... There are cheaper rigs available, but is that really what you want?... Send an SAE for the answer!

2m SSB/CW PORTABLE

MIZUHO 2M SSB HANDHELD

FDK PALM II

2M FM

SIZE: 6" × 2½" × 1¾"

WEIGHT: 1lb 3oz

COMPARE ITS VALUE
COMPARE ITS FEATURES

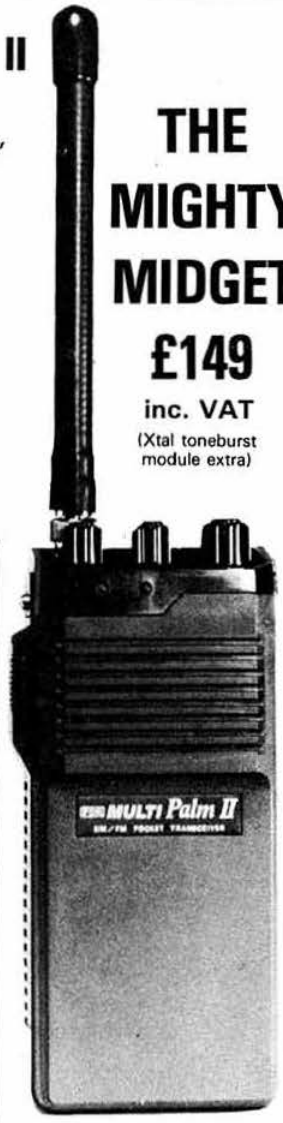
- ★ **Smallest hand-held available**
- ★ **Over one watt output**
- ★ **AC charger included**
- ★ **6 channel capability**
- ★ **Simplex or ± 600kHz switch**
- ★ **BNC aerial socket**
- ★ **Flexible whip supplied**
- ★ **S0/20/22 supplied**
- ★ **Extra channels cost £2.50!**
- ★ **Xtal controlled tone-burst**
- ★ **Ni-cad battery pack supplied**
- ★ **High quality condenser microphone**

THE MIGHTY MIDGET

£149

inc. VAT

(Xtal toneburst module extra)



TRIED UHF?

MORE REPEATERS BETTER CONTACTS

FDK **Multi-U11**

10 watts 70cms. FM
Auto Scan
10 channels fitted tone-burst—RIT **£259** inc. VAT

HP Terms:
deposit £52

MIZUHO SB-2M—ONLY FROM SELECTED DEALERS

We are pleased to announce that we are stocking the dandy little MIZUHO SB2M SSB 2m hand-held. This is a real winner and its internal construction is superior to its competitors—so much room—so neat—and its performance is quite delightful. Never heard of MIZUHO—well until now this Japanese firm have specialised in QRP HF equipment but their first VHF product is really something. Of course, you won't find it on every dealers shelf. MIZUHO are pretty particular who handles their products—we pride ourselves in being selected as one of their distributors. Space here is somewhat limited to give full information, but if 2m SSB from the office, on country walks, on the tops of mountains, etc. appeals to you and **£155** inc. VAT is not too much for you perhaps you had better send us an S.A.E.

FITTED 144·20—144·40 Extra ranges £3.00 and complete with English Handbook.

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BE THE FIRST WITH A Western DX-5Y

WE AT WESTERN are proud to present a new five-band vertical antenna—the DX-5V—to complement our highly successful range of triband beams.

IF you don't have room for a tower and rotary beam, then the WESTERN DX-5V is for you.

THE WHOLE LENGTH of the DX-5V is active on all bands except 15 metres due to its unique design. On 15 metres the DX-5V is a full physical quarter-wave.

HEAVY DUTY air-wound inductors permit correct resonance on 80 and 40 metres and can be adjusted for lowest SWR on these bands.

SLIM-LINE configuration makes the DX-5V "neighbour acceptable" and requires no guying. A tubular mounting post is provided with the antenna.

MATCHING to a 50 ohm feed-line is achieved through a length of 75 ohm RG11/u coax (supplied) which is terminated with a PL259 plug and in-line connector (back-to-back SO-239).

DC GROUNDING is provided via a base shunt inductor to alleviate static build-up problems.

DX-5V SPECIFICATIONS

Frequency bands 80-10 metres inclusive

Bandwidth (for VSWR 2:1 or less):

Entire 40, 20, 15 or 10m bands

60-100kHz on 80m band

Power rating: 1200W p.e.p.

VSWR at Resonance: 1:5:1 or less on all bands

Feed impedance: 50 ohms (matching line included)

Connector: SO-239 on end of matching line

Height: 7·8m (26ft)

Shipping weight: 6kg (13¼ lbs)

THE NEW 5-BAND VERTICAL ANTENNA the Western DX-5V

★ ★ ★

★ A NEW CONCEPT IN VERTICALS

★ FULLY AUTOMATIC BANDSWITCHING

★ LOW VSWR ON ALL BANDS 80-10 METRES

★ HEAVY DUTY RESONATORS

★ DC GROUNDING FOR STATIC PROTECTION

★ SLIM, INCONSPICUOUS DESIGN

★ NO GUYING NECESSARY

★ ★ ★

PRICE: (VAT and DELIVERY INC)

ONLY **£59.00**

MERRY CHRISTMAS TO ALL OUR CUSTOMERS

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LOUTH: 9-12; 1-5pm Mon-Fri. By appointment Sat 9-12.
LEICESTER: May's Hi-Fi, Churchgate (Tel: 0533-58662). Mon-Sat 9-6pm; closed Thurs.

A VERY HAPPY CHRISTMAS

THE REST OF THE RANGE ARE LEADERS IN THEIR FIELD TOO:—

IC-215

The IC-215 is getting more and more popular also as it combines the advantages of a portable, which can be operated anywhere, with the ability to double as a low power base station by virtue of its 3 Watts of output and SO239 antenna connecter on the back. Of course there are facilities to operate it from an external power supply, and if it is fitted with Ni-Cads you can arrange to trickle charge these at the same time. The batteries used are of a sensible size being C type (or UII) instead of the 'penlight' batteries used by most of its competitors. This gives at least three times the operating power when you are away from home which you will appreciate if ever you have run out of battery in the middle of a QSO! It comes already crystalled up for 12 channels, S20, S22 and all the repeater channels 0 to 9. We think the extra power and larger batteries far outweigh the advantages of having the extra channels produced from a synthesizer.
Less VAT = £159.11 With VAT = £179

IC-202

ICOM's range of sideband portables has been recently expanded. The well known and tested IC-202E has now been improved in the form of the IC-202S which has lower side band fitted also and provides sidetone on CW. The receiver has been hotted up making it even more suitable for use as a base station, either barefoot or as a prime mover. The new IC-402 is the 70cm version of the 202S giving the same facilities as its 2m cousin over the range 432-435·2 MHz. Both use a very stable VXO circuit, to give fully tuneable coverage of the band in 200kHz segments and both have extremely clean signals so that using them to drive a linear to the full legal limit presents no problems. We are very impressed with both the 202S and the 402.
The IC-202E was good . . . these are even better!

IC-202E	Less VAT = £150.22	With VAT = £169
IC-202S	Less VAT = £192	With VAT = £216
IC-402	Less VAT = £256	With VAT = £288

IC-402

IC-701PS **IC-701**

IC-RM3

The IC-701 with its power supply the IC-701PS and the remote, micro-processor controlled IC-RM3 make the ideal station for HF. By no means the cheapest on the market, this transceiver system, which has all the facilities normally listed as extras with other systems, is getting a very good name for itself throughout the world. The quality is typically ICOM and the sheer pleasure of driving one of these beasts has to be tried to be understood. The size is so compact too, so that mobile operation with 100Watts of RF into the antenna is easy to achieve. The RM3 is the luxury extra for the man who wants the lot. It provides automatic remote band changing and the facility to key in any allowed frequency on any band and to store up to four. Scanning up or down the band over a range programmed in by the user is possible. The RM3 can also be used on your 2 metre station if you have a 211E or a 245E.
The IC-SM2, which is supplied as standard with the IC701, is also available as a separate. It is a superb Electret desk microphone which is powered directly from all current ICOM equipment without modification. Details can be given for use with other makes of equipment also.

IC-701	Less VAT = £760	With VAT = £855	IC-RM3	Less VAT = £88	With VAT = £99
IC-701PS	Less VAT = £128	With VAT = £144	IC-SM2	Less VAT = £23.11	With VAT = £26

Phone—or put a message on the ansafone for further details

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MICROWAVE MODULES **ANTENNA SPECIALISTS**

J-BEAM **YAESU MUSEN** **FDK**

HP AND PART EXCHANGE WELCOMED

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A VERY MERRY CHRISTMAS

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DUMMY LOADS

HF BALUNS

COAX SWITCHES

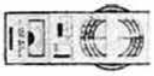

ANTENNA ROTATORS


COAX RELAYS


ABSORBTION


HF POWER METERS


VHF POWER METERS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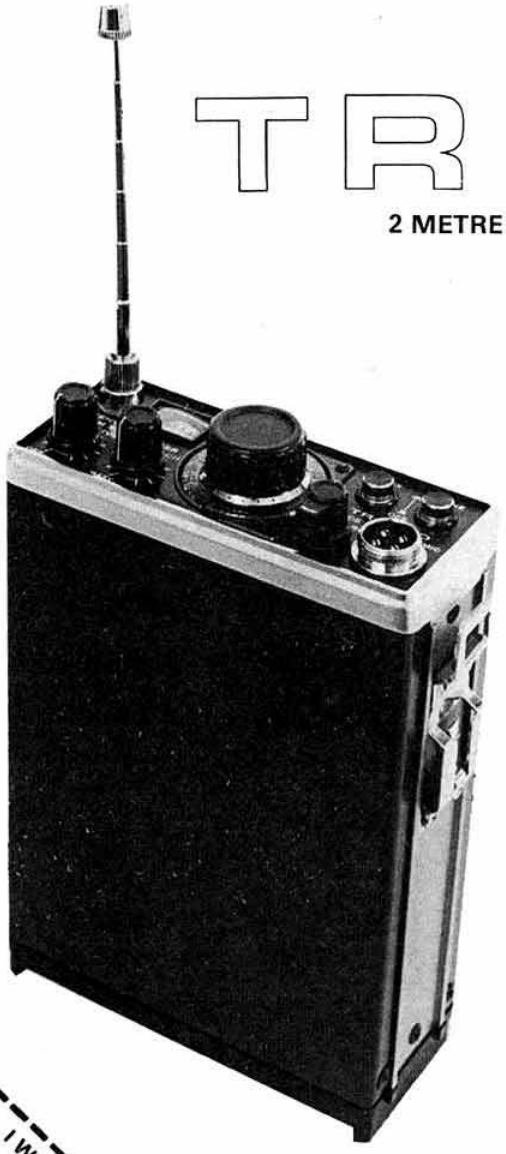
TRIO

TR2300

2 METRE SYNTHESIZER PORTABLE



Trio once again lead the field with the introduction of the new TR2300 2 metre FM portable. Following the established TR2200 line, the all new 2300 combines all the virtues of small size, ease of use and rugged go-anywhere construction but introduces for the first time, full band coverage in 25kHz steps from the same advanced synthesiser used in the TR7500. The synthesiser provides 80 FM channels from 144–146MHz together with 600kHz repeater shift, and a single auxilliary channel which can be crystal controlled to your favourite net frequency.

Automatic tone burst is provided for repeater operation and all in all, the TR2300 looks like being the new definitive 2 metre FM portable.

Although not so obvious from the photo, the TR2300 is actually smaller than the existing TR2200 and is a totally new design with an improved specification. The high sensitivity receiver section uses a combination of effective RF filters providing optimum cross modulation rejection across the entire band. An extra low profile speaker uses a samarium cobalt magnet to reduce equipment size whilst improving speaker efficiency and clarity of reproduction.

Switchable dial illumination is provided so as to ease dial readout in dimly lit situations.

Needless to say, in line with Trio advance planning, the TR2300 will allow for incorporation of the new IARU region 1 adoption of 12½kHz FM channels as this is gradually introduced.

Once again, Trio sensible design, attention to detail and care in providing equipment designed specifically for the user, rather than hand-me-down Japanese designs, is reflected in the TR2300—why settle for anything less!

Price—a shade over **£200** including VAT.

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TRIO

TS120V

MULTUM IN PARVO

We introduce yet another exciting innovation from Trio in the new TS120V HF transceiver. Equally at home in mobile or home station situations, the TS120V packs more features into a small package than any other comparable model.
Measuring only $9\frac{1}{2}" \times 3\frac{3}{4}" \times 9\frac{1}{4}"$ – which is about the size of a packet of cornflakes, the TS120V can best be described as a miniature TS820. The rig covers all bands 80–10 metres – and all of 10 metres 28–30 MHz so it's ideal for transverter driving, has digital readout built in, vox, break-in CW, RIT, noise blanker and the unique Trio passband tuning system used in the 820. The power output is 10W and a matching linear will be along shortly.

The TS120V is clearly a winner for mobile operation but is equally attractive at home and is perfect for the VHF/UHF enthusiast who requires a high performance I.F. system for his transverters.

The transceiver is based on an advanced PLL system and the digital readout gives you the *correct* operating frequency at all times unlike many other rigs. Remember my previous comments about Trio attention to detail!

For ease of operation, the TS120V is unsurpassed; simply select the band required, tune the VFO to the frequency you want and there you are: no pre-selector or PA tuning to worry about, and a distinct safety feature for the mobile operator.

We at Matlock, have all fallen in love with the TS120V and we feel sure that you will too. At it's projected price of around £425 including V.A.T. (and including digital readout, vox, etc) we have no doubt that this transceiver will be another winner from Trio. See it soon.

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ST-3
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PSU-5
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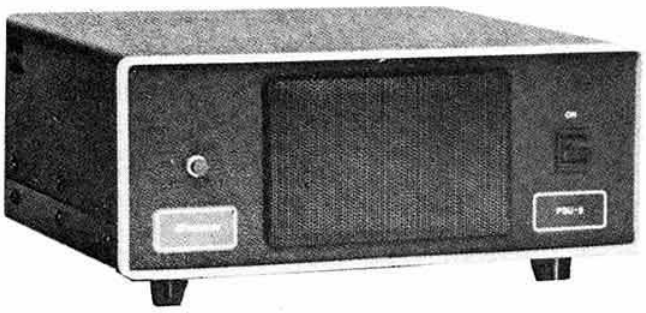

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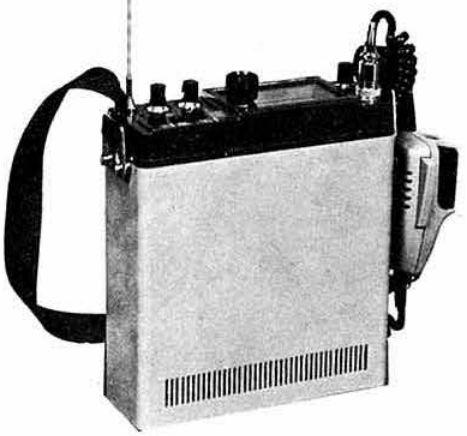

CQ-P2200E
2m FM
Portable
Transceiver

SPECIFICATION

General		Transmitter		Receiver	
Frequency range	144.00 146.00 MHz				
Channels	12 Channels	Emission type	F3	Receiving system	Double superheterodyne
Microphone	Dynamic type (10KΩ)	Transmitting power	3W (at HIGH), approx, 1W (at LOW)	Intermediate frequency	First IF 10.7 MHz Second IF 455 KHz
Speaker	3W 8Ω	Antenna impedance	50Ω	Sensitivity	S/N 30 dB or more at 1μV input
Supply voltage	Built in batt. DC12V HP11 × 8, External power supply 13.5 V	Maximum frequency deviation	± 10 KHz	Squelch	−6 dB or less
Current consumption	900mA at transmission 110mA at reception	Modulation	Crystal controlled variable reactance modulation	Pass band width	±10 KHz or more (at −6 dB)
Semiconductors in use	29 transistors; 3 FET's: 16 diodes: 2 IC's: 1 LED	Multiplication	12	Filter	Ceramic filter
		Undesired radiation	−60 dB or less	Low frequency output	0.5W (rated output)
Dimensions	196 (W) × 69 (H) × 219 (D) mm	Repeater tone	1750 Hz± 2 Hz	Overall distortion	10% or less at 1,000 Hz 0·5W
Weight	Approx. 2.6kg (including batteries)				

DESCRIPTION

This is a very well built piece of equipment with robust case and strong webbing carrying strap. All controls are on the top face making operation easy and comfortable. The built-in extending rod antenna can be used as ⅝ or ¼ wave whip depending on the number of sections used. The battery compartment is recessed from the bottom of the unit and is held by one bolt giving easy access to compartment and the battery pack slides out without any connecting wires. External DC supply socket and external antenna socket are recessed into base. The microphone is particularly comfortable to hold and is the right shape and size.

The 1750HZ repeater access tone operates on release of the P.T.T. switch thus giving a tone at end of transmission even on normal simplex working.
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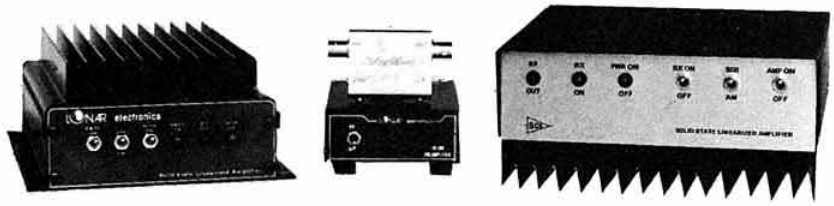

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£3.25 (excluding *Radio Communication*).

COMPOSITION OF RSGB ZONES

Zone A:	Regions 1, 2 and 18
Zone B:	Regions 3, 4 and 5
Zone C:	Regions 7, 8, 16 and 19
Zone D:	Regions 6, 9, 17 and 20
Zone E:	Regions 10 and 11
Zone F:	Region 15
Zone G:	Regions 12, 13 and 14

COMPOSITION OF RSGB REGIONS

Region 1	Cheshire, Cumbria, Greater Manchester, Isle of Man, Lancashire, Merseyside.
Region 2	All that part of Humberside north of River Humber, North Yorkshire, South Yorkshire, West Yorkshire.
Region 3	Hereford and Worcester, Salop, Staffordshire, Warwickshire, West Midlands.
Region 4	Derbyshire, all that part of Humberside south of River Humber, Leicestershire, Lincolnshire, Nottinghamshire.
Region 5	Bedfordshire, Cambridgeshire, Northamptonshire.
Region 6	Berkshire, Buckinghamshire, Oxfordshire.
Region 7	Greater London south of River Thames, Surrey including that part of London north of the Thames administered by Surrey.
Region 8	Kent, East Sussex, West Sussex.
Region 9	Cornwall, Devon.
Region 10	Dyfed, Gwent, Mid Glamorgan, Powys, South Glamorgan, West Glamorgan.
Region 11	Clwyd, Gwynedd.
Region 12	Grampian, Highland, Island Authorities, Tayside.
Region 13	Borders, Fife, Lothian.
Region 14	Central, Dumfries and Galloway, Strathclyde.
Region 15	Northern Ireland.
Region 16	Essex, Norfolk, Suffolk.
Region 17	Isle of Wight, Channel Islands, Dorset, Hampshire, Wiltshire.
Region 18	Cleveland, Durham, Northumberland, Tyne & Wear.
Region 19	Greater London north of River Thames, Hertfordshire.
Region 20	Avon, Gloucester, Somerset.

A seasonal message from the President

IF 1978 comes to be regarded as one of the more eventful years in the Society's history, then it will be partly the result of important decisions made in previous years beginning to show their influence on affairs, and partly because of the exceptional amount of hard work put in on several fronts. One perhaps could highlight the advances made in HQ administration, the widely-based efforts made to improve the quality of the interaction between the Society and its members (and non-members!), and the continuing efforts in preparing for WARC 1979, manifested, for example, by the IARU Region 1 Conference in Hungary earlier in the year.

In referring to these activities, one must of course also refer to the efforts of those responsible, the 20 who comprise the staff of our headquarters, and the 150 or so officers and committee members of the Society who have made these extra efforts in addition to their normal activities.

I have much appreciated being invited to the 30 or so major events I have attended during the year, and regretted that I have had to miss others. At these events I have often taken the opportunity, in speeches and talks, to give an impression of the scale of the activities of the Society. Their extent sometimes has been a surprise to many members: in the other direction, the interest people have expressed in the mechanics of running their Society has come as a very pleasant surprise indeed.

However knowledgeable a person is before he becomes President, I am sure that he is significantly affected by the experience. In my case, a very early event of note, shared by many others, was meeting the Marchesa Marconi and the Princess Elettra—the origins of our hobby at one stroke became much closer and much more real. On the international scene, the statement so often expressed that the RSGB is a significant force in the world of amateur radio acquired a reality that came as something of a shock because of the responsibility it implied.

One was moved by two events where perhaps amateur radio may have helped to provide a lead. The first was that this year for the first time, foreign amateurs were allowed to operate their transmitters from within Hungary. The second event was the recent most successful joint meeting between GI and EI amateurs, the first since the troubles began several years ago. One would like to think that the basic international-mindedness of amateurs in some way helped in fostering both events.

The most lasting impression of all will be the many amateurs from this and other countries one has been fortunate to meet and who represent the essence of amateur radio. I would like to wish all of them and other amateurs and their families a very happy Christmas and a successful New Year.

D. S. Evans, G3RPE

QTC
amateur radio news

Christmas holidays

RSGB headquarters will be closed from 23 December 1978 to 1 January 1979 inclusive.

The Chelmsford editorial office will be closed from 23 to 26 December and from 29 December to 1 January 1979, all dates inclusive.

Science Museum lectures

The RSGB Education Committee has again arranged for the lecture "The World of Amateur Radio" to be presented at the Science Museum, Exhibition Road, South Kensington, London, on three occasions in January 1979.

The lecture aims to give young people an insight into amateur radio, and active radio amateurs will form the team of lecturers. Demonstrations will show some of the principles of radio communication, typical amateur equipment will be operated, colour slides will show various types of radio installation, and the way to become a radio amateur will be described.

The lecture will be given on Friday 5 January at 3pm, and on Saturday 6 January at 1030am and 3pm. Admission is by ticket only, obtainable free on application to the Education Service, Science Museum, London SW7 2DD.

Area representatives

In the list of area representatives on page 788 of the September issue of *Radio Communication*, the Farnborough representative was incorrectly shown as R. J. Harrison, G3TMQ; he is, in fact, D. N. Jones, G8IMX.

The area representative for Poole and district is D. Mason, G3ZPR.

WARC preparations

The Special Preparatory Meeting (SPM) which was held between 23 October and 17 November in Geneva was in response to a resolution of the ITU Administrative Council which invited the International Radio Consultative Committee (CCIR) to carry out the necessary studies to ensure timely provision of the technical information likely to be needed as a basis for the work of the WARC. During the two years prior to the SPM a great deal of preparatory work had been carried out by CCIR Study Groups. Prior to the start of the SPM some 350 documents were sent to the 720 delegates who participated in the meeting.

The technical topics around which the work of the SPM was organized were as follows:

A. Terminology and classification and designation of emissions.
B. Terrestrial services up to 40GHz, technical data for allocation and regulations.
C. Space services and space/terrestrial sharing up to 40GHz, technical data for allocation and regulations.
D. Monitoring and identification.
E. Services above 40GHz, and optimum use of the spectrum.
F. Propagation.
G. Resolutions and recommendations related to CCIR work.
H. Drafting.

The amateur service and the amateur satellite service were considered in committees B and C. Initially the conference was divided into a large number of sub-working groups and working groups which reported to the main committees. The documents approved by the SPM will be published in a report which is intended to be comprehensive and self-contained, consisting of all the technical information and conclusions considered by the SPM to be of importance to the work of the WARC.

The IARU participated in the SPM as a full delegation and actively took part in discussions involving the amateur service. The delegation included: Merle Glunt, W3OKN; Dave Sumner, K1ZZ, and Roy F. Stevens, G2BVN.

David Wardlaw, VK3ADW, and Michael Owen, VK3KI, served on the Australian delegation with special responsibilities for amateur radio matters. In addition there were more than 50 radio amateurs who formed part of national delegations. Dr J. A. Saxton was the chairman of the SPM, and the UK delegation was led by Mr W. H. Bellchambers, the director of radio technology at the Home Office.

During the SPM a reception in the ITU headquarters was arranged by the IARU, and more than 150 delegates attended. Among these were many from Asia and Africa, including representatives of the People's Republic of China. This was the first occasion on which representatives of the People's Republic of China had attended an IARU function.

Jersey Radio Convention

A successful convention was held in Jersey on 10 September, and among those attending were 30 amateurs from Jersey and Guernsey, and 88 French amateurs. The programme included a local tour of the island for the visitors, lunch, a raffle for £1,000 worth of prizes donated by local wholesalers, and a shopping trip.

Following this success, a two-day event is being organized for September 1979 which will include a trade show and convention on a Saturday and Sunday. Details can be obtained from Mr G. Brown, GJ8ORH, "Lemnos", Longueville Road, St Saviour, Jersey, CI.

1979 Presidential Installation

The installation of Mr J. Bazley, G3HCT, as the 45th President of the Radio Society of Great Britain will take place on

Saturday 13 January 1979
7 for 7.30pm
in the
Executive Suite
Warwickshire CC Ground
Edgbaston
Birmingham

Admission will be by ticket only. Tickets will be limited to two per member, and the total number available will also be limited.

Single ticket.....£2 **Two tickets.....£3**

Dress: informal

Applications for tickets should be addressed to: The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE.

Tape/film library

Because of ill-health, Mr S. W. Coursey, G3JJC, has had to give up the honorary post of curator of the RSGB taped lecture library. The Society thanks him for his considerable efforts over the years to supply clubs and others with taped lectures on a variety of subjects. Thanks also to Mr N. W. Kemsley, G3WJK, who has recently been assisting with the library.

For the time being, all requests for tapes and films should be addressed to Mr M. J. N. Hawkins, membership services officer, at RSGB headquarters.

Activities at Leicester

Mr C. P. Watkins, senior lecturer at the Charles Keene College of Further Education, Painter Street, Leicester, advises that the RAE course held at the college at 6pm on Fridays has 27 students this year and that room is available for a couple more keen types. The college RAE course had an 80 per cent pass rate in 1978.

The college station G4CKC is active under the management of Mr P. D. Johnson, G3UQX, and the vhf/uhf group which meets at the college has constructed a 432MHz repeater at Markfield, northwest of Leicester, and plans another on 144MHz. The college would be pleased to offer hospitality and test equipment facilities to RSGB members.

Stolen equipment

The following equipment was stolen from a car at Wombourne, near Wolverhampton, on 11 October: FDK Multi-U-11, serial 14214, top cover missing, fitted with channels RB0, 2, 4, 6, 10, 14, RB0 reverse, RB14 reverse, SU8, 16, 18, 20; FDK Quartz 16, serial 04033, top cover missing, fitted with channels R3, 4, 5, 6, 7, R5 reverse, S20 to S24; pair Pye Pocketfones, fitted RB14, receiver fitted with small rubber helical antenna. Any information to L. Saunders, 174 Marsh Lane, Fordhouses, Wolverhampton WV10 6RX, tel 789581; or to PC Vaughan, Wombourne Police Station, Wombourne, near Wolverhampton, tel Wombourne 4611.

Stolen while in transit by British Rail from Stevenage to Hyde at the end of February 1978: KW204 valve transmitter, serial T389, with internal mod to bandswitch on 1·8MHz. Any information to B. Kitchen, G4GHB, 18 Welch Road, Newton, Hyde, Cheshire SK14 4DJ.

Heatsinks

by G. C. OXLEY, G8MW*

THE rating of all electrical equipment is determined by its working temperature. If the apparatus gets too hot then insulation may catch fire or melt, conductors expand and semiconductor junctions can be destroyed. In the specific case of semiconductors the device is usually kept cool by using a heatsink. Keeping the temperature of semiconductor devices within the specified limits is also important because their operating characteristics alter with changes in temperature. This is particularly important with zener diodes, Class B amplifiers and temperature-limited voltage regulators.

The heatsink loses heat to its surroundings by convection, radiation and conduction. Mounting the heatsink vertically, so as to give as good a flow of air as possible, will help the convection of heat. The larger the volume of metal, the more heat it will absorb; but the most important factor is the surface area of the heatsink. This area can be increased by adding "radiating" fins. When natural convection takes place the rate of heat loss in a constant-temperature enclosure is proportional to $\theta^{1\cdot2}$; where θ is the temperature excess over the surroundings. Loss of heat by radiation can be enhanced by painting the heatsink matt black or by anodizing.

A rough comparison of the ability of some metals to conduct heat is given in Table 1.

Table 1. Heat conductability of some metals

Silver	Ag 100	Brass	25
Copper	Cu 80	Iron Fe	15
Aluminium	Al 40	Lead Pb	8
Zinc	Zn 30		

When cost and ease of working are considered, aluminium comes out best; but copper, zinc and brass can all be used, and these metals are easily soldered (plumbers' solder). The working temperature of the device and the power that it needs to dissipate must be known before a heatsink can be designed. Considerations of cost, weight and space will require the size of the heatsink to be kept to a minimum.

The opposition to a body losing heat is called its thermal resistance. This is usually denoted by θ and is expressed in °C/W [1].

Rectifier diodes, large zener diodes and transistors dealing with more than about 0·5W are often provided with heatsinks in order to achieve a higher power output. A rule-of-thumb value for the working temperature of silicon junctions is approximately 150°C, and for germanium junctions 75°C.

The rating of rectifier diodes is often related to the temperature of the stud (bolt) T_S. Fig 1 shows that the output current of this diode must be halved if the temperature T_S rises from 50°C to 100°C.

Examples using diodes and voltage regulators

A rectifier diode has a forward voltage drop of 1V when delivering a current of 5A. The stud temperature must not exceed 80°C when the rectifier is dissipating 5W. Let the air

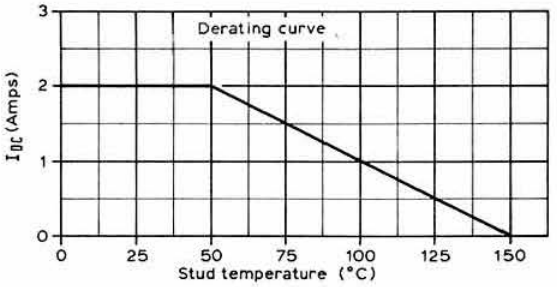


Fig 1. Diode rating related to stud temperature

(ambient) temperature inside the rectifier compartment be $T_A = 50°$, then

$$\frac{T_S - T_A}{P_D} = \frac{80-50}{5} = 6°C/W$$

From the curves, Fig 2, an aluminium heatsink would need to be approximately 260cm² in area of one side. The dimensions of a square heatsink would be $\sqrt{(260/2)} \times \sqrt{(260/2)} = \sqrt{130} \times \sqrt{130}$, and a 12cm by 12cm piece of 1·5mm aluminium sheet would be suitable. Painting the sheet with matt black paint would give an added safety margin of about 20 per cent.

Manufacturers often draw heatsink characteristics on logarithmic graph paper, the result being nearly a straight line. Fig 2(a) shows the rapid increase in area needed as the thermal resistance falls below 5°C/W or so, while Fig 2(b) shows that the area and material become of less importance above 30°C/W.

Fig 3 shows a diode rectifier mounted on a heatsink. Heat must be conducted away from the junction to the case, and this path has a thermal resistance of θ_{J-C} °C/W. From the case to the heatsink the resistance is θ_{C-HS}, and from the heatsink to the surroundings θ_{HS-A}. Adding these together:

$$\theta_{J-A} = \theta_{J-C} + \theta_{C-HS} + \theta_{HS-A}.$$

The same conditions apply also to transistors and voltage regulators. Compact and cheap voltage regulators are now available, and best results are obtained by using adequate heatsinks.

For a regulator required to supply 3A at 12V the input voltage will be about 14·5V, but to allow for mains variations, transformer and rectifier tolerances, this input may reach 17V. At maximum output the regulator must dissipate $5 \times 3 = 15$W. If $T_A = 50°C$ and $T_J = 150°C$:

$$\theta_{J-A} = \frac{150-50}{15} = 6{\cdot}7°C/W$$

$$\theta_{J-C} + \theta_{C-HS} + \theta_{HS-A} = 6{\cdot}7°C/W$$

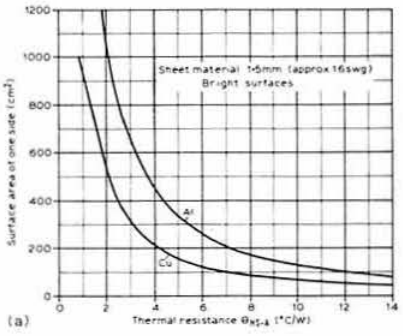
$$\theta_{HS-A} = 6{\cdot}7 - \theta_{J-C} - \theta_{C-HS}\ °C/W$$

The manufacturer of one such regulator gives the value of θ_{J-C} as 3°C/W. A figure for the value of θ_{C-HS} can range from 0·1°C/W to 0·5°C/W, depending on whether an insulating washer and bushes are used and upon good surface contact, aided by a thermal compound such as silicone grease. If a figure of 0·3°C/W is chosen:

$$\theta_{HS-A} = 6{\cdot}7 - 3 - 0{\cdot}3 = 3{\cdot}4°C/W.$$

From Fig 2, an aluminium plate approximately 17cm square would be suitable as a heatsink.

* Osterwald, Littlemoor, Ashover, Chesterfield, Derbyshire.



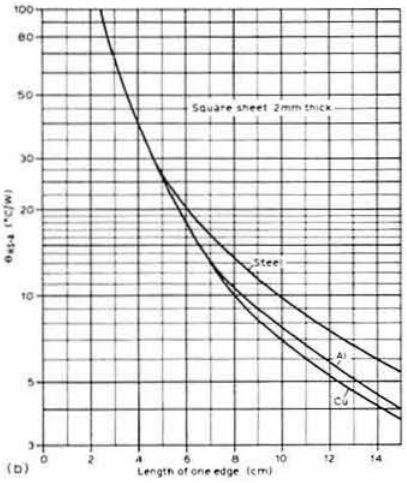


Fig 2. (a) Thermal resistance related to surface area. (b) Graph showing reduced importance of area and material at higher thermal resistance

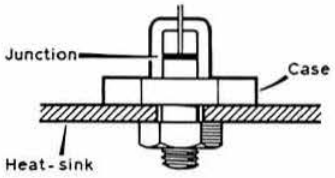


Fig 3. Diode rectifier mounted on heatsink

Examples using transistors

BFY50. If the temperature of the case can be kept below 100°C then the power dissipated can be 2·86W. θ_{J-A} is quoted as 220°C/W.

$$P_D = \frac{T_J - T_A}{\theta_{J-A}} = \frac{200-25}{220} = \frac{175}{220} = 0{\cdot}8W$$

This is the power which a BFY50 will handle in surroundings having a temperature not exceeding 25°C. The derating curves are given in Fig 4.

Let the desired output be 2W

$$\theta_{HS-A} = \frac{200-50}{2} - \theta_{J-C} - \theta_{C-HS} = 75 - 35 - 1 = 39°C/W$$

Because this transistor has a TO-5 can a rather higher figure is chosen for θ_{C-HS}.

Note, case is connected to collector.

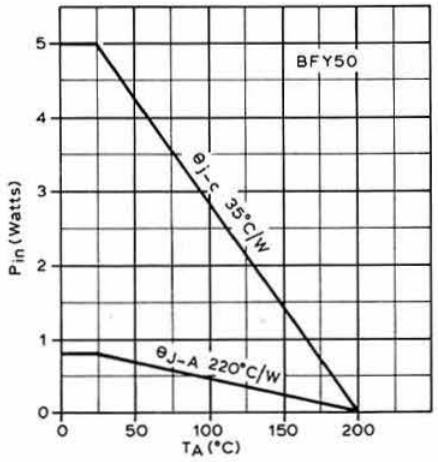


Fig 4. Derating curves of a BFY50

BLY85. VHF transistor.

Let $P_D = 5W$

$$\theta_{J-A} = \frac{150-50}{5} = 20°C/W$$

$$\theta_{HS-A} = 20 - \theta_{J-C} - \theta_{C-HS}$$
$$= 20 - 12{\cdot}5 - 0{\cdot}5 = 7°C/W.$$

The data sheet gives $R_{th(J-mb)}$ instead of θ_{J-C}. The term "mounting base" is used instead of "case". The torque applied to the nut on the fixing stud is quoted as between 7·5kg/cm and 8·5kg/cm. Tight, but not too tight.

TIP42. This low frequency power output transistor will dissipate 2W continuously if the free air temperature does not exceed 25°C. Let the required output be 10W

$$\theta_{HS-A} = \frac{150-50}{10} - \theta_{J-C} - \theta_{C-HS} = 10 - 1{\cdot}92 - 0{\cdot}5 = 7{\cdot}5°C/W$$

Practical considerations

Heatsinks can be bought from retailers; one heatsink, made by Marston Excelsior Ltd, is shown in cross-section in Fig 5. With the fins vertical in free air, a 100mm length has a thermal resistance of 2·1°C/W.

For a length of 100mm the performance is shown in the graphs of Fig 6.

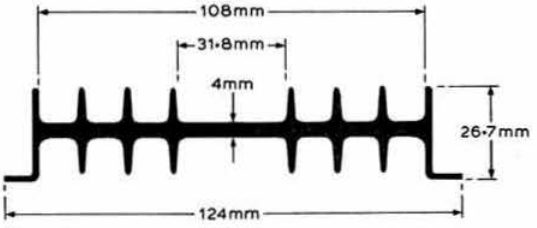


Fig 5. Cross-section of a Marston heatsink

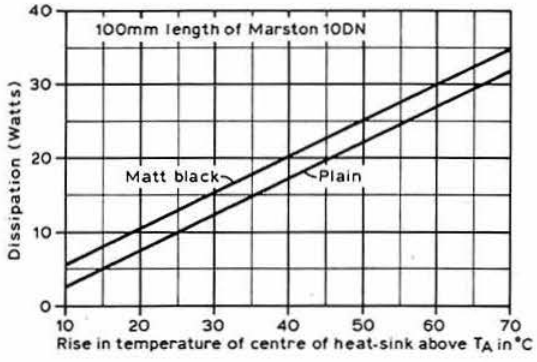


Fig 6. Performance graph of Marston 10DN heatsink

For a dissipation of 25W with $T_{HS} - T_A = 50°C$,

$$\theta_{HS-A} = \frac{50}{25} = 2°C/W.$$

Care should be taken to make sure that the surface of the heatsink is as smooth and flat as possible. Apply the correct fixing pressure to the securing nuts and bolts, and use a thermal conducting grease. When no insulating washers are needed use bolts or screws which fill the fixing holes and use flat washers under the nuts. If the heatsink must be mounted horizontally its size should be increased by a factor of 1·3.

Home-made heatsinks

Details are given in the handbooks. Copper-clad board can be used; if clad on both sides, the copper should be bonded.

Transistors with TO-5 cans are best sunk into an 8·5mm diameter hole drilled into the sink [2].

Aluminium or brass vanes from old tuning capacitors, as well as discarded aluminium sole-plates of smoothing irons, can be adapted.

Manufactured heatsinks

Manufacturers of heatsinks and radiators include Redpoint Ltd, Lynton Road, Cheney Manor, Swindon, Wilts SN2 2QN; Staver Thermal Products (UK) Ltd, Heron Trading Estate, Bruce Grove, Wickford, Essex SS11 8BS; and Fischer-Electronik, c/o DAU (UK) Ltd, 42a Main Road, Barnham, Bognor Regis, Sussex PO22 0ES.

Well-illustrated broadsheets and catalogues are available from these and other manufacturers.

Acknowledgements

The writer wishes to thank Marston Excelsior Ltd, STC, Texas Instruments, Lambda Electronics and Mullard for technical information.

References

[1] "How to solve transistor heatsink problems", Courtney Hall, WA5SNZ. *Ham Radio* January 1974, p46.

[2] "Low-power transistor transmitter", G. R. Kennedy. *Wireless World* October 1968, p350. □

EQUIPMENT REVIEW

Quartz 16
144MHz fm transceiver

by T. G. GILES, BSc, G4CDY*

Introduction

To many mobile operators the appeal of 144MHz fm is the simplicity of the equipment. It is not necessary to tune the receiver, to net the transmitter or adjust any other controls while, at the same time, driving a vehicle. But many of the fm black boxes now on the market have become very sophisticated with their synthesizers, led readout of frequency, scanners, simplex/duplex switching etc, and have lost some of that ease of use.

The Quartz 16 represents a straightforward 23-channel, crystal-controlled, 144MHz fm transceiver which has a performance which is just as likely to make and maintain contacts as its "all singing, all dancing" brothers. The advantage of synthesized equipment is the large number of channels that can be called up, but often (particularly outside the London area) only a handful of channels are used, eg a couple of local repeaters and half a dozen simplex channels. Having more frequencies than required only makes the unit more difficult to use without taking one's eyes off the road.

The unit used in the review was kindly loaned by Waters & Stanton Electronics, who can supply the Quartz 16 with seven channels fitted for £149.75, and an additional three channels for £7.50, both including VAT and delivery.

Description

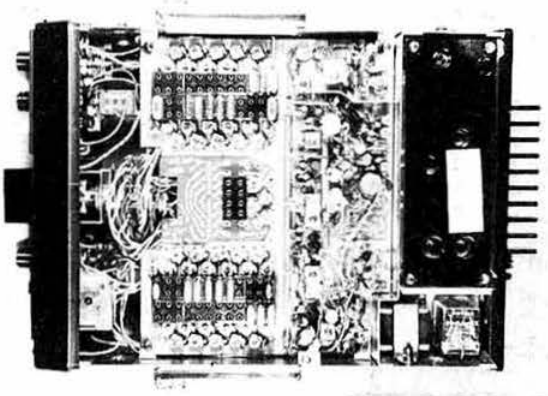
The transceiver is housed in a black steel case with diecast alloy front and back panels. The main circuitry is built on two glass-fibre printed circuit boards accessible by removing the top and bottom covers. The unit is supplied with a well-designed and mobile mounting bracket which has two quick-release catches, making it very easy to put in or remove from a car. This means that the same equipment could be used for home station and mobile operation, or that the transceiver can be safely locked in the boot when the car is left unattended. The main control is a centrally mounted 23-way channel selector switch which also has a position for an external vfo. There is an additional switch for selecting two priority channels, which could, for instance, be the mobile calling channel (145·500MHz) and a club frequency. The power is turned on by pushing the volume control knob. Pulling the squelch knob switches on the automatic 1,750Hz toneburst oscillator for repeater access. High or low power can be selected by a small lever switch.

*54 The Mount, Coulsdon, Surrey.

The Quartz 16

The meter has three functions: on receive it reads signal strength; on transmit, forward rf output power; and when a slide switch on the back panel is moved to "F" it reads the discriminator voltage. This feature allows the receiver to be netted to a transmitter known to be on the correct frequency or to a crystal calibrator. Another nice feature is that the lamp illuminating the numbers behind the selector switch is only on if a crystal has been installed in that position. The back panel has the power connector, an SO239 antenna socket, an external speaker jack and a B9A accessory socket.

The receiver is a conventional double-conversion superhet with 10·7MHz and 455kHz i.f.s; selectivity is provided by a 2-pole monolithic crystal filter at 10·7MHz and a ceramic filter at 455kHz. The rf amplifier is a dual-gate fet type 2SK40, and is coupled to a similar fet as a mixer via three helical filters. The second mixer is a bipolar transistor with injection at 11·155MHz. The channel crystals used are parallel resonant 14MHz types, each of which is provided with a trimmer. The i.f. amplifier uses six discrete transistors and a ratio detector.



Top view showing transmitter stages

This is followed by a conventional noise-operated squelch and an ic audio output amplifier.

The signal from the dynamic microphone is amplified by two transistor stages; amplitude limited by the normal two series diode arrangement, then further amplified in a single stage and low-pass filtered in an LC circuit. The audio is applied to a bipolar transistor phase modulator which is driven by an oscillator using 12MHz parallel resonant crystals. There are five multiplier and amplifier stages before the pa unit, which contains the driver and power output devices types 2SC1590 and 2SC1591 respectively. The reverse power from the antenna is monitored by a reflectometer, and if it exceeds a preset value a thyristor is triggered which cuts off the drive to the pa. Switching of the antenna between transmit and receive is achieved by diodes, and there is a two-stage low-pass filter before the antenna connector.

Measurements

Sensitivity

At 145·5MHz a 0·24μV emf gave a 10dB s+n/n ratio. A 0·2μV signal would open the squelch.

Spurious responses

The image was measured as 65·5dB down on the wanted signal, and the only other significant spurious response was at 130·52MHz which was 84dB down. Rejection of both i.f. frequencies was better than 80dB.

Adjacent channel rejection

The rejection of signals 25kHz from the wanted signal was measured by degrading a 20dB s+n/n ratio on-tune signal to 14dB by a modulated signal on the adjacent channel. The unwanted signal needed to be 76dB above the on-tune one to give this degradation.

Output power and current consumption

Measured at 145·5MHz into a 50Ω load.

Supply voltage	P_O(High)	P_O(Low)	I_{RX}	I_L	I_H
12·5V	8·3W	1·05W	0·25A	1·1A	1·95A
13·8V	9·5W	1·45W	0·31A	1·25A	2·1A

The pa was stable into a vswr of 3:1 at all phases.

Spurious outputs

±12MHz at −70dB.
2nd harmonic at −48dB.
3rd harmonic at −50dB.

Modulation

A 1kHz tone was injected into the microphone socket, and the deviation was measured as +5·9kHz and −4·6kHz. With normal speech the deviation was approximately ±2·5kHz.

Conclusions

The transceiver is supplied with a manual which is both useful and highly amusing. It suffers from the Japanese English which was common a few years ago. As an example, a quote from the installation instructions: "It is very important to wiring of those wires should not bother your drive and vehicle operation. When it will happen those wires bother your handle, breaks and some other car operation may going to dangerous".

The transceiver performed very well, both in measurement and practical operation. The 10 channels fitted are probably adequate for the majority of mobile operators, and can be conveniently extended as required or when funds are available. □

A cmos "pip-tone" unit

by T. HALL, BSc, GM3HBT*

Introduction

IT was announced in *Radio Communication* [1] that the Home Office had agreed to the use of "pip-tones" at the end of A3j transmissions under certain adverse operating conditions on frequencies of 144MHz and above. The operational specification is: tone duration 250ms±100ms; frequency 800–1,000Hz.

Pip-tone units are available commercially but the author experimented to see if a suitable circuit could be evolved using an inexpensive cmos device (MC14572CP) [2], and which would meet the criteria of ease of assembly and low cost. The circuit in Fig 1 is the result of the experiments.

The circuit is intended for use in transceivers using relay t/r switching. For equipment with solid-state switching, a miniature 12V single-pole relay of suitable rating can be added, being driven by TR1/TR2 to provide an isolated switching facility.

Circuit details

Transmit delay. The 250ms±100ms delay is provided by the time constant of C1/R1. The values shown provided, in the author's case, a delay of around 220ms, but individual preferences for the length of the tone can be obtained simply by varying the value of R1.

Tone oscillator. C2 and R2 control the frequency of the oscillator, the values shown providing a frequency of around 1,000Hz. Again the tone can be varied easily by choice of alternative values of R2 (or using a miniature potentiometer instead of R2). The output of the oscillator into the microphone terminals must be found by experiment, to provide a satisfactory signal level compared to normal speech on transmit. The 15nF capacitor was chosen for the input to the author's TR7010, using a 500Ω microphone, and has also been used satisfactorily in an FT221.

*50 Hamilton Street, Larkhall, Strathclyde ML9 2AU.

Components list

R1	270kΩ	**C1,3**	1μF (tant)
R2	27kΩ	**C2**	10nF plate
R3	470kΩ	**C4**	15nF plate
R4,5	100kΩ	**D1,2**	1N914, 1N4148 etc
R6	390kΩ	**S1**	Spco switch
All resistors ¼ or ⅛W, 10%		**TR1,2**	(see text)
		IC1	MC14572CP

Motorola MC14572CP, and all other components, available from J. R. Hartley, 78b High Street, Bridgnorth WV16 4DY.

Relay driver. Any small switching transistors are suitable in this Darlington configuration, the only precaution being to ensure that they can handle the "on" current continuously when the relay is energized. The relay in the TR7010 draws just over 100mA, and two small transistors similar to the BC107 series were used, with current gains of around 150 each.

"Initial inhibit" circuit. It was discovered that although the prototype circuit performed exactly as designed, there was one minor problem which had not been foreseen. On initially switching on power to the transceiver with the pip-tone unit in circuit, a "phantom-bleep" effect was produced which automatically transmitted one isolated but disconcerting toneburst as the timing circuit in the pip-tone unit charged up.

This has been inhibited successfully by the circuit of C3/R3, which disables the initial pulse by keeping the base of TR1 low via IC1f and D2, for the required period. Obviously, to do this, the time constant of C3/R3 must be greater than that of C1/R1, as can be seen from the circuit values. This arrangement does not inhibit the initial audio pulse from the oscillator but, as this is only heard locally as a low tone from the microphone, it is not considered a problem, and in fact serves as an indication that the unit is functioning.

NOTE. It is important to use this unit in the spirit of the Home Office authorization, and to ensure that one's friends in the local vhf fraternity do not rapidly become antagonized; so keep it switched off for local contacts!

General comments

The author's unit has been constructed on a piece of Veroboard 2 by 1¼in; although, no doubt those with better facilities could produce a neat pcb. The Veroboard unit is

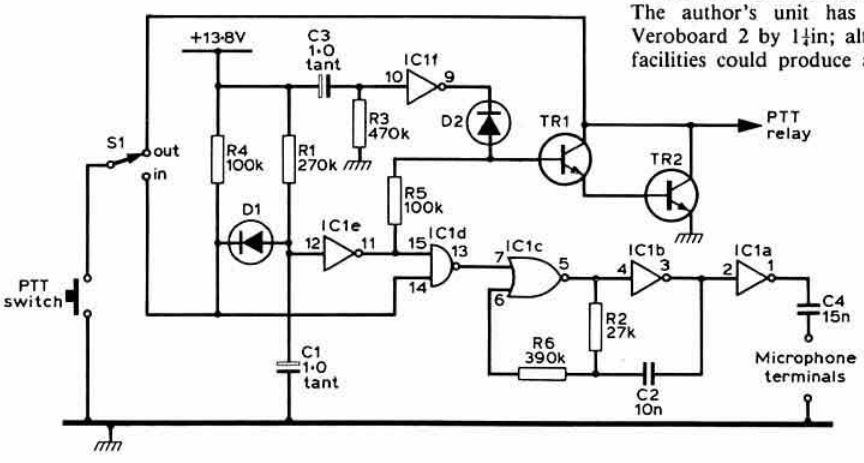


Fig 1. Circuit diagram of the "pip-tone" unit

easily mounted in a convenient corner of the chassis, using double-sided adhesive pads.

The circuit has been air-tested in the FT221 and the Trio TR7010, with excellent results, and reports from distant stations have been very gratifying. On the FT221 it has been found quite simple to mount a miniature toggle switch for S1 in an empty space on the front panel. On the author's TR7010 the noise blanker has been permanently wired "on", and the NB push-button on the front panel, which conveniently happens to be of the changeover variety, is now used to select the pip-tone when required. No doubt similar facilities will be found on other equipment.

Doubtless, someone will come up with a simpler method of producing a pip-tone, but it was felt that this circuit permits "doing-it-yourself" with an interesting little exercise in logic, which others might like to copy, modify, or extend.

Acknowledgements

Thanks are due to colleague Brian Wilkie (Motorola) for circuit discussions, and to Bernie, GM8NXW, who has assisted with tests on the FT221.

References

[1] *Radio Communication* February 1978, p112.

[2] *Motorola Semiconductor Data Library* Vol 5, Series B.

Anti-tvi filters

by V. ROSSI, I4QQE/F0BJT*

Introduction

This article describes two filters useful for the elimination of tv interference (tvi) and broadcast interference (bci), among the sources of which are:

(1) Harmonics of the transmitter which fall into one or more tv (or bc) channels (trouble depending on the frequency of emission).

(2) Saturation of the input stage of the receiver (troubles *not* depending on the working frequency). This problem is becoming more and more frequent, especially with certain broadband antenna amplifiers and with semiconductor devices. Lack of selectivity of the input stage and sometimes the poor choice of the working point of the device(s) aggravates the situation. As a general rule, valves are less sensitive to this phenomenon than semiconductor devices, since the potentials employed are higher and the dynamic range is better.

The author offers the following suggestions which could help amateurs having trouble with tvi:

(1) Filter the mains power supply socket.

(2) Ground the transmitter chassis.

(3) Feeders. Often the antenna radiator itself is a balanced device, while the more frequently used feeders (coaxial cables) are unbalanced systems. A few manufacturers offer antennas (with symmetrical radiators) fed directly by a coaxial cable without using balanced to unbalanced transformers (baluns). They state that the radiation pattern is still symmetrical, but in this way one creates rf currents flowing *outside* the braid in such a way that the cable can radiate, especially if its length resonates at the working frequency. Such an installation is a potential source of tvi and bci.

In the author's antenna installation, tests made before and after placing baluns gave the same antenna efficiency, but the rf in the shack fell almost 20dB. In fact, he attached an indoor antenna to the scope used to monitor his signal on the air, and the strange "tingling" felt when touching the transceiver (when transmitting) disappeared (it was not tne 220V!).

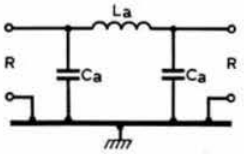


Fig 1. Constant k low-pass filter circuit (section)

Low-pass filter (for transmission)

A constant k low-pass filter suitable for transmission is described below. With this, one can obtain about 20dB/octave per section (ie the output voltage falls by a factor of 10 each time the frequency is doubled) and, consequently, 60dB at twice the cut-off frequency for three sections.

The two principal reasons for the choice of this type of filter are: (a) no tuning is necessary; and (b) the attenuation increases with the frequency without passing through maxima and minima (Fig 2). One can recalculate the filter for different frequencies and/or impedances.

$$R = 50\Omega,\ f_c = 34\text{MHz},$$

$$L_a = \frac{R}{\pi f_c} = 0{\cdot}47\mu\text{H},$$

$$C_a = \frac{1}{2\pi f_c R} = 94\text{pF}$$

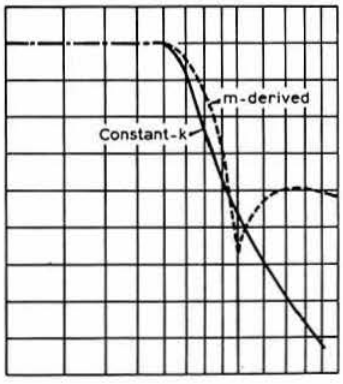


Fig 2. Comparison between a constant k and an m-derived filter (arbitrary scales)

*Villa Route de Chenaz, Segny, 01170 GEX, France.

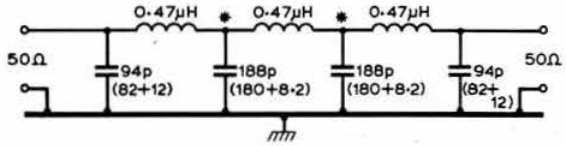


Fig 3. Complete schematic diagram of the low-pass filter. Coils: 8t 1·5mm enam copper wire, 14mm dia, 21mm long

Note that the maximum voltage which will develop in the filter is at the points marked * where, at about 30MHz, the voltage doubles in respect of the input voltage. For this reason the minimum working voltage must be for a given P_{RMS} (that read on the wattmeter):

$$V_p = 2 \cdot \sqrt{2} \cdot \sqrt{P_{RMS} \cdot R}$$

To have a safety margin it is good practice to double this value.

The filter was built in an aluminium diecast box, the different sections being screened from each other. The author used 1,000V feedthrough capacitors, wired in parallel to obtain the required value. Other types of capacitors are also suitable, provided their maximum voltage ratings are not exceeded.

High-pass filter (for reception)

When the interference is due to the overloading of the input stage (for both tv and bc sets), the only solution is to remove the interfering signal. The network must reject the undesired signal by at least 30dB, since one does not know its intensity beforehand, and to have a margin if one increases the power.

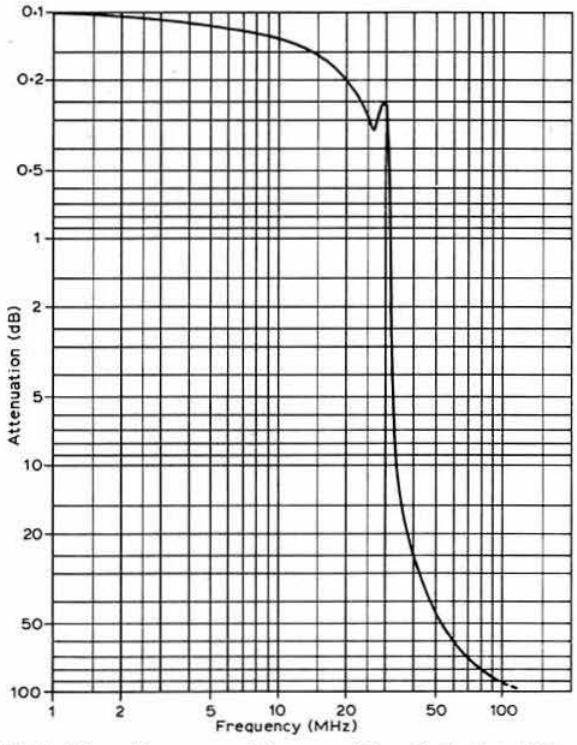


Fig 4. Attenuation curve of low-pass filter. Final attenuation >90dB at 250MHz, >70dB at 500MHz

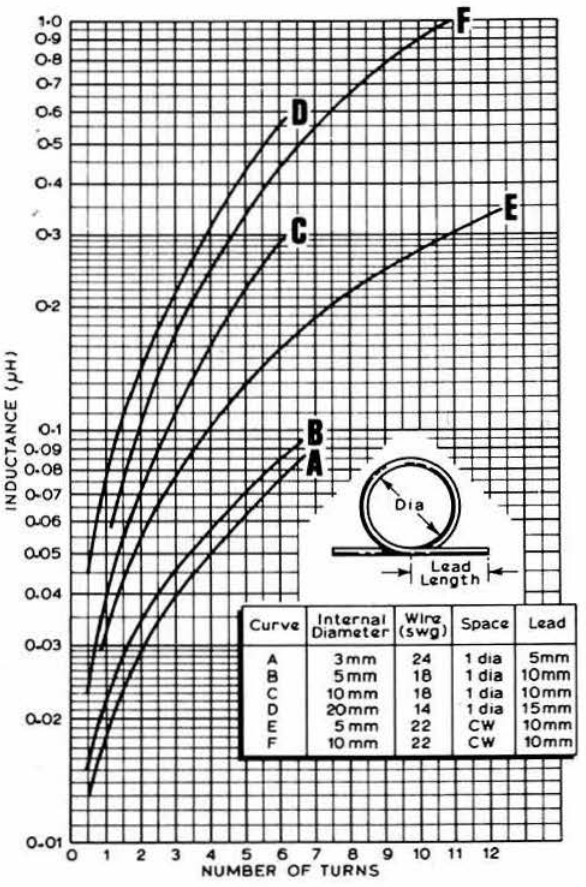


Fig 5. Characteristics of small inductors

The filter attenuates the hf signal by 40 to 70dB, and the vhf 144MHz signal by 34 to 38dB. The circuit may be recalculated for different frequencies and/or impedances, and for this reason the author has included a chart with winding data for small coils (Fig 5), reproduced from the RSGB *VHF/UHF Manual*, and thanks the Society for permission to do so.

The author works both the hf and vhf (144MHz) bands, but people not interested can omit the vhf section. He has a constant k high-pass filter (two sections) for hf, and a series-tuned circuit for vhf.

In the Geneva region the lowest tv channel is E4 (62·68MHz); the impedance is 75Ω.

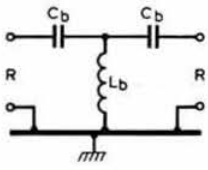
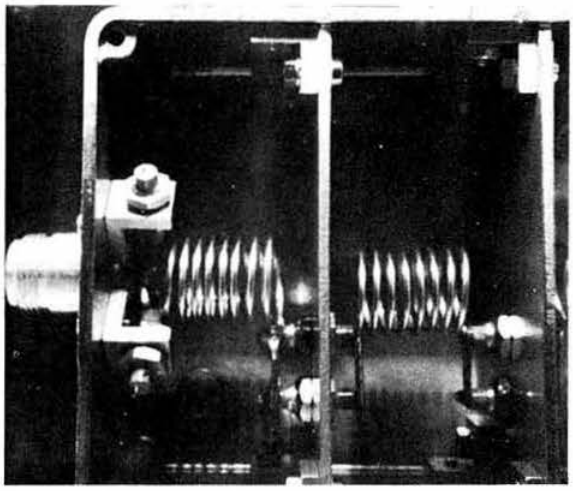


Fig 6. Constant k high-pass filter (section)



Close-up view of the low-pass filter (detail)

$$R = 75\Omega,\ f_c = 60MHz,$$

$$L_b = \frac{R}{4\pi f_c} = 0{\cdot}1\mu H,$$

$$C_b = \frac{1}{2\pi f_c R} = 36pF$$

For the vhf section; $R = 75\Omega$ and $f_o = 145MHz$

When L_c and C_c are tuned to resonance, the impedance between the points X X is very low (theor→zero). In practice there is always a series resistance R_s (mainly due to the Q of the coil) which limits the depth of the notch.

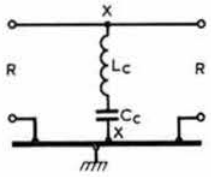


Fig 7. Series tuned trap filter

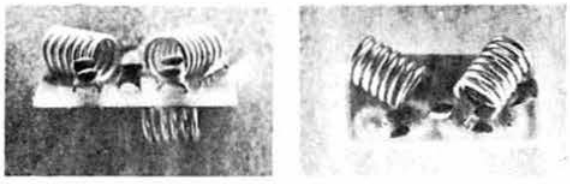
In a 75Ω system R_s must be, say, 1 or 2Ω to obtain good rejection, and so

$$Q = \frac{X_L}{R_s}$$

where: Q = quality factor of the coil

X_L = reactance of L_c at f_o

R_s = series resistance of L_c at f_o



Close-up views of the prototype high-pass filter

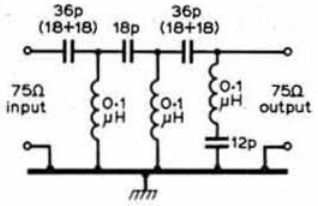
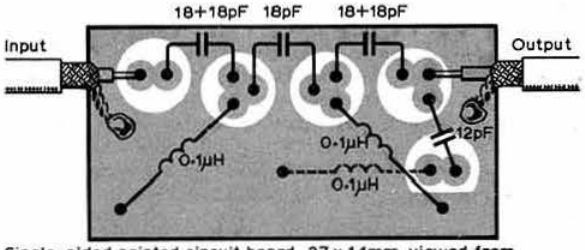


Fig 8. High-pass filter circuit. Coils: 7t 0·8mm enam or silver-plated copper wire, 5mm dia, 10mm long

A first computation with $R_s = 1{\cdot}5\Omega$ and $Q = 60$ gives $X_L \approx 90\Omega$ and, consequently, $L_c \approx 0{\cdot}1\mu H$.

$$L_c = 0{\cdot}1\mu H$$

$$C_c = \frac{1}{4\pi^2 f_o^{\,2} X_L} \approx 12pF$$



Single-sided printed circuit board, 27 x 14mm, viewed from copper side

Fig 9. Layout of high-pass filter

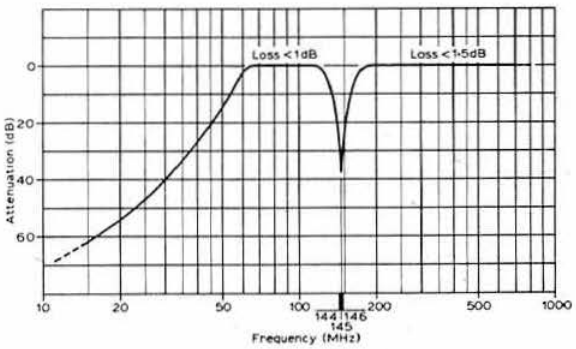


Fig 10. High-pass filter performance

The filter has been constructed on a single-sided pcb, the components being placed on both sides to avoid the mutual induction of the coils (Fig 9 and photographs). At 145MHz the tuning is carried out either by displacing the turns of L_c or by using a trimmer as C_c.

It is absolutely necessary to use a metallic box to avoid stray coupling degrading the filter performance. The filter should be installed as near as possible to the receiver input terminals to obtain maximum filtering of cable "picked-up" interference. □

Circuit design with NAND and NOR

Converting an expression containing AND, OR and INVERT into a circuit using NAND and NOR gates

by M. WARD, G3KZB*

AN ever increasing number of devices in the amateur's shack have circuits employing digital logic techniques: frequency counters, keyers, and—most recently—microprocessors. When the design of such a device is being considered, it is clearly an advantage to keep the variety of different ic packages to a minimum. A system using AND/OR gates will probably require inverters; but NAND/NOR has inversion built in. Further, with ics of the 7400 and cmos types, NAND/NOR packages are more common and cheaper than AND/OR/INVERT.

But *thinking* in terms of NAND/NOR is not easy. One way round the problem is to think and design in AND/OR; and then, as a last step, to convert into NAND/NOR. The procedure to be described is especially useful when each term and its complement can be obtained from flip-flops, in other words when there are available both A and $\overline{A}$, B and $\overline{B}$, and so on.

Suppose the expression to be realized with NAND/NOR gates is:

$$AB(C+\overline{D})+AE\overline{A}$$

(+ represents non-exclusive OR, ie A + B means A or B or both.) To make the explanation clearer, put a fullstop (".") for the Boolean AND operation:

$$A.B.(C+\overline{D})+A.E.\overline{A}$$

The aim is to break the expression down into separate terms: that is, each letter must stand on its own. First, simplify the Boolean expression. In this example, because $A.\overline{A}=1$, the last part of the expression reduces to E.

$$A.B.(C+\overline{D})+E$$

Next, use pairs of brackets to show the order in which the various operations of "." and "+" are to be carried out. This has been started already: the brackets indicate that $C+\overline{D}$ is to be worked out first. Normally one would *assume* that the operation "." takes precedence over "+", but for this purpose put in another pair of brackets:

$$(A.B.(C+\overline{D}))$$

And then the final step is +E. Writing the expression with enough space on its right hand side where later one can draw the circuit, this is labelled "Line 1".

Line 1: $(A.B.(C+\overline{D}))+E$

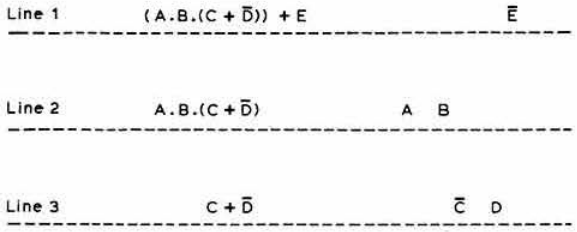
Leaving any single letters not within brackets (E in the example), carry the rest of the expression down to the next line, shedding the outermost pair(s) of brackets. This is Line 2.

Line 2: $A.B.(C+\overline{D})$

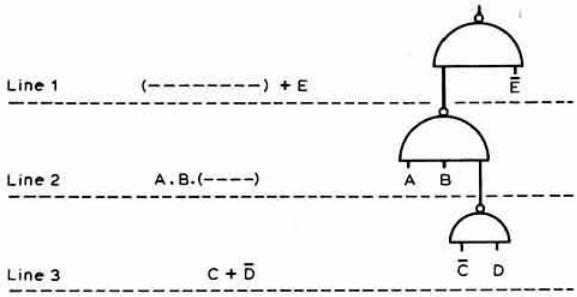
Repeat the process until all the brackets have gone.

Line 3: $C+\overline{D}$

Where the terms have separated out into single letters provides a guide for drawing the circuit. So, looking at the *even* lines, write the letters on the right-hand side, keeping their same relative positions. Then, for the odd lines write the *inverse* (the complement) of each term, ie A for $\overline{A}$, $\overline{A}$ for A, $\overline{B}$ for B, etc.



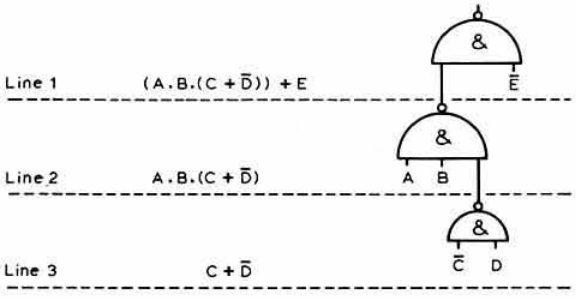
The letters will mark the position of inputs to gates. Other inputs will occur where there are brackets; ignoring for the moment the actual contents inside the outermost brackets on any line—suffice it that an input is drawn at this point.



Having the gates in outline, now label them NAND or NOR according to this schedule:

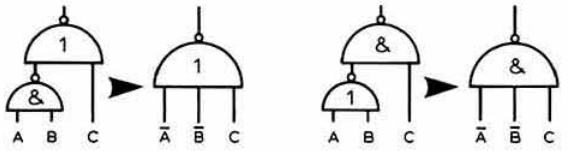
on odd lines "." gives rise to a NOR gate
on even lines "." gives rise to a NAND gate
on odd lines "+" gives rise to a NAND gate
on even lines "+" gives rise to a NOR gate.

On Line 1 of the example there is a "+" between the brackets and the E. From the schedule it is found that a NAND gate is called for. In Line 2 there are two "."; another NAND is indicated. And a final NAND on Line 3.



*Green Lane, Milford, Surrey.

An easy check is possible. If the expression is in its simplest form, all the gates will be of one kind only, because a NAND and a NOR in cascade can be simplified:



It is now possible to justify the rules given above. Gates have been drawn alongside each line. So any term which separates out into a single letter at Line 1 will pass through just one gate before it emerges at the top. A term on Line 2 will go through two gates, and so on. Passage through one NAND/NOR gate gives rise to an inversion. So, if the expression at the output contains the term A, $\overline{A}$ is required at the input on Line 1. Going through two NAND/NOR gates involves two inversions, restoring the original, since $\overline{\overline{A}} = A$. Hence, if the expression contains A, and A separates out on Line 2, write A at the input on that line.

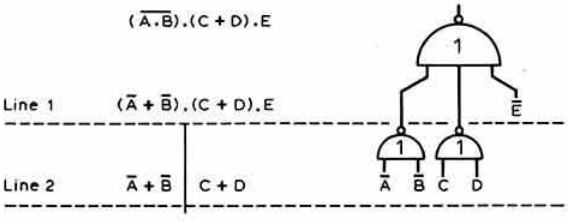
The expression A.B is obtained from a NOR gate with the two inputs $\overline{A}$ and $\overline{B}$. Similarly, A + B is obtained from a NAND gate with the same two inputs, $\overline{A}$ and $\overline{B}$. So the schedule works for Line 1.

Turning next to Line 2, one can work back from the expressions A.B and A + B through two gates. It will be seen that A.B derives from a NAND gate on Line 2; in like manner a NOR gate on this line produces an output of A + B. The discussion has related to Lines 1 and 2, but it could be generalized to show that the rules of procedure apply for all odd and all even lines.

If the expression contains any terms under a NOT bar that are not single letters, these need to be simplified first by applying de Morgan's Theorems:

$$\overline{A.B} = \overline{A} + \overline{B}$$
$$\overline{A+B} = \overline{A}.\overline{B}$$

This is illustrated in the next example:



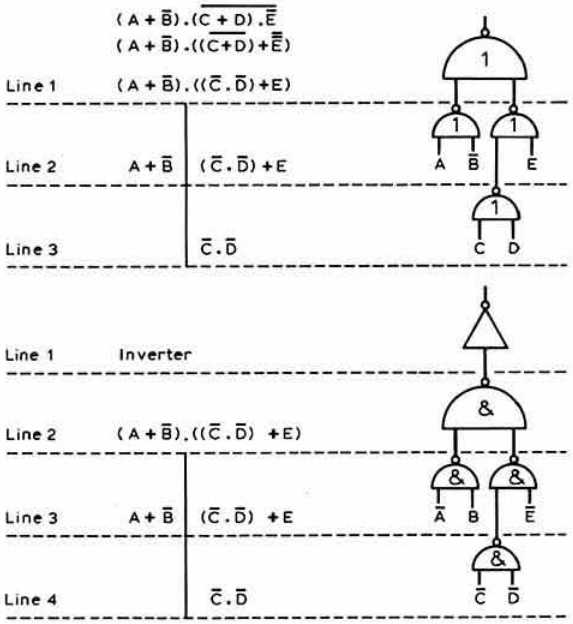
To emphasize the separation of Line 2 into two distinct parts (each of which gives rise to a gate), $\overline{A} + \overline{B}$ is kept apart from C + D with a vertical line.

Sometimes a rigorous algebraic simplification may not lead to the most efficient use of gates if:

(a) a particular expression is required in more than one place in the circuit;

(b) if a particular inverse is not already available so that an extra gate would have to be used as an inverter.

In these cases one may end up with a mixture of NANDs and NORs. Conversely, where the major part of a circuit consists of, say, NOR gates, in some sections the procedure described may work out to the NAND form. To obtain the NOR form when this happens, move all the lines down one and put an inverter on Line 1. For example:



Summary

1. Simplify algebra.
2. Put in brackets, label Line 1.
3. Carry down all but single letters, shed outermost brackets, label Line 2.
4. Repeat as necessary.
5. Even lines: write letters for inputs.
6. Odd lines: write complements.
7. Draw outline gates.
8. Label gates:

		+
odd lines	NOR	NAND
even lines	NAND	NOR

To change NAND ⟺ NOR: move down a line, put inverter on Line 1. □

technical topics

Pat Hawker, G3VA

WITH Christmas and the New Year looming up once again, I take this opportunity to send readers, old and new, the season's greetings. I also want to thank all the many members who have sent in suggestions or drawn my attention to interesting articles published elsewhere. As ever, I am acutely aware that not all such ideas have yet actually appeared in *TT* (and by the nature of things some may never do so) even though many of them are interesting and deserve to be more widely known. In excuse I must plead the need to keep the column reasonably balanced between different interests, limitations of space, failure on my part to grasp what the writer has in mind, illegible handwriting (not very often) or—what members always suspect—that fearful combination of indolence and lack of time that sometimes makes activity on the air seem so much more attractive than getting down to writing next month's *TT*. So apologies for all sins and omissions, and have a good Christmas.

VHF/A.M. with vmos

A curious belief has developed in recent years that nbfm is "better" than a.m., or ancient modulation as it is disparagingly called. Certainly nbfm has the advantage that it may cause less tvi and may be more suited to semiconductor power amplifier ratings, but its communications efficiency (particularly with 12·5kHz channelling) for weak signal operation or in the presence of fading is *lower*. Amplitude modulation has "a more graceful signal degradation characteristic in Rayleigh fading and weak signal conditions" to quote the article mentioned below. Amplitude modulation could well be heading for a revival, particularly on 28MHz and above.

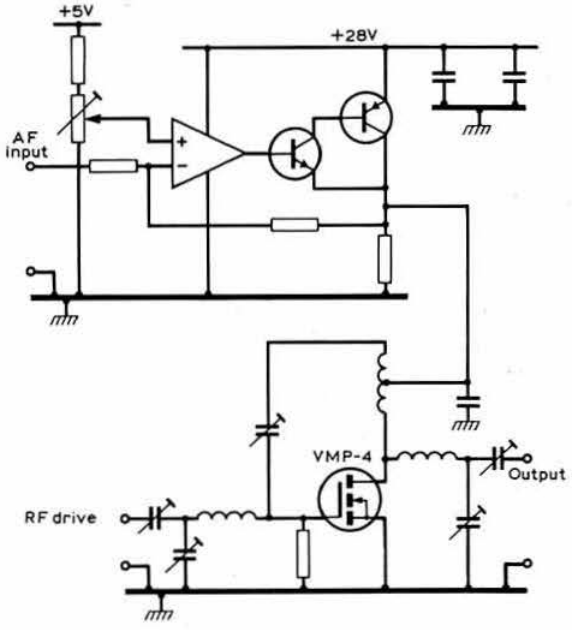


Fig 1. Heising (drain) modulator for vmos power fet transmitter

Philip Regan, of Siliconix UK, has drawn my attention to an article by V. Petrovic and Professor W. Gosling of Bath University in *Electronic Engineering* (June 1978, pp65-67) based on a paper presented at Communications 78. This explains how a high-efficiency vhf/a.m. transmitter, costing no more than an nbfm design, can be built using a VMP-4 Mospower fet in the pa with linearized gate-modulation (ie grid-modulation in valve parlance). The authors also outline a transformerless Heising (drain) modulator for use with vmos devices and noteworthy for its simple bias arrangement: Fig 1. To those old-timers who traditionally regard grid-modulation as a low-efficiency, high-distortion system, it may come as a surprise to find that the suggested gate-modulation arrangement (Fig 2) provides considerably higher power efficiency and has very low distortion. The Heising arrangement results in 3·7W mean or 9·5W p.e.p. output at 90 per cent modulation, with an overall dc to rf efficiency of 28 per cent; the gate-modulation ups the output to 5·1W mean or 13·3W p.e.p. at 93 per cent depth of modulation and an overall dc to rf efficiency of over 50 per cent, a useful improvement for portable/battery operation. These figures relate to a 28V supply, which is a bit of a disadvantage.

The power amplifier in both circuit arrangements is neutralized to reduce leakage of carrier signal to output and so permitting high modulation indices (input/output isolation about 51dB), one of the problems with transistor a.m. The modulation amplifier for gate-modulation is a single 741 op-amp and the other two op-amps are used for convenience as signal and feedback buffers; they can be omitted without sacrificing the performance of the modulator. The system as shown is stated to have a total harmonic distortion of the demodulated signal of only 0·3 per cent at 93 per cent modulation depth.

The test transmitter was designed for 100MHz with L1 5 turns, 18swg, 0·25in id; L2 7 turns, 18swg, 0·25in id, tapped in the ratio 2:5; L3 4 turns, 16swg, 0·5in id but could readily be modified for 70 or 144MHz. Some of these details have been provided by Philip Regan and will not be found in sources mentioned above. But the articles do stress that by using gate-modulated pa stages based on vmos devices, a.m. once again becomes more favourable in respect of simplicity and cost compared to nbfm units, since they do not require a long chain of frequency multipliers. In other words, v-mos fet technology makes a.m. efficient and economical.

In a recent letter, Ed Oxner, the guru of rf applications of vmos, mentions that Siliconix in California are hard at work on new hf devices, and that 1979 may well see important additions to this interesting range of devices. He notes that all major bipolar pa transistor failures can be traced directly to thermal stress: secondary breakdown, thermal runaway and current crowding. Since vmos has the opposite characteristic under thermal stress, none of the above failure modes apply, and there are no deleterious effects caused by the paralleling of transistors or from severely mismatched loads.

Vmos is a Type C fet; that is, an enhancement mode mosfet. It remains fully off when either zero bias or negative bias is

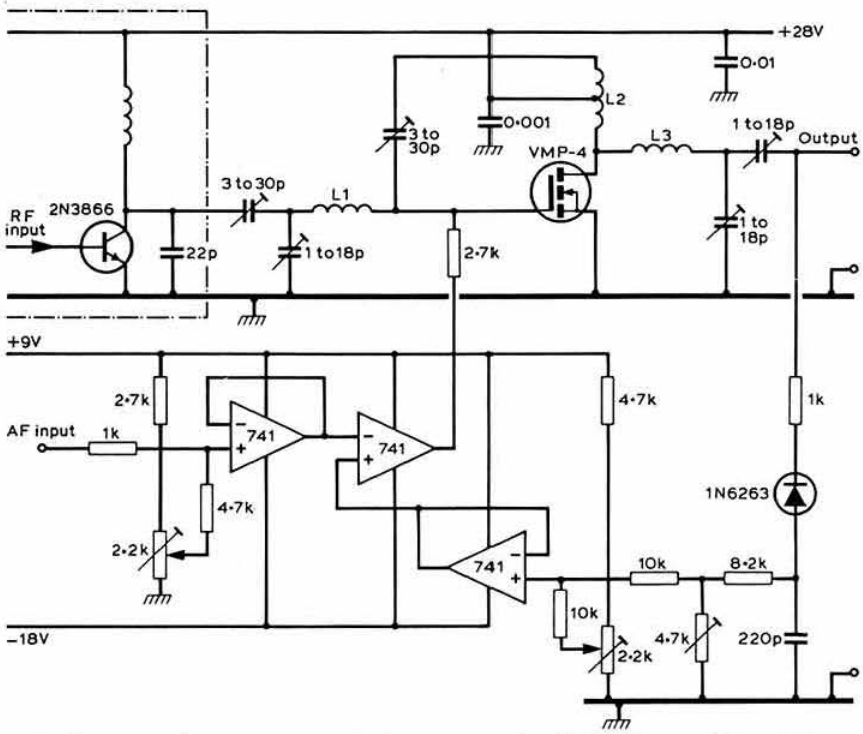


Fig 2. Linear gate modulator used with 100MHz vmos power amplifier to provide 13·3W p.e.p. output, as developed by Petrovic and Gosling

applied to the non-zenered gate (negative bias *cannot* be applied to zenered v-mos). With the application of a positive potential beyond the threshold voltage (between 0·8 and 2·0V) drain current will flow. Once a certain quiescent current is reached any further increase in gate voltage results in a linear increase in the dc drain current. Biasing vmos is different from biasing bipolar transistors simply because vmos only requires a positive potential to activate drain-to-source current flow. Since vmos biasing requires no current at the gate, the rf isolation between the input to the gate and the biasing network can be a simple high-value carbon resistor: Fig 3. Temperature tracking protection diodes are unnecessary as are "emitter" (source) ballast resistors; the vmos transistor needs only to be securely fastened to a heat sink capable of handling the anticipated dissipation. The high, low-frequency gain of vmos devices requires adequate by-passing of all dc drain and gate bias. Generally a 5μF tantalum capacitor works well. These

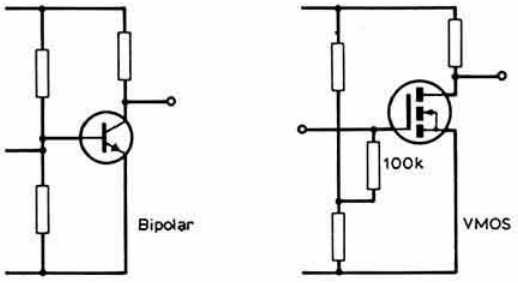


Fig 3. Comparative biasing networks for bipolar and vmos linear amplifiers

notes are from a paper given by Ed Oxner and Larry Leighton at an IEEE convention in Boston, Mass, last May.

It is only fair to add that vmos devices are currently rather more costly than bipolar disposal devices, but the advantages do seem to be significant. As we have indicated before, new devices are becoming available which provide, for example, up to 60W output through the vhf range. They also give good performance as low-noise small-signal amplifiers.

Portable power sources

A paper at Communications 78—"The next generation of combat radios", by C. J. Lomer of Racal-Taticom—included a useful survey of the advantages and disadvantages of the various types of batteries suitable for portable equipment, as follows:

"Most of our manpacks are powered by nickel-cadmium cells, which seem to offer us the best performance, although some of the small radios will work off primary cells, either dry cells or alkaline manganese. Other possibilities include silver zinc, which suffers from a limited number of recharges, and sodium sulphur which unfortunately operates at 300°C! Lithium cells look promising, although expensive, as primaries, but are not yet available as rechargeable types."

There are many factors involved in the choice of suitable primary and secondary power sources, and what may be the most economical battery for one application may be unduly extravagant for another. Discharge rate, energy density, end-point life, shelf-life, temperature etc are all inter-related factors. These points have been discussed before in *TT* and can be found in *ART*, but, in addition, a recent 12-page "Focus on batteries" appears in *Electronic Design* 12, 7 June 1978. This stresses how careful one should be, and how misleading

manufacturers' data can be. Loosely specified "service capacity" or "average capacity" in ampere-hours is often "no better than a nominal value or model number". Even a minimum guaranteed value can be almost useless without, at least: a specified discharge rate; an allowable voltage swing from full charge to a low cut-off voltage as determined by the circuit; an ambient temperature; a knowledge of the duty cycle; and a designated capacity cut-off point with age.

The article emphasizes how shelf-life is important, particularly for smaller conventional dry cells, and especially when stored at high temperatures. This loss can be reduced by storage at, say, 10°C rather than 20°C, possibly by as much as a half. But to take advantage of this, the batteries should be sealed in a polyethylene bag, preferably with a desiccant. When the batteries are to be used, they should be allowed to warm to room temperature for about 24 hours before being removed from the bag. In this way, condensation damage is minimized. It is most important to avoid storage at high temperatures; deterioration may be four to six times as great at 45°C as it is at 20°C.

The article once again points out that, provided the necessary care and precautions are taken, standard carbon-zinc "primary" cells are rechargeable to some degree (sometimes 10 to 20 times), but can be dangerous due to excessive gassing of sealed units. The US National Bureau of Standards lists five conditions that should be fulfilled: (1) The battery open-circuit voltage should not be less than 1V per cell; (2) The battery should be placed on charge very soon after removal from service; (3) The ampere-hours of recharge should be 120 to 180 per cent of the discharge; (4) Charging rate should be low enough to distribute charge over 12 to 16 hours; (5) Cells must be put into service soon after charging, since recharged cells have poor shelf life. The technique of "dirty dc" charging, described in *ART*, seems to offer some advantages, and large cells respond much better than small cells to such treatment. With the present high cost of batteries it is worth experimenting.

The *Electronic Design* article notes that alkaline-manganese dioxide cells are available as primary and rechargeable units and offer high efficiency under continuous or heavy-duty high-drain conditions (under some conditions they can provide up to seven times the service life of carbon-zinc cells); but they are significantly more expensive.

Fig 4 shows some typical discharge characteristics of secondary cells.

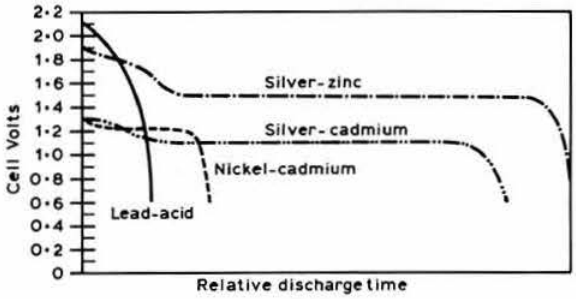


Fig 4. Typical discharge characteristics of secondary cells as given in *Electronic Design's* "Focus on batteries". Despite poor voltage regulation, the lead-acid units (including sealed lead-acid batteries) can offer cost advantages, although for portable equipment the nickel-cadmium units are probably the best choice at present

Lithium batteries are described in *Electronic Design* as "the newest and hottest items on the battery scene" and already a large number of firms are marketing (or preparing to do so) these cells. Very high energy-density; high voltage per cell; use over a wide temperature range, and long shelf life are among the advantages claimed. There are various forms of lithium cells with different soluble or solid reactants, all having different nominal cell voltages (typically 3·4V with inorganic electrolyte, 2·8V with organic electrolyte). Bell Telephones have developed a 2·5V lithium battery that *is* rechargeable, although few details have been announced and this is still experimental. There seems a degree of coyness about publishing the prices of lithium cells, which suggests that there is no reason to doubt the Racal comment that they are expensive, at least at present.

Another VK2ABQ mini-beam

Over several years a number of designs for compact, lightweight mono- and multi-band hf beam arrays have been presented in *TT*, originated by Fred Caton, VK2ABQ (former G3ONC). These have been based on wooden, horizontal "X" frameworks, using wire elements. A new variation, reducing the size still further, has been developed by VK2ABQ and is shown in Fig 5. This takes the form of a compact 28MHz array, with a turning radius of only 4ft, although of course it could be scaled up for 14 or 21MHz.

The unusual form of cross-over folding of each element means that a similar amount of wire to a full-size dipole and reflector can be accommodated on this small structure, two-thirds the size of the original VK2ABQ design.

The main effect of reducing the size is to increase the Q of the array, and in turn this implies a reduction of effective bandwidth. This makes it essential to check carefully with a gdo at the feedpoint before cutting the side wires, as suggested for previous designs. It is possible to lower the resonant frequency by lengthening the bases of the overlapping "pyramid" sections, but this is not recommended unless it is necessary in order to reduce the size of the framework beyond that shown. The total length of wire for 28MHz is about 35ft.

Normally, points Y and Z should be half-way along the 4ft wooden dowels. Where the wires cross over, a small insulator should be used to keep the wires apart; otherwise when power

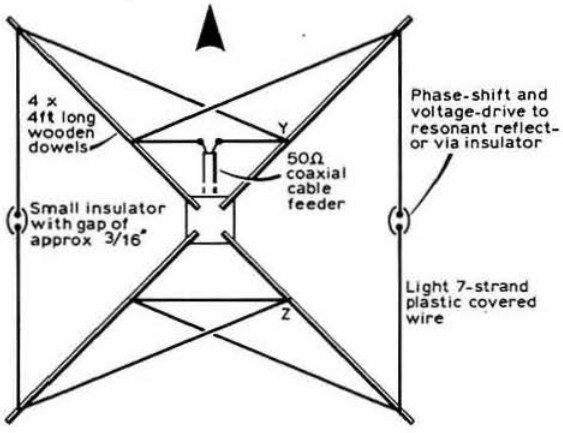


Fig 5. VK2ABQ's miniature 28MHz beam with 4ft turning radius. It can be scaled up for other bands. Note that accurate tuning up is needed

is applied there may be a tendency for the wires to weld together.

The "pyramids" can be thought of as a relatively efficient form of inductive loading, while the end sections continue to represent capacitive loading as in earlier VK2ABQ designs. When fed with 50Ω coaxial cable, an swr of less than 1·5 could be achieved around the correct operating frequency.

Despite the compact size and high-Q construction, VK2ABQ reports a substantial front-to-back ratio (of the order of three S-points), respectable forward gain over a full-size dipole and "excellent" side rejection (which had not been anticipated). Using a converted 8W citizen's band rig, many American stations and other dx have been worked from West Merrylands, New South Wales. Incidentally, in regard to the Australian cb situation, VK2ABQ contrasts the moronic chaos of 27MHz with the very successful Australian *novice* licence.

Instability in 432MHz linears

As a result of the notes on the problem of instability in 432MHz amplifiers using the 4CX250B in the linear mode (*TT* June 1978), Bill Williams, G8AVX, has received correspondence from many parts of the world. It has become clear that this problem is by no means limited to the G8AVX design but can occur with virtually all the published high-gain uhf amplifier designs. Unfortunately measures that seem to provide a solution for one amateur often only aggravate the problem for others!

G8AVX has spent many hours operating his amplifier into a dummy load, and is by now convinced that there is no single easy solution. However, he has recently followed a suggestion by G8HVY and fitted an Eimac type SK620A socket and chimney. This has very short screen ring fingers and an electrostatic screen round the screen ring, it has been referred to several times in *QST* and *73 Magazine*. This has proved successful, although it must be mentioned that the cost is around £23 and a cure still cannot be guaranteed. Some amateurs have overcome their instability problems by changing to another variant of the 4CX250 family or to another valve altogether (VK2BQJ finds the 8874 very successful). A high-gain uhf linear calls for great care in such factors as joints in screening boxes which can result in rf leakage; line Q-factor; and return paths from anode bypass to valve cathode. There are so many permutations that it is often far from easy to pin-point the actual cause of the trouble; though G8AVX feels that the objective of some 16dB gain and some 200W p.e.p. output is worthy of effort.

The experience has convinced G8AVX of the desirability of testing a "to-be-published" design on more than one prototype, and that there are some projects that really do require experience and instruments if they are to be successfully completed. On the other hand, I feel we must not be *too* inhibited by such considerations, provided readers accept, as they do for *TT*, that everything is experimental and nothing can be guaranteed.

Vertical polarization and large earth screens

The performance of vertically-polarized hf antennas is very significantly affected by earth conductivity. This is now widely recognized, although few amateurs are aware just how much additional low-angle radiation can be achieved when very large earth screens are used *extending out as far as possible* in the direction of the main target area.

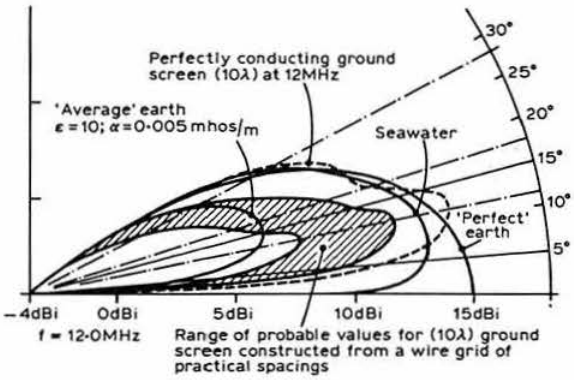


Fig 6. Vertical radiation patterns in boresight direction of a large extended aperture vertically-polarized log-periodic array showing how gain and radiation angle are improved by using extremely large earth screens. Note that for most urban and residential areas the earth conductivity is likely to be appreciably worse than the "average" indicated

The ideal vertical antenna is one sited *directly* at the edge of the sea (or better still, directly over a salt-water lagoon). Not many of us can do this; and unfortunately the sheer size of an earth screen needed to approach anywhere near the same performance is almost always out of the question: see Fig 6.

A recent article by TCI (an American firm making hf antennas for communications and broadcasting) in *ABU Technical Review* (September 1978, pp26–29) shows that the difference in power gain of a vertical antenna over perfect earth and one erected over good "average" earth can be as much as 9dBi. Poor earth conductivity virtually wipes out the low-angle radiation that we often hopefully associate with vertical polarization. Even with a screen some 1,000ft long and 400ft wide and the vertical antenna at one end, this may mean that the improved results in the target direction fall off quite rapidly in directions other than along the boresight (ie along the 1,000ft screen).

Here again it is important to note that directivity and power gain are not the same thing. For reception, it is seldom necessary to use earth screens with vertically polarized dipoles (radials are of course needed on vertical monopoles for purposes of impedance matching). In other words, it is not safe to assume that a vertically polarized antenna that brings in real dx well will necessarily be anything like as good on transmission as this might lead one to expect.

More on the switchable quad

The UA3IAR quad seems to have succeeded at least in arousing considerable interest in the concept of switched rather than mechanically-rotated beams. Not everybody, of course, accepts that UA3IAR has really solved all the problems of this approach. In the first place, a design intended to provide a 90° beamwidth is almost inevitably going to result in low forward power gain, unless this could be achieved by restricting still further the vertical radiation pattern (the way in which a monopole over *perfect* ground achieves "omni-directional gain"). Les Moxon, G6XN, has considerable reservations about the results likely to be achieved with the UA3IAR form of quad, which he considers may be likened, alternatively, to two stacked X-type antennas, and which results in much reduced radiation resistance compared with the conventionally

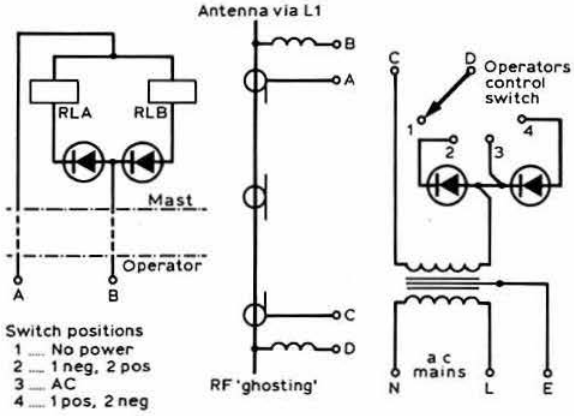


Fig 7. G8ABZ's suggested methods for using two-core or "ghost" (along the rf feeder) in the control system for the UA3IAR switchable quad as described in October *77*

shaped quad and delta loops; possibly by a factor of eight. He notes the use of an actively fed reflector, which again is indicative of low radiation resistance and can also result in problems of sidelobe performance.

Nevertheless this interesting and novel design may well stir others into coming up with improvements while retaining the benefits of simple switching of the polar diagram. G6XN, for instance, has for some time had thoughts of using "slopers" in a similar type of arrangement, although he has yet to prove it in practice. This should not dissuade people from experimenting along the UA3IAR lines; indeed, Frank Emery, G3ZMF, has already reported achieving satisfactory results using the basic design on 28MHz.

The error in the diagram of the current-steering diodes was noted last month, and it should also be mentioned that there was an error in the text description. As made clear in the caption to Fig 2 (October), both relays are *un*energized in Position 1.

A. Tinsley, G8ABZ, has also pointed out that by using two more diodes it is possible to use a two-core control cable or even to "ghost" the control functions over the main coaxial cable, as shown in Fig 7.

Direction-finding up-dated

Many amateurs are fascinated by the ability to locate transmitters by the use of quite simple direction-finding techniques, as indicated by the continued popularity of the 1·8MHz df contests. The *Radio Communication* reports of these events show that despite all the ingenuity and Machiavellian cunning shown in exploiting techniques for making it difficult to find the hidden operators, the simple loop gets there in the end. But, of course, this type of portable loop is very far from what is possible with large fixed wide-aperture installations. Those who recall the dubious bearings provided 30-40 years ago by Adcock-type hf installations (transmitters could appear to move hundreds of miles between successive transmissions) will note with interest a recent book *Radio direction-finding* (subtitled "and the resolution of multicomponent wavefield") by Dr P. J. D. Gething, of ASWE, published in the IEE Electromagnetic Wave Series. The text is heavily mathematical and intended for research students, but it does provide some glimpses of the sort of results which can now be achieved using developments of the Wullenweber ring technique. The Wullenweber was one of the less-publicized secret weapons of the 1939–45 war and undoubtedly gave the German intercept services a very considerable advantage over their Allied counterparts. For the Allies, "Huff-duff" exploitation of cathode-ray-tube displays owed much to British, American and French work.

Modern developments of the Wullenweber system depend on wavefront analysis with measurements made at a number of antenna elements, recorded in digital form and subsequently analysed in a computer. Dr Gething points out that a "Wullenweber with the best modern instrumentation, installed on a good site and well maintained, should measure the azimuth of arrival of a single ray to an accuracy of 0·1° or better—an order of magnitude smaller than deviations of the ray path (1°) produced by the ionosphere". He notes, however, that it is virtually impossible to build a circular array large enough to provide "instant" resolution of the order of 0·1° at the lower end of the hf band.

But before anyone tries to build one of these arrays in the back-garden, it is worth noting that many of the calculations in the book are based on a circular array of 96 doublets with an array radius of 163·83m. And then you need that computer!

Noise blanking and frequency shifting

Not long ago I heard an amateur commenting over the air that, despite all the talk about noise blanking etc in recent years, he had not come across any modern receiver with a really effective way of cutting out ignition and similar QRN, in any way comparable to the effectiveness of some classic noise silencers of the 'thirties and 'forties intended for a.m. reception (personally, for cw I still use back-to-back diodes across the af output of the receiver, although recognizing that this sometimes degrades signal-to-noise ratio and is a far from elegant solution).

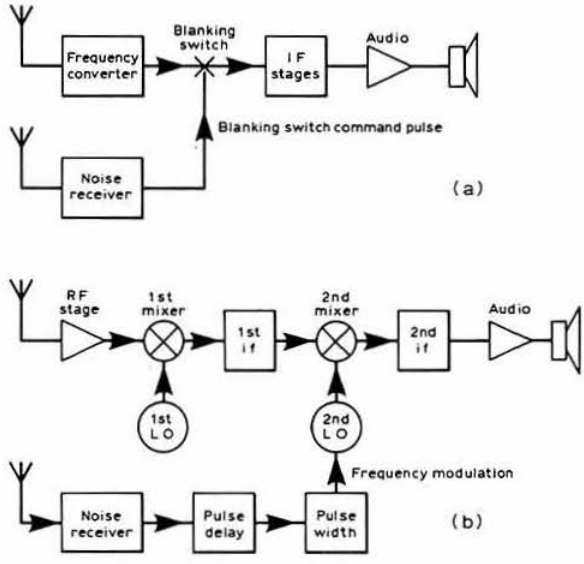


Fig 8. Noise blanking techniques. (a) Typical arrangement using blanking switch in the signal path which may produce switching noise, etc. (b) FM blanking system uses the output of the noise receiver to push the noise and signal temporarily outside the second i.f. passband

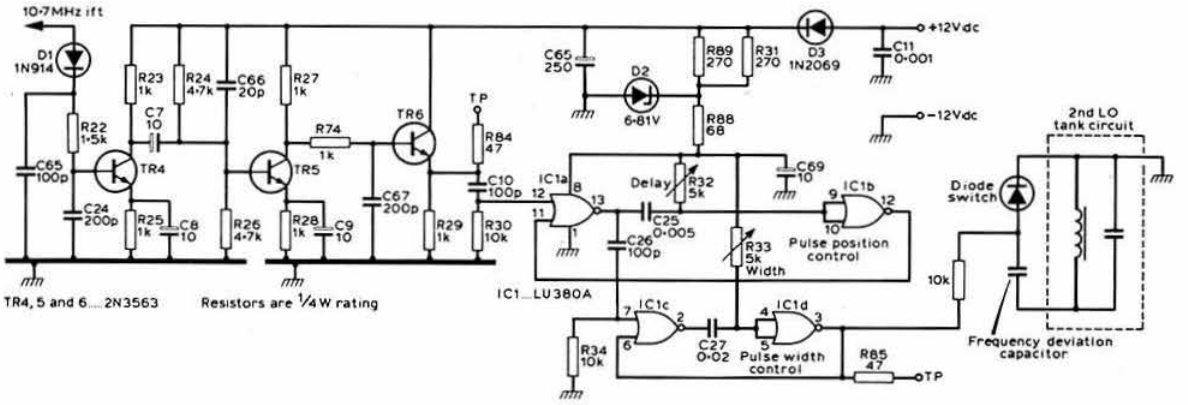


Fig 9. Processing sections of the noise blanking receiver

Not long afterwards I came across an article "Blank noise effectively with fm" by R. T. Hart in *Electronic Design* 18, 1 September 1978. This starts off by agreeing strongly with the proposition that current noise blanking systems are a good deal less effective than one might expect; it then goes on to suggest a possible solution, as follows:

"Blanking switches included in hf communications receivers are supposed to suppress impulse noise from sources like automobile ignition without affecting the communication signal. Unfortunately, limited on/off ratios and transient noise have made it hard for them to reduce saturation effects that can stretch from a few microseconds of noise pulse into an annoying audible output. But now you can bypass the switching/transient problem—and the saturation that goes with it—by using a frequency modulated blanker."

In effect, as shown in Fig 8, what the author is suggesting is to use the well-known technique of having a separate noise receiver, together with suitable delay and pulse shaping circuits, and then using this to "switch off" the main receiver at the appropriate times. However, instead of using a conventional blanking switch in the signal path, which he considers introduces too much switching noise of its own, he interrupts the signal path by frequency deviation of the second local oscillator in the receiver. During the noise pulse the fm diode switch across the tuned circuit of the second oscillator is actuated, causing an extra frequency deviation capacitor to appear across the tuned circuit, and so shift the frequency that the incoming signal, together with the noise pulse, is temporarily shifted outside the passband of the second i.f. Frequency shift keying is, of course, often an effective way of switching without introducing unwanted transients.

To implement such a system requires careful design of the noise receiver and the associated pulse position and width controls. The design used by R. T. Hart (full circuit diagram in *Electronics Design)* is tuned to about 38·3MHz and has wideband 10·7MHz i.f. transformers to preserve the shape of the noise pulses; this signal is then fed into logic pulse shaping and delaying circuits to match the distortion of the noise in the signal path. Fig 9 shows part of the system, but some different component values may be needed to match the delay to that of the main receiver's first i.f. R. T. Hart claims that: "Although easy to build, the fm switch easily outperforms conventional noise-blanking systems. In one case, using the fm switch, ignition-noise interference was not noticeable in an hf mobile receiver operating at a busy intersection. With the switch disabled, communication was impossible."

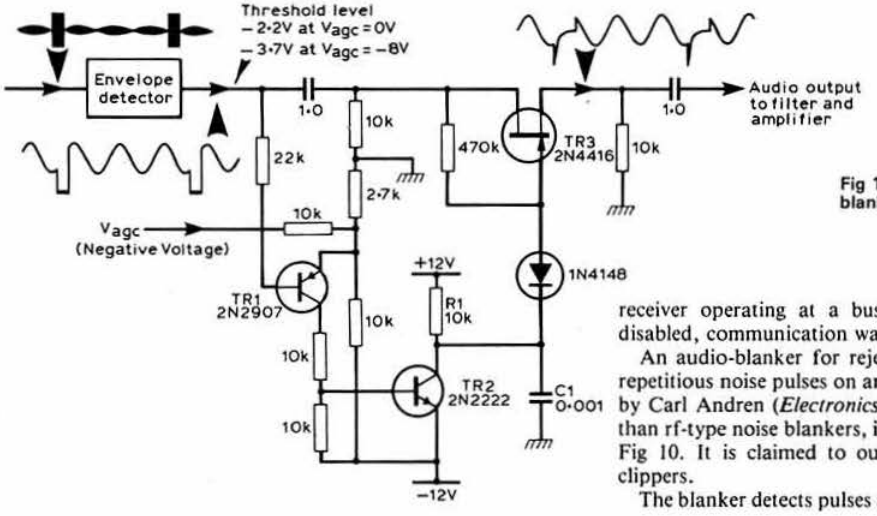


Fig 10. Improved form of audio-blanker as described in Electronics

An audio-blanker for rejecting ignition, radar and similar repetitious noise pulses on an a.m. receiver has been described by Carl Andren (*Electronics,* July 6). Although less effective than rf-type noise blankers, it is much less costly and complex: Fig 10. It is claimed to outperform the more usual audio-clippers.

The blanker detects pulses above a set threshold (140 per cent

modulation) and then disables the output stage if necessary. To ensure correct blanking action independently of signal-level changes, the receiver's agc signal is used. TR3 operates with no applied dc voltage to minimize switching transients. TR2, R1 and C1 have fast-attack, slow-decay characteristics. TR3 is thus gently turned on after a spike has passed, so that the popping and clicking sounds that often accompany the operation of a blanking circuit (see above) will be further suppressed, and only brief transients appear. The signal is slightly distorted but this is barely audible.

Soldering aluminium again

Max Bacon, G3WMB, suggests that one way of avoiding the aluminium soldering problem is to note that zinc or zinc-titanium alloy sheet is well suited as an alternative metal to aluminium. He writes:

"It is very easy to solder using black-heat-iron temperature and solder 50/50 or 60/40 with a low antimony content. Present day zinc or zinc-titanium alloy sheet is an easy metal to bend or drill, and its surface condition is very similar to aluminium. Metra Non-Ferrous Metals Ltd, Pindar Road, Hoddesdon, Herts, are stockists."

Dynamite and rf

The hazard presented by the operation of a radio transmitter, even quite low-power hand-held units, near the scene of blasting is widely recognized, but few amateurs have any clear idea of how far this hazard extends. Fortunately not much electric firing of explosives normally takes place in residential areas (there are exceptions!) so that this problem is usually confined to mobile or portable operation, where transmitter power and antenna gains tend to be restricted.

In *73* Magazine (September 1978), Bill Johnston, N5KR, provides a list of minimum safe distances between a transmitting antenna and the closest part of an electrical firing circuit:

Watts (erp)	Feet	Metres	Watts (erp)	Feet	Metres
10	100	30	500	675	200
50	225	70	1,000	1,000	300
100	325	100	10,000	3,000	915
250	500	150			

It must be added, however, that N5KR does not state whether these figures are derived from an official source, or whether they apply to both vhf and hf operation.

Remember that erp means *effective radiated power* and is obtained by multiplying the output power reaching the antenna by the gain of the antenna. The erp can thus be many times *higher* than the dc input to a transmitter or its p.e.p. output. A high power amateur station on 144 or 432MHz may well have an erp of the order of 10kW—and 3,000ft is over half a mile.

Quick shut-down power supply

In *TT* (April 1978) a low-voltage, high-current power supply was outlined, based on a design built by Bruce Riley, VK3ZSR, and initially described in *Amateur Radio* November 1977. K. Postler, VK5KI, has used some of the same basic ideas in developing a 12V, 1·5A supply but with virtually instantaneous shut-down facilities rather than the current-limiting approach of VK3ZSR. Higher output currents could be obtained by using additional external pass transistors.

His arrangement is shown in Fig 11 and is again based on a regulator ic (type 723). The pin numbers indicated, it should be noted, refer to the 10-pin metal-can version, but there is no reason why the 14-pin dil version should not be used (the pin numbers for the dil package were given for the VK3ZSR unit). He has adopted the shutdown technique suggested by Fairchild (*linear integrated circuits data catalogue*, Fairchild Semiconductors, 1973). A led overload indicator is included and a simple reset push-button restores the supply. An adjustable output is possible by substituting a potentiometer in place of RV1 and R2.

R1 limits the switch-on surge to within the ratings of the diode rectifier bridge (typically 30A peak). In the event of an overload, some power is dissipated in R6 and R7 to prevent the voltage across C1 exceeding its rating (a higher rated component would have been physically too large in the original unit). D1 protects TR2 and IC1 in the event of the load generating a back emf or other undesirable transient when the supply shuts down.

VK5KI uses an scr from a low-cost unmarked package of roughly similar appearance to a BC108. Several have been tried and all work satisfactorily, although R8 needs to be adjusted to achieve satisfactory triggering (take care not to reduce R8 too much or one may exceed the gate current of the device) but this should be around 1kΩ. A 2N2322 is suitable if one does not want to reduce costs by experimenting. Construction is not at all critical, and a beginner's printed circuit board should not give rise to any problems. □

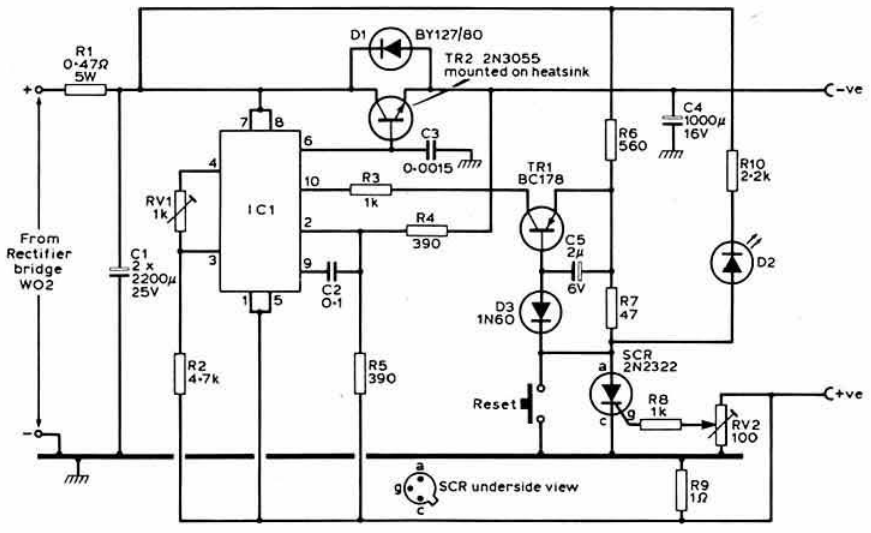


Fig 11. VK5KI's 12V, 1·5A power supply with quick shut-down facilities in the presence of an overload

New IARU Region 1 operating standards

The following recommendations on (a) S-meter standards, and (b) facsimile standards, proposed by VERON, the Netherlands national society, and Dr A. C. Gee through the RSGB, respectively, were adopted at the IARU Region 1 Conference held in Hungary earlier this year.

S-meter standards

In order to make a uniform reporting system on the amateur bands possible, taking into account the widespread use of the "subjective" S-system, and the large deviations between the characteristics of S-meters on current amateur equipment, IARU Region 1 recommends the use of the S-system for signal strength reporting on the amateur bands, based on the following standards:

(a) One S-point shall correspond to a level difference of 6dB.
(b) On the bands below 30MHz a meter deviation of S9 shall correspond to an available power of a cw signal generator connected to the receiver input terminals of −73dBm.
(c) On the bands above 30MHz this power shall be −93dBm.
(d) The metering system shall be based on quasi-peak detection with an attack time constant of 10ms±20ms and a decay time constant of at least 500ms.

Comments

1. Signal reporting on the amateur bands at the moment is based on the well-known "subjective" rst system. Although the system is very useful, the availability of modern, sometimes professionally made, receiving equipment, makes the use of a less subjective system for the measurement of the strength of the received signal possible. The system to be chosen, however, must not deviate too much from the "subjective" system.

2. The first, and most important, standard to be recommended, will be the definition of an S-point. A value of 6dB seems very practical. It corresponds to an already widespread "unofficial" standard and gives the least problems for non-mathematically-oriented amateurs.

3. Once having agreed upon the value of one S-point, a second, less important, but very useful recommendation is the definition of a reference level.

Taking into account the practical situation it is not possible to define one reference level for all amateur bands. On the hf bands a level of −73dBm (50μV over 50Ω) does not deviate too much from current practice. On the higher bands, however, where thermal noise is the limiting factor in many cases, a lower level must be chosen and −93dBm (5μV over 50Ω) seems appropriate.

4. Although the standards given above are based on continuous signals, in real traffic non-continuous signals (ie A3j) will be encountered. It is necessary, therefore, to define the measurement system in more detail.

In many cases the S-meter is coupled to the agc system of the receiver. Therefore a quasi-peak detector will be taken as the standard, with an attack time constant of 10ms and, although of less importance, the decay time constant shall be more than 500ms.

5. It is hoped that the recommendation will be followed by all equipment manufacturers, so that in the not too distant future one will know how to interpret the strength report of the other station.

Societies should advise their members about equipment manufacturers adhering to this recommendation, and try to avoid publication of receiver designs which do not, in principle, use the recommended standards. Simple means for calibration of at least the 6dB level ratio should be published.

Standard table

S	HF bands dBm (V over 50Ω)	Bands above 30MHz dBm (V over 50Ω)
9 + 40dB	−33 (5mV)	−53 (500μV)
+ 30dB	−43 (1·6mV)	−63 (160mV)
+ 20dB	−53 (500μV)	−73 (50μV)
+ 10dB	−63 (160μV)	−83 (16μV)
9	−73 (50μV)	−93 (5μV)
8	−79 (25μV)	−99 (2·5μV)
7	−85 (12·6μV)	−105 (1·26μV)
6	−91 (6·3μV)	−111 (0·63μV)
5	−97 (3·2μV)	−117 (0·32μV)
4	−103 (1·6μV)	−123 (0·16μV)
3	−109 (0·8μV)	−129 (0·08μV)
2	−115 (0·4μV)	−135 (0·04μV)
1	−121 (0·21μV)	−141 (0·02μV)

Facsimile standards

Preferred characteristic values for facsimile transmissions in the amateur radio service.

[a] The video (picture modulation) signal is generated at the audio frequency level, as in the sstv technique: the edge frequencies for "black" and "white" are 1,500Hz and 2,300Hz respectively, and the frequencies corresponding to the half-tones are positioned between the two frequencies. The audio-frequency bandwidth is 3,000Hz maximum.
[b] The rotation speed of the picture drum is switchable between 60, 90, 120, 150, 180 and 240rpm, with 60, 120, 180 and 240rpm being the preferred values.
[c] The index of co-operation shall be provisionally 288 in accordance with CCITT regulations; minor deviations from this value are permissible.
[d] Phasing-in signals and end-of-picture signals will be chosen at a later stage, taking into account practical considerations as regards the state-of-the-art.
[e] All amateur radio frequency allocations should be open for this new mode. Also, operation via repeater stations and amateur satellites should be allowed. The calling frequency on 144MHz is to be 144·700MHz.
[f] For transmissions on the hf bands the class of emission should be A4j, ie frequency shift keying by the basic signal of an audio frequency subcarrier, which modulates the main carrier in amplitude by single-sideband with suppressed carrier, or F4, ie direct frequency modulation (shift-keying) of the main carrier by the modulating signal.

In addition, on frequencies above 144·5MHz, F4/fm, ie frequency modulation of the rf carrier by a frequency-modulated sub-carrier, should be permitted. □

Transequatorial dx contacts on 144MHz

by J. RÖTTGER, DJ3KR*

In this article transequatorial contacts over distances of 6,000km carried out in the 144MHz amateur radio band are summarized, and a possible explanation of this recently detected propagation phenomenon is presented. The most likely mechanism suggested is forward scattering at spread-F irregularities occurring in connection with high rising plasma bubbles in the equatorial ionosphere. Some open questions which are raised could be answered by further observations by radio amateurs.

SOME very interesting observations of long distance contacts on 144MHz over more than 6,000km on transequatorial paths were reported recently by radio amateurs [1]. After some stations in one hemisphere had heard 144MHz signals from stations located several thousand kilometres apart in the other hemisphere, the first two-way transequatorial (te) contacts on 144MHz were made at the end of October 1977 between several LU stations in Argentina and YV5ZZ in Caracas over a distance of more than 5,000km. These were followed by contacts over almost 6,400km between KP4 stations in Puerto Rico and other stations in Argentina. In February 1978 144MHz contacts between VK stations in Darwin (Northern Australia) and Japan took place. A continuous series of contacts between ZE2JV in the southern and 5B4WR, as well as SV1AB, in the northern hemisphere started in April 1978. An instructive picture of the continuity of these te openings is given by the observations of 5B4WR in Limassol, Cyprus, copying ZE2JV from Salisbury, Rhodesia (Fig 1). These observations indicate maximum occurrence of 144MHz te propagation between 1700 and 1900gmt, which is 1900–2100 local time at the stations involved.

The general features of 144MHz te propagation, as observed until now, can be summarized as follows: (1) highest probability and maximum signal strength is observed during the hours after sunset near the radio path; (2) north–south paths with the station locations approximately symmetrical to the earth's magnetic equator seem to be preferred; and (3) signals very frequently indicate strong flutter fading connected with perceptible frequency modulation comparable to those features of 144MHz auroral backscatter.

These 144MHz te contacts surely signify a novel situation, since the previous highest frequency at which such long distance QSOs took place was the 50MHz amateur radio band. Even on commercial radio links, the maximum frequency which could be used for transequatorial contacts over 5,000km did not exceed 100MHz [2].

It is known that transequatorial contacts on 50MHz can be established regularly during years of reasonably high sunspot numbers. These contacts become possible due to the so-called supermodes, which are explained by a double reflection (better, perhaps, to say deflection, Fig 2) in the equatorial ionosphere showing large enhancements of the critical frequency north and south of the earth's magnetic equator. This enhancement is called "equatorial anomaly of the F-region". The supermodes (see dashed-dotted line in Fig 2) due to this anomaly are sometimes covered by the influence of strong irregularities in the night-time equatorial ionosphere. This phenomenon is called "equatorial spread-F" and is rather common in equatorial regions. In transequatorial propagation of vhf, as well as hf, signals, it causes flutter fading and considerable great circle deviations [3]. Since it is well known that the critical frequencies in the equatorial anomaly of the F-region do not reach values which allow frequencies greater than about 50MHz to be reflected at oblique incidence, a new explanation must be offered for the well-established transequatorial contacts on 144MHz.

Observations with high-power 50MHz radar near Lima, Peru [4], transequatorial propagation experiments in the hf band [3], as well as observations with orbiting satellites [5], guided scientists to an interesting phenomenon which occurs during the development of the equatorial spread-F. These experiments showed that in the night-time equatorial ionosphere rather turbulent fluctuations of irregularities exist which are connected with large depletions or bite-outs of ionization. These "deep holes" in the ionosphere, which are generated about an altitude of 400km, can drift upwards in the ionosphere like bubbles in the water. It is observed that these bubbles, which have dimensions of some 10 to 100km, occur in periodical patches. One assumes that this periodicity is due to large-scale oscillations of the earth's neutral atmosphere caused by severe tropical thunderstorms. Besides drifting upwards, these patches of bubbles and the corresponding spread-F irregularities also move in west–east direction. One can thus expect several bubbles to cross a transequatorial radio path during an evening at time intervals of 20–60min. The ionization or plasma bubbles, which most frequently occur about 1–4h after sunset at the equator, can even rise to altitudes larger than 1,000km. At the boundaries and in the wake of these rising bubbles, ionization irregularities occur which scatter vhf radio signals (50MHz as well as 144MHz).

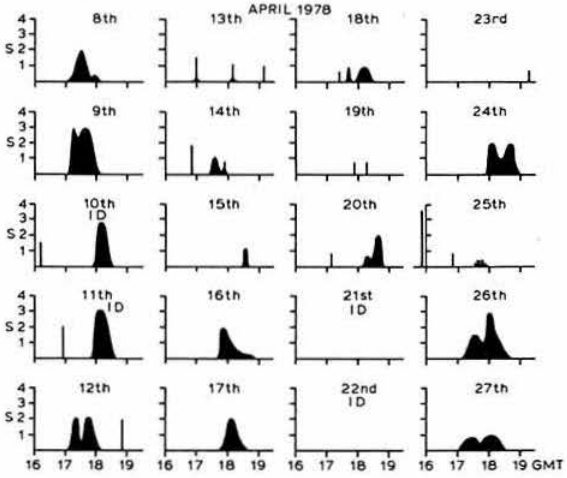


Fig 1. Reception of ZE2JV, Salisbury, on 144·118MHz in Limassol by 5B4WR during April 1978. The vertical axes denote the signal strength in S-units. The ZE2JV beacon had 50W rf and an 11-el Yagi; 5B4WR used a 10-el Yagi and a receiver with a noise figure of 1·8dB

*PO Box 5, D-3411 Katlenburg-Lindau 3, W Germany.

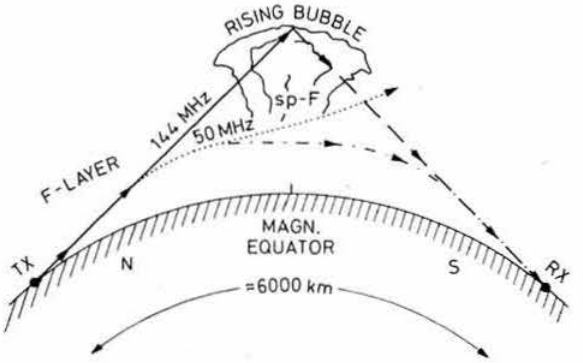


Fig 2. Scheme of transequatorial (te) propagation on 50MHz and 144MHz. During the post-sunset hours spread-F irregularities (sp-F) regularly occur in the ionospheric F-layer near the magnetic equator. Characteristic features of the equatorial spread-F phenomenon are plasma bubbles which rise to altitudes of about 400–1,000km. The accompanying high-altitude ionospheric irregularities scatter 144MHz signals so that te propagation over distances of more than 6,000km becomes possible (dashed line). 50MHz signals are deflected north and south of the magnetic equator. Mainly during daytime hours, this can give reason for 50MHz te propagation ("supermode" indicated by dashed-dotted line). The deflection, on the other hand, can prevent the 50MHz signals reaching the high-altitude irregularities (dotted line), which explains the observed difference of post-sunset transequatorial propagation on 50MHz and 144MHz

This scattering process is comparable to aurora backscatter from field-aligned, almost vertically extended, irregularities. Because of the horizontal direction of the earth's magnetic field at the equator, the ionization irregularities causing te propagation, however, are horizontally extended. In the case of te propagation these high-altitude spread-F irregularities cause forward scattering, which means that a small part of a transmitted signal deviates from its original propagation direction so that it can reach stations far beyond the horizon (see dashed line in Fig 2). One may also regard transequatorial ducting of 144MHz signals in field-aligned tubes of ionization bite-outs. The term "scattering" used in this report expresses a possible super-position of ducting or quasi-reflection at the bubble boundaries and pure forward scattering.

It is noted that ray bending in the lower ionosphere along the paths to the bubbles can be neglected on 144MHz, which means that these signals propagate approximately on a straight line from the transmitter to the scattering bubble and from there to the receiver. The lower the frequency, the stronger is the ray path deflection of radio signals in the ionosphere. This well-known phenomenon causes the ray paths of hf signals to be deflected or bent so strongly that they again reach the earth's surface, which is called ionospheric reflection. At frequencies larger that the muf (maximum usable frequency for a given radio path) the ray is still somewhat deflected in the ionosphere but can no longer reach the earth's surface. On 50MHz this ray bending still has to be taken into account, which can cause these signals not to reach the high-altitude irregularities in the bubbles (dotted line in Fig 2). This may be the reason for some reports indicating that 50MHz te propagation was not observed during 144MHz te contacts.

During times of low critical frequencies of the ionosphere, the ray bending is not too strong. Thus 50MHz signals can also reach high-rising spread-F bubbles so that long-distance te propagation via scattering can also take place on 50MHz. The 50MHz te signals then gain strong flutter fading. It is estimated that the bubble irregularities should also be capable of scattering frequencies even higher than 144MHz, which in fact already appears to have been observed in the 430MHz amateur radio band. Due to the moving bubble and the accompanying turbulent irregularities, the scattered signals gain strong amplitude and frequency distortions, which are known as severe flutter fading and frequency spread. Thus, even cw signals are sometimes difficult to read. Since bubbles can move in periodical patches across the transequatorial propagation path, one expects the signal to indicate long-term fading of 20–60min (Fig 2). These bubbles commonly reach heights around 700km, so that 144MHz te signals were often observed over distances of 6,000km. Since the maximum altitude at which irregularities connected with these bubbles were observed exceeded 1,000km, and taking into account some slight ray bending in the F-layer, one should expect 144MHz te propagation over distances up to 10,000km.

From these preliminary considerations it seems to be very valuable for amateur radio operators to contribute to the investigations of this new phenomenon of long-distance transequatorial propagation in the upper vhf band by attempting to discover, record and report:

(1) the highest frequency (greater than 430MHz?) which can be used;
(2) the maximum path deviation from the north–south direction and the asymmetry with respect to the magnetic equator which still allows long-distance te contacts;
(3) the maximum distance to be spanned.

Item (3) can probably be resolved by radio amateurs in IARU Region 1, since a maximum path length of about 10,000km and approximately symmetrical to the earth's magnetic equator is between the southern tip of Africa and Central Europe. Finally it can be documented that the detection of 144MHz transequatorial propagation, as well as continued observation of further details, again prove the appreciable contribution of radio amateurs to the investigation of radio propagation phenomena.

Acknowledgement

The author is indebted to W. A. Tynan, W3XO, for providing reports, as well as to the IARU Region 1 secretariat for making available the observational material from R. Whiting, 5B4WR.

References

[1] "The world above 50MHz", W. A. Tynan. *QST* January 1978, pp73–74.

[2] "Ionospheric propagation of hf and vhf radio waves across the geomagnetic equator", D. L. Nielson and M. Crochet. *Rev Geophys Space Phys 12,* 1974, pp688–702.

[3] "Some properties of large-scale equatorial spread-F irregularities interpreted by influences of atmospheric gravity waves", J. Röttger. *Ztschrft Geophys 39,* 1973, pp799–818.
"Transäquatoriale Kurzwellenfunkverbindungen", W. Dieminger and J. Röttger. *cq-DL,* February 1975, pp84–88, March 1975, pp145–147. (English translation available from DJ3KR).

[4] "Radar observations of F region equatorial irregularities", R. F. Woodman and C. La Hoz. *J Geophys Res 81,* 1976, pp5447–5466.

[5] "Plasma bubbles and irregularities in the equatorial ionosphere", J. P. McClure, W. B. Hanson and J. H. Hoffman. *J Geophys Res 82,* 1977, pp2650–2656. □

Preliminary results of a six-year study of the lower troposphere over southern England in terms of radio refractive index and potential refractive index

by R. G. FLAVELL, FRMetS, G3LTP

PART 1

Introduction

The main object of this article is to present a preview of some of the results of a long-term statistical study of the vertical distributions of radio refractive index (rri) and potential refractive index (pri) in the lowest 3km of the atmosphere over Crawley, Sussex. Some 4,380 consecutive soundings by radiosonde were used in the survey. Its aim has been to establish a reliable reference atmosphere, in terms of refractive index, for southern England, and to record in detail the form and extent of the variations which occur in the course of a year. The article opens with a summary of the roles played by rri and pri in radio propagation studies. A more complete account has been published elsewhere [1].

Tropospheric propagation

A radio ray, like a beam of light, travels in a straight line until deflected. At hf, deflections appear as a form of reflection from concentrations of free electrons in layers at heights of 100km or more. At vhf and above the dominant mechanism is refraction; nearly all the ray-bending occurs within about 3km of the ground.

The degree of bending depends on change of refractive index, rather than on the absolute value of refractive index itself. Anomalous tropospheric propagation at vhf and uhf has an exact counterpart in the visible part of the electromagnetic wave spectrum, where it is known as a mirage.

The expression for rri contains a term which shows it to be dependent on the amount of water vapour present; this is a major cause of the variations which are to be found in both space and time.

The rri of air

It is possible to measure the rri of air more or less directly using a device called a refractometer, usually mounted on an aircraft or a tethered balloon. For reasons of economy, however, it is more usual to derive it mathematically from upper-air meteorological data provided by radiosondes, relatively cheap telemetry devices carried aloft by free balloons.

The true value of rri of air, symbol n, is a quantity which is very close to unity; 1·000325 is a typical ground-level value. Significant changes are so small, however, that it is found preferable to subtract 1 from the n value and to multiply the remainder by one million. The quantity which results is given the symbol N; thus, when n = 1·000325, N = 325. This is sometimes known as the refractivity.

The expression which relates rri, N, to meteorological parameters is

$$N = \frac{77.6}{T}\left(p + \frac{4810.e}{T}\right)$$

where p = atmospheric pressure in millibars
e = water vapour pressure in millibars
T = air temperature (°K)

A pocket calculator programme has been prepared to deal with this. It provides N values directly from pressure, temperature and dew point depression [2].

The extent of ray-bending which results from refractive index changes can be estimated by calculating the gradient per kilometre of height. Near the ground this is often taken to be −40N/km (but see "Reference atmosphere" later, para 2). A gradient of −157N/km produces the same degree of bending as the curvature of the earth. A gradient exceeding −157N/km results in a situation known as ducting, where a radio wave can travel over great distances by alternately undergoing refraction in a steep-lapse layer and reflection from the ground.

Fig 1(a) shows a time-section of the lower atmosphere over Crawley, Sussex, during the period 18 to 22 January 1974, a notable occasion of anomalous propagation. The ordinate is atmospheric pressure, which is more convenient to use than height in these studies. The upper edge of the scale represents a pressure of 750mb, approximately 2·5km. The isopleths are rri (N) values at five-unit spacings. A dominant feature of the section is the formation, consolidation and eventual dissipation of a steep-lapse layer, marked by the closer-spacing of the isopleths. Note, however, that the N values of the lines associated with the layer when it is high differ from those which are included when it is low.

Potential refractive index

Potential refractive index is that value of rri that a sample of air would have if it were transported adiabatically, ie without change of heat or moisture, to a standard pressure level of 1,000mb. It has been given the symbol K.

The modification process is essentially one of normalization, the better to compare the refractive properties of air at different levels.

A number of other modified units have been proposed from time to time. Potential refractive index is unique among them in that the normalizing process used in its derivation is applied in accordance with thermodynamic laws which tend to be followed in nature by air in vertical motion. It is a fundamental truth that any adiabatic change in a sample of air will leave the value of pri unaltered.

Potential refractive index may be obtained from the expression already given for N, by substituting the value 1,000 in place of the original p, the potential temperature θ (a quantity which may be obtained from tables) instead of T, and by including a factor 1,000/p with the value of e, thus

$$K = \frac{77.6}{\theta}\left(1{,}000 + \frac{4810000.e}{p\theta}\right)$$

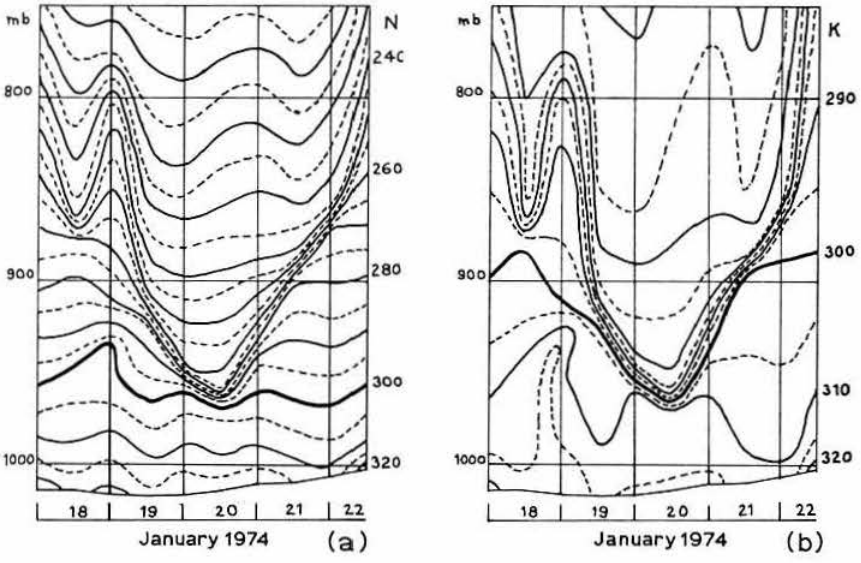


Fig 1. (a) Time section showing isopleths of rri, N. Crawley, 18–22 January 1974. (b) Time section showing isopleths of pri K. Crawley, 18–22 January 1974

As with N, a pocket calculator programme has been prepared to provide K values directly from pressure, temperature and dew point depression data [2].

Fig 1(b) shows the same event which was used to demonstrate the use of N, but this time in terms of K. A number of advantages should be apparent:

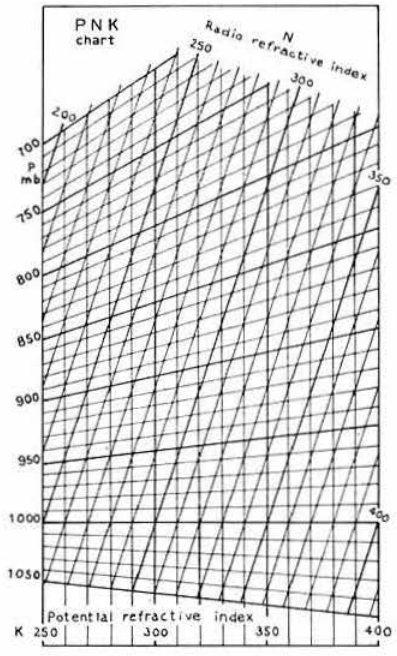


Fig 2. Refractive index plotting/conversion chart. Ordinate: pressure (mb). Abscissae: (vertical) pri K; (slant) rri N

(a) There are fewer isopleths because some of the "clutter" caused by the normal fall-off of refractive index with height has been suppressed;
(b) Features of interest to the propagation engineer are emphasized, yet there is no alteration in the height at which they occur, nor in their vertical extent;
(c) There is now a coherence of values within the steep-lapse layer which remain virtually independent of height.

The relationship between K and N

T, the air temperature (°K) and θ, the temperature (°K) which would result when the pressure of a sample of air was altered to the standard 1,000mb (amount of heat must not be confused with temperature where adiabatic changes are concerned) are related such that

$$\frac{T}{\theta} = \left(\frac{1000}{P}\right)^{-0\cdot288}$$

By manipulating the expressions previously given for K and N the following conversions can be obtained:

$$N = 0\cdot00731.p^{0\cdot712}.K$$
$$K = 136\cdot8.p^{-0\cdot712}.N$$

These two expressions allow conversions to be made from one unit to the other at any stage of the work, providing always that the appropriate value of atmospheric pressure is known. This is one of the reasons why all the statistical work to be described has been carried out in terms of pressure instead of height.

Alternatively, the chart shown in Fig 2, which was developed expressly for this work, may be used to facilitate rapid conversions from one unit to the other. It is also intended for use as a plotting chart, where a single profile may be read off in N-values or K-values, as required.

These relatively simple relationships mean that advantage may be taken of the convenient pictorial qualities of pri which make it easier to identify a period, or area, of interest, without losing the ability to convert rapidly to N in order to suit the ray

tracing formulas. This being so, it should be feasible to rewrite the ray-tracing equations in terms of pressure intervals and K-values, but that aspect is beyond the scope of this study.

Vertical motion in the atmosphere

It may be shown that, because of its derivation, pri acts as an effective indicator of vertical motion in the atmosphere in addition to its more-obvious role in connection with ray-tracing. The time section sequence of 3 to 8 January 1977 (Fig 3) illustrates this.

Consider first an anticyclone, a closed system of isobars on a weather map, with high pressure in the centre and light winds blowing clockwise (in the northern hemisphere) and diverging slightly outwards. This outward flow demands for its maintenance a downward flow from aloft. A feature known as anticyclonic subsidence leading to a warming and drying of the air as it becomes compressed in the lower levels of the atmosphere (for the same reason that the end of a bicycle pump becomes warm in use). The process approximates closely an adiabatic change, and K-values which are normally found several kilometres above the ground are drawn down by the descending air, as can be seen over the periods 3 to 4 January and 7 to 8 January in Fig 3.

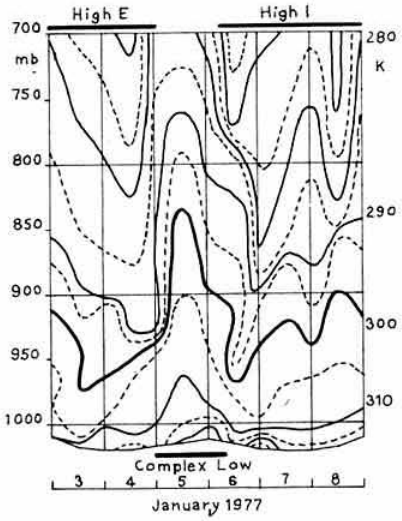


Fig 3. Time section showing evidence of downward motion of the atmosphere associated with high pressure systems, and upward motion associated with low pressure systems, as shown by displacement of K isopleths. Crawley, 3-8 January 1977

In a low pressure system the reverse occurs; winds blow anticlockwise (in the northern hemisphere), converging towards the centre. In order to maintain a balance there must be an upflow, leading to cooling and an increase in humidity as the air expands with height. The eventual result is saturation and, if the lifting is continued beyond the level at which that occurs, water will condense and fall out of suspension as rain, or some other form of precipitation. When that happens an alteration in the K-value occurs because of the effect of latent heat, but the evidence of the up-flow remains, nevertheless, as may be seen over the period 5 to 6 January in Fig 3.

Once the underlying principles have been grasped it is easy to recognize the changes in the pri patterns which result from the passage of the various weather systems over the radiosonde station; in this case at Crawley.

The layers of steep refractive index gradient which are associated with periods of anomalous radio propagation require two things for their formation:

(a) Subsiding air, generally, though not exclusively, in association with a large anticyclone, which brings low values of refractive index down from high levels;

(b) A barrier, maintained by turbulence, containing high refractive index air, stirred up from the ground, where moisture is generally available. The most favourable conditions for anomalous propagation occur when there is a deep layer of warm, dry, subsiding air aloft and, below it, an extensive area of cool, thick, dripping fog.

Thus subsidence alone is insufficient. If the turbulence in the lower levels is insufficient to maintain a steep boundary at the interface, the low refractive index air will be allowed to descend to below antenna height and a sudden deterioration in signal levels will result. Thus not all anticyclones produce periods of high signals or long ranges, and for that reason atmospheric pressure alone is an unreliable indicator.

The six-year survey

The six-year survey of refractive index which forms the basis of this article was undertaken by the Radio Society of Great Britain in order to establish an authoritative long-term record of conditions over Crawley, which could be regarded as being representative of southern England. There appears to be no evidence in the literature that such a task had been attempted on this scale before; so far as is known the statistics on pri are unique at the present time.

The source of meteorological upper-air data has been [3]. The period investigated extended from 1 January 1972 to 31 December 1977. The analysis has taken account of all resported levels to 700mb of every ascent (made at 12-hourly intervals) at Crawley, and has included statistics on surface pressure values and the reported heights of the 850mb and the 700mb levels.

In this analysis both rri and pri have been treated as meteorological variables in their own right. Like the data from which they were derived, they have been dealt with at all times in terms of pressure levels, with the sole exception that a two-year analysis of lapse-rates per kilometre, which was undertaken for comparison against accepted notions, was, of necessity, worked in terms of height. For the rest of the work, combining results statistically at levels of constant pressure has effectively eliminated one of the variables from the refractive index equations and also provides the condition necessary for simple conversion between N and K.

In other radio-meteorological studies the more usual approach to refractive index has been to work exclusively with N expressed as a function of height. Despite one's instinctive regard for its usefulness, height is not a parameter which occurs naturally in the free atmosphere—consider, for example, the frequent in-flight adjustments which must be made to an aircraft's aneroid altimeter if it is to be kept functioning as its designer intended. To use height as a basis for statistical studies of refractive index is to introduce into them quasi-exponential components which vary with each sounding according to the temperature structure through the environment. This can be avoided by working throughout in terms of pressure, making conversions individually when required,

using the pressure vs height relationship which forms part of every radiosonde message.

All the basic work has been carried out in pri K-units. Where results have been given in N-units it is as a result of applying the conversion expressions given under the heading "The relationship between K and N", para 1. A complete survey of the techniques involved is contained in [1].

References

[1] "Propagation", R. G. Flavell. *VHF/UHF Manual*, 3rd edn, chapter 2.

[2] "Using a programmable pocket calculator to determine values of Radio Refractive Index and Potential Refractive Index", R. G. Flavell. Paper prepared for the IARU Region 1 Conference, Hungary, April 1978.

[3] *Daily Aerological Record*. Meteorological Office, Bracknell. (HMSO). □

(To be concluded next month)

oscar news

USSR satellite system RS

On 26 October the USSR amateur satellites Radio 1 and Radio 2 were launched, together with COSMOS 1045. The characteristics of the two satellites, as observed after launch, are basically in accordance with previously published information, except that they are in a higher orbit with a correspondingly longer period. The observed parameters of the two satellites are given in the table. These figures are provisional and are subject to confirmation after a longer observation period.

E. T. Krenkel Central Radio Club of the USSR. L to r: Vera S. Sviridova, head of the Box 88 QSL Bureau; Boris G. Stepanov, UW3AX, deputy editor-in-chief of the amateur radio monthly magazine "Radio"; Vasiliy M. Bondarenko, chief of the Central Radio Club; Nikolay V. Kazanskiy, UA3AF, a frequent contributor to "Radio" and a member of its editorial board. In the background is an exhibit dedicated to the arctic explorer, philatelist, and radio amateur Ernst Krenkel, after whom the club is named

The launch of the satellites received a great deal of publicity in the Soviet press. *Izvestia* and the *Sovietskiy Patriot* carried prominent notices and the TASS News Agency issued a long announcement.

The information so far released indicates that there are two command stations devoted to the control of the satellites, but their locations are not yet known. The stated purposes of the spacecraft are radio communication, scientific-technical experiments and educational purposes. The two satellites differ in their size, construction, on-board equipment, antenna systems, solar batteries and power sources. Frequencies of the transponders and beacons are the same in both spacecraft.

The satellites are the result of many months of work by the Space Technology Laboratory of DOSAAF and by members of student construction groups. The telemetry systems were developed by A. P. Popkov, and Leo Labutin, UA3CR, was the leader in the development work for the remainder of the electronic systems.

Characteristics	
Apogee	1,724km
Perigee	1,688km
Inclination	82·55°
Period	120·38min
Increment per orbit	30·2°W
Uplink	145·880—145·920MHz
Downlink	29·360— 29·400MHz
Telemetry and beacons	29·400MHz

Mondays and Wednesdays are days on which both satellites will be available for experimental work only.

Both satellites are in a very similar orbit, close together, and distinction between them is made on the basis that one sends the identification "RS" once, the other sending "RS RS". For latest details and information on reference orbits please check the AMSAT net at 1015 on Sundays on 3,780kHz.

Orbital calendar for 1979

The calendar containing all orbits of Oscars 7 and 8 for 1979 will be available during December from AMSAT-UK. The cost to non-members is £2.80, and to members £1.65. Orders should be sent to G3AAJ, QTHR. AMSAT life members should request their free copies of the calendar directly from W6PAJ, PO Box 374, San Dimas, CA 91773, USA. The free calendars will *not* be available from AMSAT-UK.

Oscar 7 telemetry

Battery problems have resulted in garbled telemetry on Mode B of Oscar 7. The position may change rapidly and users should check the AMSAT net on 3,780kHz on Sunday mornings at 1015 for news of the latest developments. There are a number of other Oscar nets on 144MHz, details of which are given in *Oscar News* published quarterly by AMSAT-UK.

Power

Users should employ the minimum power necessary to access Oscars 7 and 8. The use of vastly excessive power has caused problems to both satellites, and, unless some measure of discipline can be brought into the use of the on-board transponders, the Phase 3 satellite scheduled for launch in 1979 will be a wasted project.

AMSAT election

Following the recent election for three directors to the Board of AMSAT-USA, the following candidates were successful: Tom Clark, W3IWI; Pat Gowen, G3IOR; and Richard Zwirko, K1HTV. □

RADIO COMMUNICATIONS and the ITU

This is the last in the series of articles prepared by the International Telecommunication Union to mark the "Radiocommunication" theme of this year's World Telecommunications Day.

The future of radio communications

Nothing is more difficult than prophecy. The history of radiocommunications is rich in categorical statements which nowadays merely raise a smile.

In 1901, for example, Dr Albert Turpain, Doctor of Sciences and demonstrator in physics at the University of Bordeaux, published a book entitled *Les applications pratiques des ondes électriques* (Practical applications of electric waves) in which he wrote: "To sum up, while it may be stated that wireless communications by hertzian waves are practicable over short distances, it would be audacious to claim that they could be used to exchange signals at any distance, however great, without the aid of a conductor. By going beyond the range of genuinely practical application, which it can rightfully claim for its own, and by pretending to apply to telegraphy at any distance, Mr Marconi's ingenious system would be doomed to failure." [1]

Campbell Swinton, when talking to the Radio Society of Great Britain in 1924 on the topic of seeing at a distance, said ". . . it is probably scarcely worth anybody's while to pursue it."

Seeing into the future is therefore a risky business. That is why this article will deal only with certain conclusions reached by experts [1], [2], [3], [4]. In fact, in the present era, sometimes called "the electronic age", it is becoming more and more difficult to draw a clear distinction between wire-borne and radio telecommunications. The transmission of messages, of whatever type—telephone call, data transmission, radio broadcasts—often calls for the use of both techniques. To speak of the future of radiocommunications, one has, in the same breath, to refer to the future of telecommunications.

Equipment

Generally speaking, the future can be read in the developments in electronics which have led to microelectronics, described in the following terms by Dr Boris Townsend [2]:

"It is not possible to ignore the incredible reduction in the size of electronic circuits which has been made in the last decade. Gone are the separate valves, resistors, condensers and wires of yesteryear. Today's large-scale integrated semiconductor microcircuit can house thousands of individual electronic components on a small chip of silicon the size of a screw head.

"With small size comes a reduction in the cost of materials, a reduction in weight, usually a reduction in power consumption, and a reduction in operating time, since the signals moving through the circuits have less distance to travel. The failure rate also falls since the number of mechanical or soldered joints and the opportunities for operator mistakes are alike reduced. The cost of making an integrated circuit is proportional to its area and is more or less independent of its circuit complexity. The reduction in cost is staggering. An integrated circuit now costs about the same as an apple. As a result it is now practicable on the one hand to undertake electrical processes and functions of great complexity, and on the other hand to mass-produce cheaply, for the home devices which were once only to be found in capital-intensive studios.

"Will this trend continue? It can. The latest microcircuits are approaching size-reduction limits imposed on the photo-etching process by the wavelength of light—that is to say, individual parts of the circuit are not more than a few wavelengths of light in size. Further reductions require radiations of shorter wavelengths than light, and laboratories are currently utilizing ultraviolet, X-rays, and electron-beam pattern-generation machines to continue this reduction in size. It is an industry which is aiming at a dimensional precision two orders better than that to which mechanical engineering machine shops can work.

"Which brings us to a point of fundamental importance in forecasting. The more recent history of manufacturing industry is that, despite the advantages of large-scale production and the replacement of labour by automatic machines, mechanisms grow more and more expensive to produce, while electronics become cheaper and cheaper. So whenever mechanisms can be replaced by electronics, they will be. Whenever a problem can be transferred from the mechanical domain into the electronic domain, it will be—and indeed already is."

Transmission

Micro-electronics opens up considerable possibilities for the two types of transmission employed hitherto: analogue transmission and digital transmission as described by José Luis Martín de Bustamante of the Spanish National Telephone Company (CTNE) [3]:

"Generally speaking, transmission is analogue, ie it corresponds to the nature of the information to be transmitted so that a special type of treatment is required for each type of information. In digital transmission, however, discrete samples of the original signal are sent in digital form or in a series of pulse trains which, in one way or another, enable the original signal to be reconstituted.

"This digital technique has already been introduced with pulse code modulation systems and provides a number of advantages, such as better transmission performance, absence of noise in conversation, great reliability and, above all, the availability of a digital line which does not depend on the service to be transmitted but only on the transmission rate, and which can be used as a telephone channel, or for music, visual telephony, facsimile, high-speed data, etc.

"It is, however, integrated circuit technology—in its two forms, monolithic and hybrid—which will definitively change the structures of transmission equipments. The combination of digital transmission and integrated circuits will form the real basis of future change. Apart from current developments aimed at widening the frequency margins that can be transmitted over coaxial cables and other transmission media, work is

proceeding in two directions: millimetric waveguides and optical fibres.

"**Waveguides.** Current research aims at covering great distances with circular waveguides (5 to 6cm in diamater) and transmitting a large number of messages (more than 100,000 telephone calls simultaneously). The most serious problems arise in manufacture and installations because of the high accuracy requirements in respect of diameters and straightness. Serious difficulties are also caused by the fact that the admissible curvature has to be very smooth.

"**Optical fibres.** The optical fibre technique is being developed in an attempt to mitigate the propagation drawbacks of the laser beam when the atmosphere is used as the medium; the optical fibres provide a physical support for the beam. Optical fibres consist of a central core a few micrometres in diameter surrounded by a crystal with a very low refractive index in which the coherent laser light is propagated as a wave surface. The optical fibre has a considerable capacity."

Radio links

With regard particularly to radio links, radio relay links (microwave links), although meeting competition from waveguides and optical fibres for certain applications, will continue to loom large in the design of telecommunication networks. Space links in particular will increase their capacity, as will also the submarine cable systems, the two media being complementary.

"Although satellite systems designed to cover large distances may be compared with microwave systems between fixed points, the difference between the respective distances to be covered is so great (38,000km for satellites against an average repeater distance of 50km in a radio relay link) that the design of satellite systems is becoming much more complex.

"However, as the technology develops and makes possible higher emission and repetition powers, and the placing in orbit of greater weights, satellite communications will be more competitive with conventional communication systems, mainly for intercontinental traffic; although their use will also be extended to national and regional communications over great distances." [3]

Furthermore, the World Administrative Broadcasting-Satellite Conference held by the ITU in 1977 prepared a plan for the broadcasting satellite service, so that this new facility can be expected to expand in the 'eighties.

New services and facilities

Needless to say, the main question for the public concerns the benefits to be derived from modern radiocommunication techniques.

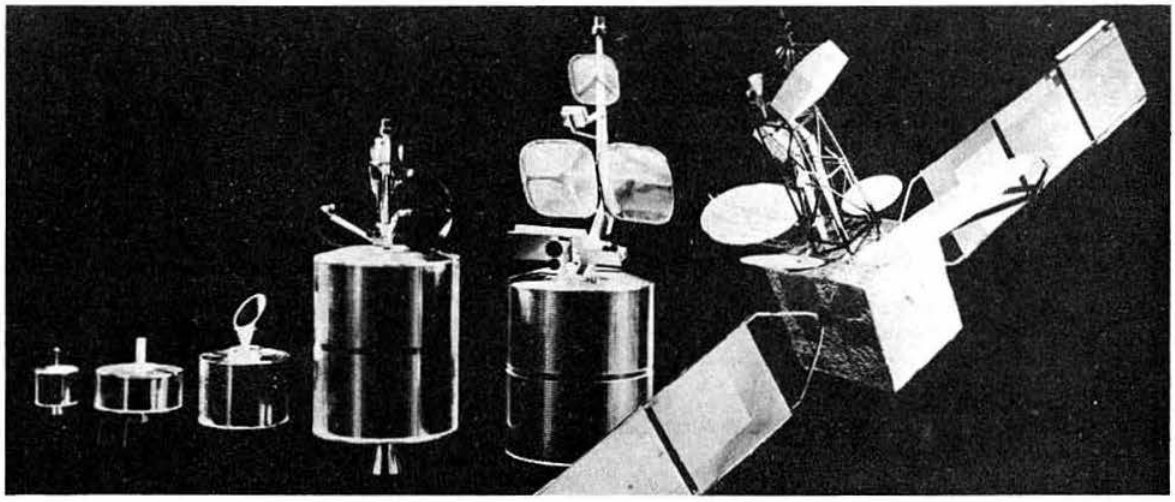
So far as can be judged, the characteristics of this future society which, in one way or another, will demand communication facilities for their development, or will result from these facilities, are the following, although the list is not exhaustive:

1. "Formation of the large urban community—the megalopolis. In this city of tomorrow there will be a collective infrastructure of audio-visual communications with audio-visual/data processing exchanges which will cater for telephony, the transmission of audio-visual programmes, consultation of libraries—books, records, video tapes, film, etc—and, of course, for computers. In this city or society . . . the individual will be able to choose what he wants to see and hear as well as when and how." [4]

2. Development of communications in rural areas, with low population or remote from the megalopolis, to put an end to their isolation. Radiocommunication media will be called upon to play an important part here.

However, the new services available to the public will not appear simultaneously in all parts of the world: the advent of new facilities is very directly connected with the level of social and economic development of the state or society. To generalize, the various types of communication which will be directly affected by the development of radiocommunications will be:

(a) communication between individuals;
(b) man-machine communication;
(c) machine-machine communication; and
(d) mass-communication media.



Generations of space communication satellites: from *Telstar-1*, launched in 1962, which was used for the first transatlantic television broadcast and which was able to transmit 24 telephone calls simultaneously, to *Intelsat-V*. The first of the Intelsat-V series is planned for launching in 1979. Intelsat-V satellites will have a capacity of 12,000 simultaneous two-way telephone circuits and two television channels. (Photo: *INTELSAT*)

(a) Communication between individuals

"Telephony will continue to have pride of place among switched services and the telephone will be the most commonly used terminal. The logical next step will be to associate it with a television screen, and the videophone will be the second largest service. With the videophone it will be possible to transmit images of moving objects, texts and drawings.

"The telephone and the videophone will bring the entire planet within the range of two of our senses which perhaps are the most important, mainly, sight and hearing, and will satisy, to a large extent, our need for personal contact. It will be possible to organize meetings among people living in different parts of the world, or to initiate business transactions by telephone and immediately to transmit written documents for signature.

"When there are millions of these combined equipments, with a little ingenuity and an additional device of some kind we shall have electric typewriters "writing" to each other so that much of the business correspondence conducted today will be dispensed with because most of it will be sent at night at high speed. This will, in the final analysis, constitute a variant of the telex services which will also expand considerably.

"After the telephoned mail service will come television, so far as distribution from studio to transmitter and thence by cable to subscribers is concerned, closely followed by the selective consultation of libraries, the exchange of information between libraries, and the telephoto service. We can also include the consultation of medical bibliographies and patent registers.

(b) Man-machine communication

"It is logical to assume that, so far as man is concerned, the equipments used will be the same as for man-man communications. Normally, subscribers will request one-way video and speech communications with information centres such as: data banks, for alphanumerical information; information exchanges which supply drawings, slides, films, photographs, etc; television channel distribution centres; audio-visual entertainment programme distribution centres.

(c) Machine-machine communication

"These may be of two kinds: one-way with one or several users and at different transmission speeds, and two-way at different transmission speeds.

"The main sphere of application is the computer, because the large volumes of information which have to be handled nowadays, and the speed of selection required by the consultations made, render it necessary to discard the conventional working systems and to rely entirely on the new techniques which call for different methods." [4]

In fact, "conversations" between computers will continue to develop, using for intercontinental links, for example, earth stations installed alongside the main computing centres which are themselves connected by satellite. Recent trials have demonstrated the advantages of such satellite links in bringing about full interworking between large-scale computers as if they were housed in the same building.

(d) Mass-communication media

These refer largely to sound and television broadcasting, on which information has not yet been issued.

References

[1] *Journal Télégraphique*, 33rd year, December 1901, pp335 and 336.

[2] "Tomorrow's broadcasting—the technical possibilities—are the engineers about to mislead us?" A lecture by Boris Townsend, head of the Independent Broadcasting Authority's Engineering Information Service, at the IBA on 22 February 1978.

[3] "Speculations on the future development of communication techniques" by José Luis Martín de Bustamenta, deputy director-general, Compañia Telefónica Nacional de España, *Telecommunication Journal*, Volume 45, March 1978, p124 et seq.

[4] "Telecommunications 2000" by José Luis Martín de Bustamente. *Telecommunication Journal*, Volume 43, May 1976, p361 et seq. □

Fifth Welsh Amateur Radio Convention

The attendance at the Welsh Amateur Radio Convention, now a firmly established event in the amateur radio calendar, has risen from 250 in 1974 to 650 this year. This convention, held on the last Sunday in September each year at Oakdale Community College, Blackwood, Gwent, offers more than the usual array of trade stands, in the way of lectures and films. These ranged this year from a very interesting lecture by Steve Cherry, G3SJK, of the Appleton Laboratory on the subject of hf telemetry from high altitude transatlantic balloons, through an "open forum" conducted by Dr Dain Evans, G3RPE, President of the RSGB, to a real scoop in the form of a film on the 1978 dxpedition to Clipperton Island.

Dr Dain Evans (l) presenting an award to Jim Reid, GW3ANU, for many years' service as QSL Bureau sub-manager for GW callsigns. *Photo:* S. W. Rees

The convention, renowned for its friendly atmosphere, also offers something of real interest to the hf dx enthusiast, with a dxpedition featured in the programme every year since 1974. The convention is one of very few to cater for this increasingly neglected aspect of the hobby. With a view to WARC 79, members of the general public were encouraged to attend this year's convention, and it attracted a great deal of interest in the local press and on local radio. The convention is organized by the Blackwood & District Amateur Radio Society, GW6GW.

microwaves

Charles Suckling, G3WDG *

Microwave repeaters

The following outlines the conclusions and recommendations of the RSGB Microwave Committee on the subject of microwave repeaters, and is based on a committee paper by G4CNV.

The setting-up of a network of repeaters at vhf and uhf has not been without its controversies. In producing a set of recommendations for repeaters at microwave frequencies, the committee feels that the purpose of microwave repeaters should be of a much more experimental nature. Each repeater should be planned to investigate some particular aspect(s) of operation and/or propagation and should be licensed for a period of two years' operation, after which the committee would expect a detailed report on the results of the experiment. The report should indicate to what extent the repeater has succeeded in its aims, draw appropriate conclusions and perhaps include suggestions for further experiments. These can then be assessed by the committee to determine what sort of repeaters are likely to prove most practicable and useful, and guide further recommendations.

The committee has made the following points concerning the planning of microwave repeaters:

1. There should be as little duplication of experiments as possible. A list of some possible suggested experiments is given at the end of this report. These are only ideas and may not be acceptable to the Home Office.

2. The repeaters should allow the use of existing simplex-type equipment.

3. The usual repeater licensing limitations will apply.

4. Similar area coverage by transmitter and receiver should be aimed for. This is especially important in the case of crossband repeaters.

5. When not accessed, the repeater should act as a continuous beacon.

6. Horizontal polarization should be used.

7. Narrow-band (ie crystal-controlled) equipment is envisaged at least up to and including the 5·7GHz band. The channel system employed on 432MHz will be extended to cover this, ie 25kHz channel spacing and 1·6MHz input/output spacing (repeater receive frequency above transmitter frequency, so that the repeater radiates in that part of the band in which people normally listen). The lower seven channels will be for in-band repeaters and the upper seven channels for crossband repeaters.

8. Wideband receivers should operate in that part of the band usually occupied by wideband traffic. Recommended input frequencies are 10,390 and 24,200MHz, and separation between input and output is at the discretion of the proposers, but common i.f.s, such as 10·7, 30, 100 and 144MHz, should be avoided.

The committee is anxious that any proposed project should be a serious experiment, and it is with this in mind that specifications which represent an advance in technique have been proposed. For example, a 1·6MHz spacing between input and output channels will pose quite a technical challenge, especially on the 1·3 and 2·3GHz bands. Should this not prove possible to achieve in practice, a wider spacing may be necessary, although it should be kept as small as possible, to avoid the necessity for transmitters to be retuned, especially for repeater operation.

Suggestions for possible suitable projects are:

1. 1·3GHz in, 2·3GHz out repeater.
2. 1·3GHz in-band repeater to investigate mobile operation.
3. 10GHz in-band repeater.
4. 24GHz in, 1·3GHz out repeater.
5. A repeater, sited on an obstruction between two centres of activity, using narrow-beamwidth antennas rather than omnidirectional ones.
6. Cross-band translators (linear repeaters) similar to those carried by the Oscar satellites.
7. Repeaters with output on more than one band.

World first on 10GHz

What is probably a world first was made on 18 October, when G3JVL and G3YGF/A contacted each other on ssb via tropospheric scatter over the 110km obstructed path between Hayling Island and Oxford. This excellent contact followed a number of one-way tests in which G3YGF/A's ssb had been regularly received by G3JVL, but slightly enhanced conditions were necessary to permit copy in the reverse direction.

The ssb was generated at both stations by mixing several milliwatts of 10,224MHz and 144MHz ssb in Schottky barrier diodes, followed by twt amplifiers, to produce 6W p.e.p. at G3JVL and 15W p.e.p. at G3YGF/A. The mixers were also used on receive, so perhaps this is also the first case of real transverters being used on 10GHz! The writer has listened to tapes of both sides of the contact, and confirms that the quality was excellent—frequency stability did not appear to be a problem. G8ADP has received G3JVL's ssb and also reports excellent quality.

The only odd effect was that due to the rapid flutter. G3JVL has analysed the fading of G3YGF/A's signals, and has found that the scatter imparts at least 25dB of fading at a rate of 30–60Hz. With this degree of fading, ssb is probably the only voice mode able to be used over such paths, as a.m. or fm would be seriously distorted.

The tests are being continued on a nightly basis, and it has already been found that the fading rate and signal strength vary considerably from night to night. Signals tend to be better in fine weather; in rain, signals are very weak or undetectable. We look forward to some more very useful propagation data arising from these tests. □

*Physical Chemistry Laboratory, South Parks Road, Oxford OX1 3QZ.

swl news

Bob Treacher, BRS32525 *

THE tables appear this time for the first time since September. Unfortunately, several letters did go astray during the move, so some scores may be out of date. This is regretted, but hopefully they can be updated in time to catch the final table which will appear in either the February or March 1979 issue.

As the table seems to be holding its popularity—27 entries last year and 28 this—there will be a further table for 1979. For all those newer members who may wonder what it is all about, the rules are pretty basic and easy to follow. The table relates to the number of countries (not prefixes) heard on each band from 1·8 to 28MHz between 1 January and 31 December 1979. Simply keep a list by your rig and note each new country heard on each band. The starting total is 100. Let your scribe have the totals only (not a list) for each band, total them and indicate the mode used. What could be simpler? The all-time list will also appear at intervals, and the starting score for this is 500. Those who participated in the 1978 table could keep these figures as a starting platform to reach the 500 needed to enter the all-time one.

CQ WW

The ssb section of the CQ WW DX contest certainly promoted a great deal of activity on all the hf bands. The 28MHz band was wide open to the USA from 1200 to 1900, and 21MHz was also extremely crowded. With most people on these two bands, 14MHz took a back seat, although on the second evening many country multipliers were audible. Activity from Africa seemed poor and the pile-up on EL2AE in Zone 35 had to be heard to be believed. Both 3·5 and 7MHz were in good shape, with American signals on 3·5MHz well over S9 during both nights. There was a great deal of Caribbean dx on 3·5MHz, in the shape of HH2CQ, FG0DWT/FS7 and HD0E. The 7MHz band lacked dx signals working Europe, although many Caribbean dx stations were heard listening for W above 7·1MHz. No doubt there will be many big scores submitted this time as a result of improved conditions, and hopefully a British multi-single group will figure in the top 10 in the world. There were certainly four such stations with dx consistently queueing up to work them, namely G4ANT, G6UW, G3RRS and G8JC. No doubt these groups plus other single-operator stations, such as G3FXB and G3MXJ, will be anxiously awaiting the results to see whether it was all really worth it!

Expeditions

It seems that a month cannot go by now without there being at least one expedition to a rare and exotic island. This time we have had the VK9ZR trip to Mellish Reef, plus KV4KV and W0DX's expedition to Desecheo Is. Both operations had their share of problems. VK9ZR encountered heavy seas and high winds which blew them off course, resulting in their having to use their reserve supply of fuel at a very early stage; they are also understood to have had problems with equipment. On the other hand, operators on the KV4KV trip to Desecheo had to leave the island before dark each day and return by boat the next morning—it is understood that USA forces use the island for bombing practice after dark. There will be further trips made to the island by KV4KV, and it is thought that KP4AM is also planning a trip there in the future.

There should be some activity from Bouvet Is at about the time this is read. 3Y1VL is rumoured to be planning a trip, with QSLs to LA5NM. It is also expected that two LAs will be leaving for Bouvet on 13 December and will be using 3Y1VC and 3Y5DQ.

LU3ZY is active from the South Sandwich Is, and has been reported on both 14 and 21MHz around midnight. CE9AT's QSL manager is CE2BIO.

G3YZO reports that he will be in Yemen early next year and is hoping to obtain a licence. He did operate from there in 1976 using the call 4W1RC, mainly on 14MHz cw, but since then no new calls have been issued.

Help wanted

Will the swl named Richard, living in Cobham, who recently wrote to G4GQH regarding the result of a planning appeal, please contact G4GQH or G4FPF who require details of the

*79 Granby Road, Eltham, London SE9 1EH.

1978 hf countries table

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS25429	170	189	217	90	107	15	788	ssb
BRS17567	186	214	238	48	80	6	772	ssb/cw
A8841	128	164	227	75	83	0	677	ssb/cw
BRS35943	127	128	165	74	111	4	609	ssb
BRS29641	127	138	171	74	72	4	586	ssb
A9140	117	140	143	87	70	20	577	ssb/cw
A9191	117	134	150	44	49	0	494	ssb
BRS34740	97	120	139	68	52	9	485	ssb
BRS35454	106	109	147	46	66	6	481	ssb/cw
BRS38518	113	112	129	50	46	3	453	ssb
ARS39965	102	125	122	37	36	7	429	ssb/cw
BRS32286	121	100	116	35	56	0	428	ssb
ARS39965	96	110	114	35	36	5	396	ssb/cw
BRS40154	64	110	175	22	12	1	384	ssb
BRS37782	57	91	114	20	33	4	319	ssb
ARS39018	38	82	111	28	44	3	303	ssb
BRS20185	67	60	82	21	42	2	274	ssb
BRS34658	15	61	98	35	57	4	270	ssb
A9107	43	60	92	20	44	6	265	ssb
BRS39162	60	73	71	18	25	7	254	ssb
BRS27421	0	0	136	46	42	1	225	ssb
ARS39720	35	58	80	17	20	0	210	ssb
ARS38532	69	44	53	17	9	9	192	ssb
ARS39965	47	54	58	9	18	4	190	ssb/cw
ARS38280	46	61	52	12	4	2	177	ssb
BRS18529	6	35	81	3	30	4	159	ssb
BRS26120	37	58	46	6	10	1	158	ssb
ARS37620	4	35	105	5	5	0	154	ssb

All-time countries table

(Starting score 500)

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS25429	230	269	306	206	216	32	1,259	ssb
BRS17567	242	280	343	137	201	17	1,240	ssb/cw
BRS32525	215	270	293	191	230	26	1,225	ssb
BRS25901	200	273	309	179	182	17	1,160	ssb/cw
BRS35943	135	227	266	172	203	18	1,021	ssb
BRS38876	74	189	233	150	181	61	888	ssb/cw
BRS35454	128	187	249	106	149	22	841	ssb/cw
BRS34740	126	181	212	126	149	33	827	ssb/cw
BRS32286	96	195	225	75	172	4	767	ssb
A8841	113	187	270	73	120	0	763	ssb/cw
A9191	102	145	192	52	69	0	560	ssb

Help wanted

Will the swl named Richard, living in Cobham, who recently wrote to G4GQH regarding the result of a planning appeal, please contact G4GQH or G4FPF who require details of the

references of the appeal and the Minister's letter to pursue current negotiations. Both are QTHR.

The mail

David Whitaker, BRS25429, wrote with details of the slps he has organized—these appear under *MOTA* in this issue. It is hoped that many swls will support these slps; after all, it is an activity primarily aimed at listeners as well as a dx exercise designed to help propagation studies.

Ken Steele, BRS36883, has been doing some late-night dxing on 14MHz; with the band sometimes staying open through the night, there was plenty of choice dx from which to choose.

The regular dxers, BRS17567, BRS25429, A8841 and A9140, all report good conditions, and provide a great deal of exotic dx covering all bands from 3·5 to 28MHz. Dave Whitaker now has 320 countries all-time, and Neville Spry 320 confirmed out of 347 heard. Robert Small again provides a good list of rare ones, including many Pacific stations on 14, 21 and 28MHz. Ian Marquis also mentions much Pacific dx, including WD4CEM/KH4 on Midway Is.

Best comment of all, this time, comes from Dave Whitaker, who reports hearing two YJ8s rag-chewing on 28,700kHz. We wonder how long that situation lasted before they were descended on by the hoards?

Letters are acknowledged from A9191, and BRSs 27421 and 26120.

News, views, comment and table scores to your scribe by 15 December for the February 1979 issue.

In closing, your scribe would like to thank all those who expressed their good wishes on his marriage, and takes this opportunity of wishing all readers a Happy Christmas and a dx-filled, prosperous New Year. □

NEW PRODUCTS

Adcola soldering instruments

Adcola Products Ltd have introduced two well-proven thermally-balanced soldering instruments for retail sales. They meet the most stringent international safety standards, including BS3456; one is designed for general do-it-yourself applications around the house and the other for the assembly of electronic and hi-fi construction kits. Both models operate from 240V mains and are fitted with 2m of three-core cable for connection to a suitable plug. The soldering bit is retained in the heating element barrel by a stainless steel shim to facilitate easy and simple changeover and replacement, and the handles are moulded in Noryl plastic to ensure they remain cool even after extended use.

Adcola K2000 is a general-purpose lightweight (1¼oz) soldering instrument fitted with a $\frac{1}{16}$in chisel-shaped copper soldering bit with a barrel length of 88mm.

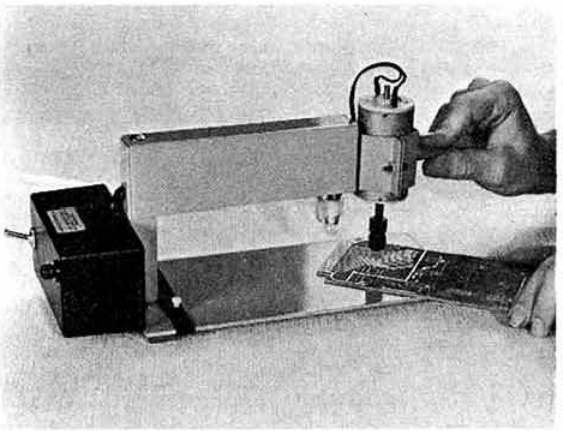
The Model K1000 is a shorter (1½oz) instrument suitable for the amateur constructing electronic equipment. It has a barrel length of 51mm fitted with a $\frac{1}{16}$in shank Adiron, $\frac{1}{8}$in faced copper bit, but is available on demand with an iron plated $\frac{1}{16}$in screwdriver longlife soldering bit for micro soldering.

The K1000 and K2000 models fitted with copper soldering bits have a rrp of £4.56, which rises to £5.28 when fitted with Adiron longlife bits. VAT is extra at 8 per cent. To provide maximum flexibility in use, a comprehensive range of copper and Adiron soldering bits are available to fit both models.

Further details are available from Adcola Products Ltd, Adcola House, Gauden Road, London, SE4 6LH.

Technomark pc drill stand

A printed circuit drill stand, specially designed for drilling small quantities of pc boards, prototypes, missed production holes and modifications, is now available from Technomark. The motor body is supported on a cantilever spring system which when depressed switches the motor on, and off when released. If the drill motor body is adjusted so that the motor switches on with the drill just touching the board surface, drill wander can be eliminated to enable accurate drilling of plain copper surfaces.



The 315mm long by 115mm wide by 150mm high, 2·5kg drill stand has an integral 12V dc power supply, fused and switched, a motor clamp for drill height adjustment, a large throat depth (168mm), low voltage lighting and a high speed motor attached to the unique parallel spring suspension. Full instructions are supplied with each unit, which comes complete with chuck, collets, light and x-y locating jigs.

Recommended retail price of the Technomark pc drill stand is £61 plus VAT. Further information can be obtained from Technomark, Allnut Mill, Church Road, Lower Tovil, Maidstone, Kent. Tel Maidstone (0622) 670022.

Lektrokit home constructor kits

Lektrokit are launching a major new range of products for retailers of hobbyist and home constructor kits. This comprises a comprehensive range of new simple-to-use solderless breadboards, terminal and distribution strips, connectors, pins, sockets, jumpers, ie test clips, heatsinks, cabling etc. All these will be available as individual items or in kits.

Their freely available illustrated catalogue, entitled *The Faster and Easier Book*, lists full details of their new product range. Further information from: Lektrokit Ltd, Sutton Industrial Park, London Road, Earley, Reading, Berks RG6 1AZ.

4-2-70

Graham Knight, GM8FFX*

Scottish convention

Many vhf personalities from all over Britain were among the 550 amateurs who attended the recent Scottish Amateur Convention at Aberdeen. The 20 trade exhibitors were kept busy all day, with a great deal of interest being shown in the new Microwave Modules 144MHz and 432MHz high power solid state amplifiers. The antennas by Tonna from France and Wiezi from Germany were also on display in Britain for the first time and drew large crowds of interested dx operators. G3MME of Lowe Electronics was seen using a calculator to convert Scottish pound notes into Matlock money and was giving a good rate of exchange to purchasers of the new Mizuho 144MHz ssb portable transceiver.

At the suggestion of the RSGB general manager, the afternoon talks and lectures started with a "no holds barred RSGB forum". RSGB President, Dr Dain Evans, G3RPE; general manager, G3OUF; Council members G3BA and G3KQF; vhf manager G3SEK, RWG representative GM3SNO, and RR12, GM8BZX, made up the panel which answered questions ranging from operation on 70MHz to propagation studies. Later in the afternoon Alex Allan, GM3ZBE, explained the digital techniques used in the latest Icom and Yaesu vhf transceivers. John Fielding, G8FPH, the technical director of State of the Art Communications, explained the principles behind the circuitry in the Lunar range of vhf preamplifiers. Charlie Newton, G2FKZ, the IARU Region 1 auroral co-ordinator, spoke of the latest research and discoveries in this field. Ian White, G3SEK, the RSGB vhf manager, spoke of the latest vhf techniques and introduced Chris Bartram, G4DGU, who played a fascinating recording of meteor scatter signals recorded on the 432MHz band. Charles Suckling, G3WDG, took time off from writing *Microwaves* to explain all about 432MHz moonbounce reception; he illustrated his talk with photographs of the antennas used and played the audience some recordings of very strong eme signals, including K3NSS on moonbounce ssb.

Just over 200 stayed for the evening dinner which followed the very informal format of previous years. The President and G3BA made speeches fitting to the occasion, and everyone participated in the now traditional paper aeroplane races—during which G3OUF's training as a pilot ensured his aeroplanes made the most spectacular flights. Among the personalities attending from over the border were meteor-scatter experts G3NAQ, G4DEZ and G3POI; repeater builders G3RXH and G3ZYC; and the entire Wulfrun Contest Group led by multi-contest winner G8BHH. This well-attended convention made a profit of £123 for RSGB funds.

RSGB VHF Convention 1979

The next RSGB National VHF Convention takes place on 10 March 1979 at the usual venue of The Winning Post, Twickenham, with the lectures being held in the nearby Whitton School. The following lectures have already been arranged: "Slow scan television" by Grant Dixon, "Tropospheric propagation" by Ray Flavell, and "Sporadic-E" by Professor Martin Harrison.

A dinner and social evening will follow the daytime lecture and exhibition programme. Dancing this year will be to "The Second Foundation", a modern nine-piece band which features Bob "Boogie" Burns, G3OUU. Further details will be published later.

Class B cw operators

James MacKinnon, GM4EKC, is the senior lecturer in marine telecommunications at Aberdeen Technical College. He also teaches at an amateur morse class and has recently received a most interesting letter from the Home Office which clarifies the circumstances under which a Class B operator can use morse on the bands before passing the morse test. The letter reads:

"A Class B licensee is not permitted to operate on frequencies below 144MHz on his own licence using his own callsign. However, a B licensee or a non-licensed person who holds a Home Office Amateur Radio Certificate may operate an A licensee's callsign provided he is in the presence of and under the direct supervision of the A licence holder. And this means that under these conditions he can operate on frequencies below 144MHz and, if desired, use morse, and any other facility available to the A licensee."

This letter from the Home Office opens up many possibilities for Class B amateurs to operate cw on both the hf and vhf bands. GM4EKC thinks that this facility will be especially useful for training operators who can manage 8w/min but find it difficult to increase their speed to the 12w/min required for the morse test. Next time you hear slow cw on 144MHz it may well be a Class B operator sending under supervision. As GM4EKC says, "The Home Office are to be congratulated on their enlightened attitude as it can only encourage more operators to train for the full Class A licence."

(This is not new, it has been an approved procedure for many years—Ed)

St Kilda on 144MHz

During a recent business trip to the Outer Hebrides, Frank Bennister, GM3COX, operated on 144MHz ssb and fm from the island of St Kilda. This is one of the most sought-after QTH locator squares of all time, and dx operators will be surprised to learn that Frank worked G2AYC at St Agnes in north Cornwall on ssb. Even more surprising is the fact that Frank also accessed and worked through both the GB3BC and the GB3WW repeaters. Frank is usually G3COX, located in London, but will become GM3COX again during a further trip to the Outer Hebrides in January.

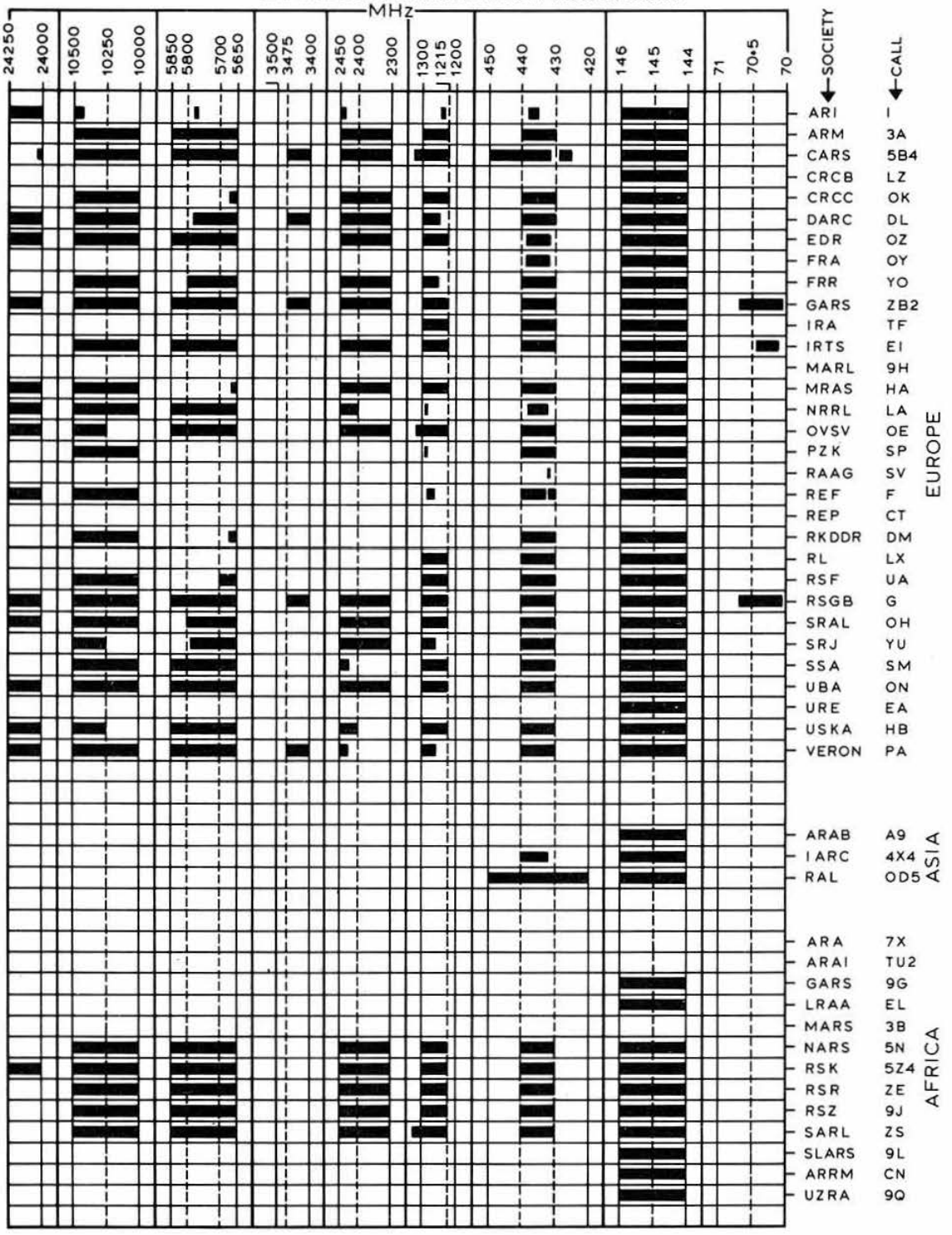
GB3BC, the Bristol Channel repeater, seems to be popular with far-away stations during lifts. During the Es opening on 4 June at 1923gmt, Terry Roe, G8NNU, worked CN8CC. G8NNU knows CN8CC accessed other British repeaters but thinks GB3BC should get a special award as it is the only British repeater to have a two-continent QSO transmitted through it.

First rtty repeater

The UK's first teleprinter repeater, GB3PT, came on the air on 14 October from a site at Barkway in Hertfordshire. All previous repeaters have been primarily licensed to assist mobile operation; this is the first of the "special type" repeater applications to be approved by both the Society and Home Office. The input frequency for GB3PT is 434·900MHz and

*PO Box 49, Aberdeen AB9 8JA

Amateur radio bands above 70MHz allocated to countries in IARU Region 1; country prefixes, and initials of national societies in those countries



the output is on 433·300MHz (RB12). Access is obtained by typing "GB3PT de G4XYZ etc"; the repeater will then come back with an rtty and cw callsign and then sends "K K K" in rtty and a mark tone. Access can then be held for up to 10min. Pip-tones are used to indicate when there is a carrier on the input and also to give a time-out warning. The repeater identifies every 15min even when not accessed by an rtty transmission.

The transmitter section is a Pye T461 with an additional 25W pa built by G4BAO. The vertically polarized antennas are positioned 40m agl and share the same tower as vhf repeater GB3PI. The receiver is a Pye R460 with a special homebrew TIS88a front-end. The rtty system is 45·45Bd, the mode F2, and uses 1,275 and 1,445Hz tones.

The idea of an rtty repeater was first suggested more than two years ago by Bob Halsey, G8JMC, and he, G8GLB, G8LHD, G8MEI, G4BAO and G4BIK all work as engineers at Pye Telecommunications. It is fitting that the first rtty contact through GB3PT was between two members of the group, G4BAO at Cambridge and G8GLB at Ealing. During the planning stages the idea of an rtty repeater has met with a favourable response at open Repeater Working Group meetings and at the "Advanced repeater techniques" lecture at the VHF Convention. The Pye Telecommunications Amateur Repeater Group acknowledges the help and assistance of the BARTG and the RSGB in getting this new concept repeater licensed and on the air. Further information about GB3PT can be obtained from the group secretary, John Worsnop, Laboratory No 1, St Andrews Road, Cambridge CB4 1DW.

Auroral reports

The following dates should be added to those given on the auroral warning calendar which was printed in September's *4-2-70:* radio events occurred on 4, 18, 27, 28, 29, 30, 31 August; 1, 2, 9, 10, 14, 22, 25, 26, 27, 28, 29 September, and on 18, 19, 22, 23, 26, 27 October. Visual displays of the aurora not recorded on the calendar occurred on 26 August; 21, 26, 27, 28, 29 September, 19, 26, 27 October.

As reported briefly in last month's late news, another aurora was noted which started early on the morning of 29 September. This is only the second morning radio aurora reported in the last 30 years. The other morning aurora also took place this year on 28 August, and was reported in detail in October's *4-2-70.* It is interesting to note that Joe Reisert, W1JR, in Massachusetts, also participated in his first morning aurora on 29 September. W1JR worked stations in the mid-west USA on 144MHz, and reported that this aurora caused great excitement among American vhf operators. This latest morning aurora was first noticed on the signals from the Lerwick beacon, GB3LER, on 144·965MHz, by Willie Low, GM8NSU, in Aberdeen. The auroral tones on the beacon started at 0830gmt and eventually faded out at 1100gmt; the auroral signals peaked up at a beam heading of 10°. When the aurora returned at noon, Clive Morton, GM4CMV, operating from near Aberdeen in YR80j, noticed he had to beam to 40° for the first three hours of contacts. GM4CMV's contacts with East German stations in HL square and with OK1MG in HK17a were all made on the this same beam heading. During the same opening, Alistair Simpson, GM8NCM, in Kirkcaldy, Fife (YQ75h), also beamed between 40° and 50° from 1220 to 1500gmt. The beam headings of stations working GM8NCM were significantly different—G4GNX in AK11g 20°, DB5YD (EL02e) 10°, PA0AKN (CL11g) 20°, LX1FX (CJ40e) 0°. At 1532gmt GM8NCM found the aurora peaked at 65°; G8BQX in Hastings was worked and he reported a beam heading of 30°.

REAL DX 1978		
70MHz ar	GM3JFG-G3OSS	710km
70MHz tropo	GM3SPJ/P-GJ3WMR	645km
144MHz tropo	GM8MBP-DF5GX/P	1,300km
144MHz ms	DK3UZ-9H1BT	2,021km
144MHz Es	GW4CQT-SV1DH	2,650km
144MHz ar	GM4CMV-UR2RQT	1,890km
144MHz eme	GW4CQT-W6PO	8,439km
432MHz tropo	GW4ASR/P-DM2BYE	1,220km
432MHz eme	G3LTF-JA6CZD	13,600km

GM8NCM worked a total of 60 stations between noon and 1721gmt, and reports being able to hear GB3LER throughout the event. The fact that GM4CMV, just 100 miles farther to the north, could not hear GB3LER at all but could hear DM0VHF (144·948MHz), OZ7IGY (144·930MHz) and SP2VHF (144·980MHz), will be of special interest to those studying this unusual aurora.

Last month's *4-2-70* recorded that the Faeroe Islands beacon on 144·885MHz had been heard via the aurora in Scotland. It has now been reported that OY5NS has been worked on cw via the aurora by GM3BQA and G4FUT, and by GD3UMW operated by Alex Gartshore from a 500ft asl site at Scerrisdale in the north-western part of the Isle of Man. From this excellent auroral take off GD3UMW frequently participates in events, and on this occasion beamed at 350° to contact OY5NS.

Most of the October auroral openings have been fairly weak, with reflecting curtains seemingly well to the north—usually on beam headings of 10° to 20° from Scotland. The visual display on 26 October was seen by GM3GAY at Banff, and he reports a greenish-blue display with arcs which peaked in brightness at 2230gmt; this is the same time as the peak of the radio reflections from the aurora. G8LIC in Middlesbrough, G4CMV in Leeds, and G8LEF in Huddersfield, were all strong signals in Aberdeen. A further visual display was seen on the following night but this was not accompanied by a radio event.

The work of the Propagation Studies Committee and other auroral researchers was described in great detail by the IARU Region 1 auroral co-ordinator, Charlie Newton, G2FKZ, at the recent Scottish convention. This most interesting lecture will be repeated on 10 March at the RSGB VHF Convention.

Tropospheric conditions on 432MHz

The increasing number of stations now equipped for 432MHz cw and ssb, coupled with the higher power levels now being obtained by the longer established stations, has transformed this once fairly quiet band. There is now a hive of activity during any contest or slight lift in conditions. The recent VHF/UHF Contest coincided with some spectacular tropospheric ducting which helped the Martlesham Group to clock up a total of 300 contacts. Outstanding contacts included 10 stations in Berlin, and DM2BYE in HS53a at a distance of 900km. Two stations in Czechoslovakia, OK1KIR/P, in GK45b, and OK1AIC, were also worked by the group which was running 250W to a 25-element "G3JVL type" Yagi antenna. The Czechoslovakian portable stations should lead the IARU section of the contest as they were worked by some stations at distances greater than G4BPO—GW4ASR/P and G8LHT in Yorkshire both report strong signal contacts with OK.

Several separate tropospheric openings occurred on 432MHz during October, with many UK operators reporting contacts

with F1EZQ in CH15d and with HB9AMH/P in DH66c. DL7RU (GM37e), DD0LC (EN08e), DM2CPA (GO61f), DK0CO/P (FL33b) and F1ANH/P (ZJ34a) were all good signals at different times during the month.

Tonna F9FT antennas

Many letters have been received from vhf operators requesting further information about the Tonna antennas which are being used extensively by dx operators in Europe and America. These antennas are now being imported into this country by Randam Electronics of 4 Severn Road, Chilton, Didcot, Oxfordshire, who can supply full specifications for both the 144MHz and 432MHz arrays. These French antennas are of a much lighter construction than the usual type of vhf beams. No balun is used, the boom is about 1in in diameter, and the elements on the 144MHz Yagi are similar to the thickness of welding rods. This lighter-weight construction offers much less wind loading, and the 20ft long Yagi, which was erected at the very exposed GM8FFX QTH three months ago, has already survived two 70mph gales. GM8FFX is waiting until the January and February storms are past before phasing two of these antennas for 144MHz. Clive Penna, G3POI, at Sevenoaks, has taken delivery of four of the 16-element Yagis, and plans to put them up in a square box configuration with each antenna spaced at 15ft. Norman Fitch, G3FPK, at Purley, has taken delivery of two 16-element antennas, and intends stacking them on a single mast.

The F9FT 21-element Yagis for 432MHz are proving to be very popular with moonbounce stations in Japan. The Tokyo University Radio Club is working with an array consisting of eight 21-element Yagis, while JA8QQ is working on the phasing harnesses for his 16 F9FTs. During the last eme contest the university station at Tokyo, using just four of the 21-element antennas, heard six stations on 432MHz. No one is yet using the French antennas for 432MHz moonbounce from the UK—maybe Angus McKenzie, G3OSS, should double up on his present set-up of two 21-elements and try for eme reception.

Grapevine

GI4GVS worked LX1DB in DJ32b via 144MHz aurora and GJ8KNV and EA1CV by tropo . . . GM3EDZ now the owner of an IC701 and IC211 combination—these linked together for Oscar even move the IC701 on 28MHz to compensate for changes in the 144MHz transmit signals. . . G4DGU has improved his 432MHz eme receive set-up and can now get 0·4dB of noise from the stellar source Cygnus A . . . EA1TA heard on 144MHz by listener Robert Andrews, BRS36797, in Barry, South Glamorgan . . . 20kHz of doppler shift noticed on Oscar's 144MHz output on 13 October but no aurora occurred . . . LA3EQ finished his National Service and is back on 144 and 432MHz from CS29h square. Jan is busy making linear amplifiers for both bands . . . HB9AEN/P from high up DH66c square very strong on 432MHz ssb . . . G8OFQ at Lincoln using a 20-el CushCraft colinear antenna . . . G8IHT threatening to put up an 80-element for 144MHz . . . The combined exhibition stand of Microwave Modules and PM Crystals undoubtably the best decorated at the Scottish convention . . . After the convention, vhf manager G3SEK had an ms contact with DL7QY in Berlin which still was not completed by daybreak . . . GB3WY on the air and serving the Leeds area very well.

Late news

Further radio auroras occurred on 29 and 30 September, these were caused by an M3 solar flux which lasted for 14min on 28 October. Project Cameo (chemically activated material ejected during orbit) took place on the morning of 6 November but no 144MHz effects were observed at Aberdeen. SMIRK member WB1FAE has been receiving 48MHz BBC television sound on 48MHz and is looking for crossband contacts—SMIRK members transmit in the 50·0 to 50·1MHz section and listen on 28·800MHz for European stations. Licences for the 15 latest vhf repeaters have been received at RSGB HQ—the first of these have been sent out to the following groups: GB3AR, GB3FR, GB3NI, GB3PR, GB3SC, GB3SR, GB3TR, GB3WH and GB3WT. During a tropo opening on 6 November, GM8FFX worked OE2CAL at a distance of 1,453km.

Finally

Thanks for all the mail, telephone calls and telex messages you have sent to *4-2-70* during 1978. Send in your news item by telephoning the *4-2-70* answering machine at 0224 780347, by telex to "739169 MANPOW G RADIO", or by post to PO Box 49, Aberdeen.

HOLIDAY IN W-LAND

During a holiday in the USA this year, Ken Grover, G3KIP, and family, were the guests of WB2FTK and his xyl. Taken at a party in their honour, this photograph shows (l to r) WB2IXR, WB2PMQ, G3KIP/W2 (rear), WB2FTK (front), WA2MOE and WA2GWI

the month on the air

John Allaway, G3FKM*

LAST month's remarks on QSLs have brought forth a number of comments—including the suggestion that it should perhaps be a golden rule to reply to every card received which specifically asks for a confirmation. There are many new amateurs who need QSLs for various reasons, and in the case of some of the club station operators in eastern Europe it is necessary for them to acquire a certain number before they are allowed to have their own licence.

Yet another case of piracy has been notified to G3FKM—this time by GJ2LU who telephoned to say that "GW2LU" has appeared recently on both cw and ssb.

Christmas is almost with us, and your scribe would like to wish all readers a very happy festive season and thank the many people who have written to him throughout the year and provided so much of the information used in writing this column—without them the task would have been difficult, and without the support of the various dx bulletin editors it would have been impossible!

DX news

DX'press reports that 4U1UN is still to be found around 2045 when HB9RS (who works at the UN building) transmits on 14,240kHz. Sometimes a list is taken by WA2RAU, but often European callers are taken between 14,140 and 14,160kHz. Operation takes place on weekdays only.

4L0KR was on the air from Krasnoyarsk recently and the special callsign marked the city's 350th anniversary. With the recent independence of Tuvalu, the prefix of stations operating from the islands was changed from the former VR8 to T2 and VR8O is now being heard as T2O. The 3F75 prefix is being used by stations in Panama to mark the 75th anniversary of the country's independence and will continue to be used until 3 February 1979. *West Coast DX Bulletin* points out that there are nine prefixes available to the amateur service in the Dominican Republic, and that an HI1 station may be heard soon from Beata Is. An award is to be made available for working all HI prefixes—details will be given later.

EJ2CA and EJ7CC, heard at the end of October, were EI2CA and EI7CC respectively, on a trip to the Aran islands (off the coast of Eire).

There is thought to be a cw operator on Franz Josef Land at the present time and, although he is not a licensed amateur, he may activate the club station UK1PPA.

As mentioned under "Dxpeditions", LU3ZY is said to be located in the S Sandwich Is. He has been heard from 2300 onwards between 14,195 and 14,205kHz, with a good signal and working into Europe. He is said to listen for Europe also on 21,295kHz at 2030, and has also been heard in the P29JS net on 14,219kHz at 0740.

TT8AL has been heard on 28MHz. He is believed to be a doctor who is working in a hospital in Fort Lamy, and says that only TT8AB and he are active from Tchad at the present time. S9CBS has been heard in the Africana net (1900 on 21,355kHz) and may be D4CBS on his visit from Cape Verde Is. FH8CY is still fairly active from Mayotte, and his old equipment has been replaced by an FT101 and vfo which the N California DX Foundation sent to him when K5YY visited the islands recently.

An attempt by a group of Mexicans to sail a replica of Columbus's galleon back from Tampico to Spain will be made soon, and XE1L is reported to be involved. There will be some activity on the amateur bands using the callsign XF1LM/MM.

There is often confusion as to the country from which certain /4U stations in the Middle East are operating. The question is decided by the exact location—for example, VE3BWK/4U was on the Golan Heights (Syrian area) and counts as Syria, and SM2ALH/4U was in Sinai (Egyptian area) and therefore counts as Egypt.

Those wishing for a QSL card from Mongolia should try to work JT1AN—W7PHO is now acting as his QSL manager and is doing an excellent job of sending out cards quickly.

A group of German amateurs has been in Sri Lanka carrying out a training programme in amateur radio. Some of the callsigns they used were 4S7JW, 4S7KL, 4S7QC and 4S7VZ. QSLs for all should be sent via DK8KL (see "QTH Corner").

OY7ML confirms that OY3NA (mentioned in November *MOTA*) is in fact a pirate. He says that OY7BA and OY5EX are also not genuine and that the former is probably in N America and the latter in Europe. Martin remarks that all the pirates actually in the Faeroe Is are on the 27MHz citizens band where there is complete chaos!

VK9XW, who is located on Christmas Is, has been reported on 14,260kHz from 1400 on Mondays and Tuesdays. Anyone still needing a QSL for a contact with the 1970 activity from Heard Is by VK0HM is advised to apply to W7PHO.

Top band news

160 Meter DX Bulletin 1978/79 No 1 has been received from Stew, W1BB. He points out that copies of these most interesting news sheets are available free to anyone who requests them and sends a supply of self-addressed envelopes and ircs to him at the following address: Stewart S. Perry, 36 Pleasant St, Winthrop, Mass, 02152, USA.

Jaoquin Mas, EA3YO, who is a member of RSGB, lives in Barcelona. He operates on sstv and rtty, as well as ssb and cw, using this very impressive array of equipment

*10 Knightlow Road, Birmingham B17 8QB.

Although the present winter is not expected to be as good as the last for 1·8MHz dx working, many regular operators have improved their equipment. Stew remarks that activity from the UK seems to be decreasing—in the 1976–7 season 45 "active" stations were logged, but last winter only 32. Stations likely to be heard on the band this season include EP2IA and D4CBS.

Dxpeditions

Much talk of expeditions to the South Sandwich Is has been heard recently. A group of more than 12 amateurs—including two Gs, two OHs, EA8CR, CX3BR and a number of Canadians and Americans—is investigating the possibility of a visit in the near future. Transportation is the chief difficulty, but should this problem be solved a really excellent expedition should be mounted. There is also news of Argentinian amateur groups liaising with Argentine naval authorities in order to visit the islands during the Antarctic summer. LU3ZY is already believed to be located there and has worked a number of Europeans.

Problems have arisen over the proposed expedition to San Felix Is (CE0X). There appears to have been a misunderstanding about operating permission for the group—this was issued for mainland Chile and not San Felix.

PY5GA and PY5BG visited Trindade Is during October and operated as PY0GA and PY0BG. A group of Brazilian amateurs will be spending most of December in the S Atlantic islands—including Fernando de Noronha, St Peter and Paul Rocks, and Rocas Atoll. The last mentioned is now alleged to have autonomous administration and, if so, could possibly qualify for DXCC status.

Iris and Lloyd Colvin commenced their latest expedition with a three-week stay in Guantanamo Bay (KG4). From there they were scheduled to proceed to Jamaica to operate through the CQ WW DX Contest (cw) before moving on to other Caribbean islands. Each stop should last about three weeks.

The Norwegian Bouvet Is expedition was on schedule at the time of writing and was due to leave Norway in mid-November. LA1VC should be heard as 3Y1VC before Christmas.

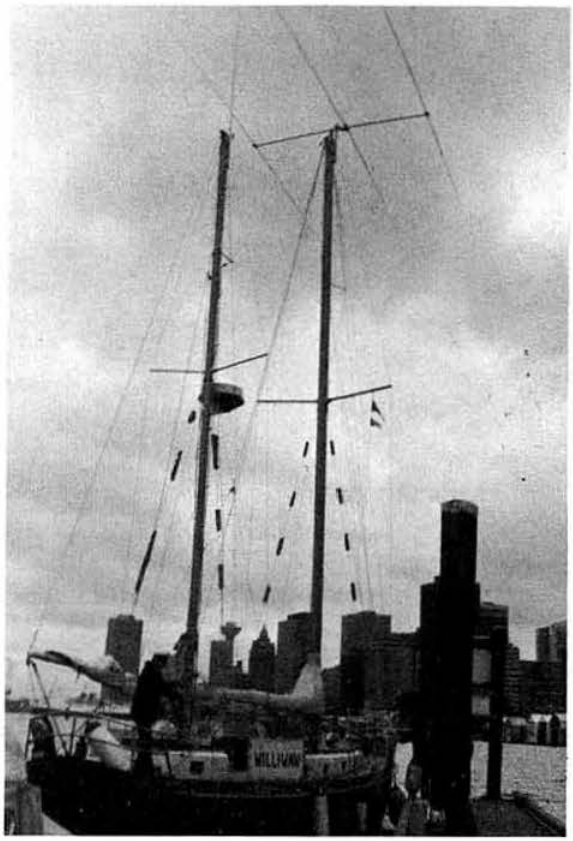
The Serrana Bank expedition expects to be on the island from 18 to 21 January. Among the list of callsigns of those expected to take part are K1PBW, K9RX, WA9EYY, W9UCW and HK0BKX. They will be making special efforts on the lf bands and will include 1·8MHz. They hope to contact many Europeans.

Welcome

The following overseas amateurs joined the Society during September: DK8SQ, F6BDS, F6BWD, OZ5QU, VE3GBL, VK7HD, VU2ST, W6EJJ, YO4AUL, 8P6IB and 9H1CD. The Society is very pleased to be able to say that it now has members in more than 130 different countries.

"Williwaw"

From May to October 1977 Willy de Roos, VK9XR/MM, sailed his 40ft ketch *Williwaw* from Falmouth, across the Atlantic, and through the north-west passage to Vancouver. He was the first person to complete such a voyage in a small sailing vessel. Between October 1977 and June this year he stayed in Vancouver and wrote a book about his exploits, but on 22 June he set sail again—this time to circumnavigate the whole American continent. He headed for Chile, via Tahiti, and expected to leave Valdivia for Antarctica during November. He expects to



The "Williwaw"—currently being sailed around the American continent by VK9XR/MM (see text)

arrive in Antarctica in the latter part of December and to attempt a landing on Peter I Island (68°47" S, 90°35" W). If he succeeds he will set up his amateur station and operate for as long as possible—possibly for up to 10 months. He has been given permission by the Norwegian government to land and to operate as 3Y0BZ for the whole of 1979. His QSL manager will be VE7ZQ, and there is a chance that Peter I Island will be a "new country" for DXCC. Willy has a TS520S (donated by Trio) and a 203BA 14MHz beam (donated by Hy-Gain). In December 1979 Willy hopes to move on to the S Sandwich Is.

Set listening periods

A series of set listening periods for short-wave listeners has been arranged for 1979. They will be of two hours duration and will be held during the first full weekend of each month. All six amateur bands—1·8 to 28MHz—will be covered, and modes of reception will be phone and cw alternately. Listeners are asked to *log every station heard* during the set two-hour period.

The objective of the exercise is to test propagation at a given time and to compare reception reports throughout the world. The slps are being publicised in many of the world's dx magazines and news-sheets. All logs will be summarized once a month and copies of the summary will be obtainable from the organizer (RSGB, c/o D. A. Whitaker, Hillcourt, 57 Green

5B4s at a dinner held in Larnaca on 20 September. At the head of the table is 5B4FK, Takis Thoma. Facing the camera (l to r): 5B4AH, Stelios Ioannou; Andreas Prastitis (swl); 5B4CR, Thanos Apostolides; 5B4GJ, Evros Lanitis; 5B4GI, Fotios Tsiakkas; and Mr Roger Michaelides, chief communications officer of the Ministry of Communications and Works. With their backs to the camera are 5B4s EA, CF, CK, FS and EN.

Photo: CARS

Lane, Harrogate, N Yorks HG2 9LN) in exchange for an sae or one irc. Reports should indicate station heard, station being worked/called, time, and RS/T. They should be sent as soon as possible after the slp to the same address. Please also enclose details of receiving equipment and a note on band conditions. These periods are not a contest but it is hoped to award a small prize at the year end to the best contributor.

The slps will be as follows: 7 January, 1500-1700 (21MHz phone); 4 February, 0700-0900 (1·8MHz cw); 3/4 March, 2300-0100 (3·8MHz phone); 7 April, 1600-1800 (28MHz cw); 6 May, 0700-0900 (14MHz phone); 3 June, 0500-0700 (7MHz cw); 7 July, 0500-0700 (7MHz phone); 4 August, 1000-1200 (21MHz cw); 2 September, 1300-1500 (28MHz phone); 7 October 0600-0800 (3·5MHz cw); 3 November, 0600-0800 (1·8MHz phone); 1 December, 1800-2000 (14MHz cw).

QRP

Great pleasure can be obtained from making long-distance contacts using low power, and readers' attention is drawn to the new QRP section of the CQ WW DX Contest. The G-QRP Club produces a useful and informative journal, *SPRAT*, edited by Rev G. C. Dobbs, G3RJV, "Willowdene", Central Ave, Stapleford, Nottingham, NG9 8PU, from whom details of club membership may be obtained.

Graham Laming, ZE1FS, runs 3W to a G5RV dipole on all bands 3·5 to 28MHz. He has been on the air since February 1978 and by early September had worked 65 countries and 40 USA states. He asks for others to listen for him around 14,060 and 21,050kHz between 1300 and 1500 and between 1700 and 1900 on weekdays, and from 1300 to 2000 at weekends. His address is Box BW229, Borrowdale, Salisbury, Rhodesia.

From G8PG, the following items of interest to QRP workers: George Burt, GM3OXX, has been awarded the first 100-country endorsement to the QRP Countries Award issued by the G QRP Club. The 100 countries were worked on cw using an input of 2W. The GM3OXX station is entirely home-built.

International QRP calling frequencies—European and USA low-power stations will in future use 14,060, 21,060 and 28,060kHz as calling frequencies. It is suggested that QRP stations call and listen during the 5min starting at each hour, quarter-hour, and half-hour. A fair amount of low power cw activity takes place on Sunday afternoons and around noon on other days.

A special "QRP Winter Sports" activity programme sponsored by the G QRP Club will take place during the period 26 to 31 December. Between 1000 and 1200 on each day, stations in the UK and Scandinavia will try to contact each other on 21,060 and 28,060kHz. Between 1200 and 1600 stations in the UK and N America will be trying to make contact. The club will award a certificate to each pair of stations which achieve a transatlantic contact when both are using an input of 5W or less. Further details are available from G8PG, QTHR.

German language contacts

A small booklet has been prepared by Mary Craven, wife of G4EQI, to help those who would like to be able to carry on simple contacts in German. In its 23 pages it is possible to find all the terms needed for a reasonably full QSO. Copies cost £1.50 and are available from "Grass Moor" Radford Road, Alvechurch, Birmingham B48 7DT.

Contests

ARRL 10m Contest

0000 9 December to 2359 10 December.

Same station may be worked on both cw and phone but no cross-mode contacts permitted. A maximum of 36 hours operating time is allowed. Exchanges consist of RS/T plus ITU zone—stations in the USA and Canada send their RS/T followed by the serial number of the contact (from 001). Each contact counts two points, four if with a novice operator (or technician) in the USA. The multiplier is the total of US states, Canadian call areas, DXCC countries and ITU zones worked (note that W and VE do not also count as countries). The contest will be restricted to the frequency bands: 28,000-28,050, 28,100-28,150, 28,500-28,600, and 28,800-28,900kHz. Log

sheets etc may be obtained from ARRL Communications Dept, 10 Meter Contest, 225 Main Street, Newington, Conn, 06111, USA, and entries should be posted to that address before 5 January 1979.

The W Australian 150th Year Celebration Contest
1600 31 December 1978 to 1600 31 December 1979.
All bands 1·8 to 28MHz, any modes. One contact allowed on each mode each day with each VK6 station. CW contacts count five points, RTTY six, and phone three. The multiplier is one point per band used—provided that at least 30 contacts are made on each (except 1·8 and 3·5MHz, where one is sufficient). Logs should show date, time, callsign, band, mode, RS/T out, RS/T in, and points scored. A cover sheet giving name, address, callsign, claimed score and signature should be enclosed, and logs should be sent to: The Contest Manager, 150th Celebration Contest, PO Box 6250, Hay St East, Perth, 6000 W Australia. Note that this contest is also open to listeners.

The AGCW-DL "Happy New Year" Contest
0900 to 1200 1 January
CW only, with activity centred in the 3,500–3,600, 7,000–7,040 and 14,100kHz areas—especially around 3,560, 7,030 and 14,060kHz.

Results of the **1978 CQ 160m DX Contest** have been received from W1WY. The only entrants from the UK were: **G3WPF/A** (63,840 points), **GM4GRC** (44,319), GM3IGW (40,796), G4BPO (27,559), **GU3HFN** (17,420)—all in the multi-operator section; and in the single-operator category **G3YMC** scored 4,277 points.

Awards

The Dachstein-Tauern-Diplom
Issued by OVSV-Ortsgruppe Liezen and Rachstadt. Five points are required for Class A and 10 for Class B (144Mz). Each call counts one point, with /M three points. Contacts since 1 January 1960 are valid, and QSLs must be in the possession of the applicant, The following are valid stations for the award: OE2s ALL, BHL, BZL, DOL, GEL, GSG, NHL, PAL, RIL, RUL, TI, UGL, FVL, WUL, DVL, OE6s AI, AJG, CBG, EPG, EUG, FOG, HCG, JRG, LBG, LCG, LPG, MLG, NJG, PHG, PRG, RRG, RTG, SHG, SFG, UGG, UEG, VZ, WBG, WUG, NWG, AMG, CRG, CJG, YPG and YQG. Send certified list plus eight ircs to: Kurt Hemmer, OE6EUG, A-8940 Liezen, Schillerstrasse 12/2/14, Austria.

Mercury Award
Issued by the Royal Naval ARS. UK applicants require 20 points, other Europeans 10, and others five. Contacts must have been made since 1 October 1960, and those made with special activity stations (eg GB3RN, GB3RM, GB3RNR and GB3HMS) count as two points, as do contacts with HQ station G3BZU. Contacts with RNARS members count one point. Note that contacts on vhf count double points. Send certified list and 30p (or five ircs) to: G3HZL, 153 Worple Rd, Isleworth, Middlesex. Additional stickers (for increments of 10 points) are supplied in return for an sase only.

The Japanese Canadian Centennial Award
For those who contacted at least two CJ stations during 1977. No QSLs are required but a certified copy of log entries should be sent to VE3BLU, 7 Nelson Ave, Ajax, Ont, LIS 1Z4, Canada. There is no charge.

QTH CORNER

FG0DWT/FS	(see FG0EUU/FS).
FG0EID/FS	via K7GEX, H. Anderson, 20148 6th NE, Seattle, Wash, 98155, USA.
FG0EUU/FS	via F6CTK, F. Rouais, 22 Rue A. Pressemanne, F-33 Talence, France.
H44DX	Wes Elton, PO Box 332, Honiara, Guadalcanal, Solomon Is.
KG4KG	Yasme Foundation, PO Box 2025, Castro Valley, Calif, 94546, USA.
KG6RT	PO Box 209-CK, Saipan, Mariana Is, 96950.
KV4KV/Desecheo	Box 1188, GPO New York, NY, 10001, USA.
LU3ZY	via LU2CN, S.A.R.A., Malabia 3029, 1427 CF, Buenos Aires, Argentina.
PJ8CO	via W8AEB, J. H. Capps, 6158 Wilson Mills Rd, Cleveland, Ohio, 44143, USA.
PJ9JR	via N4MM, J. C. Kanode, RFD 1- Box 73-A, Boyce, Va, 22620, USA.
PY0EG, PY0GA	via PY5AA, PO Box 1455, 80000 Curitiba, PR, Brazil.
VP9JO	Eric Sherlock, c/o PO Box 444, Hamilton 5, Bermuda.
VS5AM	PO Box 1200, Bandar Seri Begawan, Brunei.
ex-VS9ABL	now B. G. Levett, G3TXH, 3 Harfield Gdns, Little Sutton, Wirral, Cheshire.
W0DX/Desecheo	W1GNC, J. H. Nelson, 1133 Flenemann Rd, Farmington, Conn, 06032, USA.
ZL2UW/C	R. D. Naulls, 14 Mirlona Grove, Paekakiriki, New Zealand.
ZL3HI/C	via N2CW, G. I. Medford, 207 W 5th St, Ship Bottom, NJ, 08008, USA.
4S7JW, 4S7KL, 4S7QC, 4S7VZ	via DK8KL, A. Pollak, Im Acker 21, D-5371 Rinnen Ue Kall, W Germany.
6F8J	via XE1J, J. L. Vazquez, Calle Clavel 333, Esq Libertad, Colima, Mexico.
9N1AB	PO Box 131, Kathmandu, Nepal.

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

The DXCC Award
For confirmed contacts with at least 100 countries listed in the ARRL DXCC Country List. Application forms for this certificate and copies of the list are now available from RSGB HQ in exchange for an sase (envelope at least 8½in long, please).

WAZ Award
WPX Award
CQ DX Award
Would readers please note that applications for these awards should be submitted on the official stationery supplied by *CQ Magazine*. A small supply is available from G3FKM. Completed forms plus QSL cards (and a suitable stamped addressed return envelope) should be sent to G3FKM for checking—the application will then be certified and returned. Applications for the WPX/VPX do not need to be certified, but the sponsors reserve the right to ask for any QSL card for which prefix credit has been claimed.

Band reports

During October, 28MHz was once again the most interesting band, with stations in all continents being received at good signal strength, and with many good "pickings" for those searching for new band-countries or taking part in the Society's 21/28MHz contest or the CQ WW DX contest. G3YZQ reports that a certain amount of channelized fm operation from the USA has been heard around 29,600kHz, which seems to be a central calling frequency. The repeater station WR2ANW using input and output frequencies of 29,540 and 29,640kHz has been used from the UK, and cross-band contacts with stations in the USA 144MHz band have been made!

G8KG's summary this month says "Solar activity continued to be moderately high during October (provisional Zurich monthly number of 122·8) with the highest activity around the

middle of the month. This, coupled with the seasonal improvement to be expected at this time, gave very good conditions on the hf bands, although both the RSGB 21/28MHz and CQ WW DX contests seem to have missed the best of the month. On some days 28MHz has opened to the USA west coast soon after 1400, and remained open into VK until after 1500, while very good long-path signals from ZL1/ZL2 have been heard around 0830."

Your scribe is grateful to the following who sent in letters and logs for this section: G2HKU, G3KSH, GM3LYY, G4EHQ, GM4ELV, G4ETN, G4HJA, G5JL, G6GH, G8MFS, BRSs 17567, 31301 and 33915, and A9191.

Stations listed in italics were using cw.

3·5MHz. 0100 HH2MC. **0400** 8R1X. **0500** FG0DWT/FS, W1XK/PJ7, PY, many W/VE, VP2LLF. **0700** FG0EUU/FS, *ZL3HI/C.*

7MHz. 0000 *4L0KR.* **0400** *FY0EOL.* **0500** *TI3LN, VE7, VP2LBH* (QSL to K2IGW). **0600** *VE6, W7.* **0700** *JA, VP1XR, W7ZQ* (Wyo), *ZL.* **0800** FG0EUU/FS, FG0DWT/FS, *VE7, W6-W0.* **0900** *JA, KL7.* **2000** *JA, UH, UI.* **2200** *K0AX/DU2* (QSL to WB4OSN). *FG7AS, UK9OAD/U8W* (Oblast 045).

14MHz. 0000 *FY7BF,* LU3ZY (S Shetlands). **0500** FH8OM. **0600** FO8s AK, DO, ZK1DR. **0700** FK8CK, *FO8AZ,* FW8AC, KA1NC, KH6, KL7, VK9ZM, VR3AK, VR0M (?), ZL3HI/C. **0800** A35DG, CE0AE, FK8, KA1IW, KM6BI, LU3ZY, T2O, ZL2UW/C, *ZM7AT.* **0900** FB8YF, VR1AY, YJ8CS, 5W1AX. **1000** H44CB, 9N1AB. **1100** VK0GM. **1300** JT1AS. **1400** HS1WR, VS5AM. **1600** FB8ZM, YK1AN. **1700** *KH6FX.* **1800** FK8CR, KG6RL, VS5CW. **1900** *HH2MC,* WB6CBJ/KH4, *KL7,* ST0RK, *VK6,* VS5XU, ZD9GG, ZL. **2000** *HM1JJ,* TR8AC, XT2AT, ZD7JAM (1st Troop Jamestown Scouts). **2100** 4U1UN. **2200** FG0DWT/FS, LU3ZY, *4K1C.* **2300** FG0EUU/FS, VK6.

21MHz. 0700 JA. **0800** *KX6MP,* VK9ZR. **0900** H44LW, VK9ZR, YJ8YD. **1500** *HH2T.* **1700** KL7, TA1DKF, *VP2MAJ,* VK9ZM, VR3AK. **1800** CE9AT, KV4KV/Desecheo, HH2CQ, KH6, KX6BU, PY0EG, *9J2BO* (now Box 208, Kitwe). **1900** HH2MC, ST2HF. **2000** KL7, VP1RX, W7. **2100** FG7BA, KG6JIQ, KH6HM, TR8LE. **2200** CE9AI. **2300** CE0AE.

28MHz. 0700 JA, KJ6BZ, VK, ZL. **0800** D68AD, *HM2JN, JD1AEW, KH6IJ,* ST0RK, ZL1–ZL3, 4O79WARC. **0900** HL9WH, KG6RT, YJ8KM. **1000** H44DX, JT1KAI, SU1AL, VK. **1100** AP, KL7, W1–W4, ZL. **1200** P29, VK8, VS6. **1300** W4NT/C6A, EP2SI, HH2MC, VE8YQ, VU. **1400** W0DX/Desecheo, W6/W7, YB3AE. **1500** KG4KG, 6F8J (Mexico). **1600** VE6/VE7, W1XK/PJ7. **1800** WD4IMV/C6, KH6, VP8QG. **1900** KH6WF, W6/W7. **2000** KL7ITG. **2100** FP8HL, VK2AVA (lp). **2200** W1/W4, YS1GMV.

As always, thanks to the authors of the following for information extracted: *DX'press* **(PA0TO),** *CQ Magazine* **(W1WY),** the *Ex-G Radio Club Magazine* **(W3HQO),** *DX News Sheet* **(Geoff Watts),** *Long Skip* **(VE1AL/3),** and the *West Coast DX Bulletin* **(WA6AUD).**

Please send all items for **February** issue **to reach G3FKM** by **5 January,** and for **March** no later than **2 February.**

HF propagation study

Predicted hpfs (MHz × 10) for December 1978

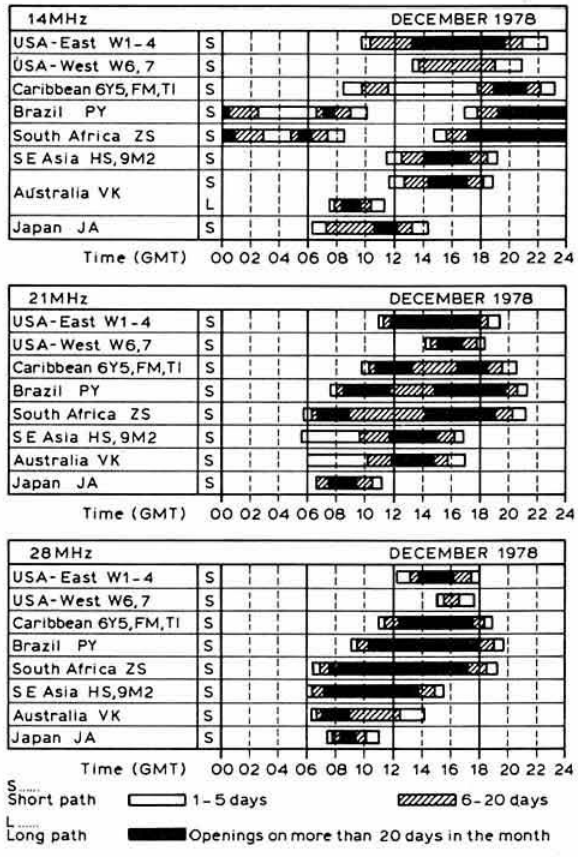
GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	174	172	149	288	451	446	445	422	343	284	195	194	174
Ascension	229	214	187	169	380	450	437	431	417	351	291	249	229
Bahrain	158	164	141	286	453	445	436	416	322	262	174	163	158
Bangkok	129	126	125	249	460	489	492	423	313	181	135	129	129
Barbados	199	181	171	144	163	277	474	446	412	397	294	237	199
Bermuda	176	159	140	136	154	206	454	479	472	426	270	208	176
Bogota	192	169	162	141	162	223	470	483	420	395	293	232	192
Buenos Aires	219	204	194	155	251	368	376	416	431	385	298	248	219
Cape Town	223	206	169	265	369	394	409	404	390	321	275	242	223
Colombo	150	155	138	295	458	477	479	442	342	233	164	150	150
Cyprus	148	154	134	216	412	479	441	426	345	257	169	155	148
Dakar	229	138	187	169	384	459	437	431	417	351	291	249	229
Denver	134	138	134	143	150	159	162	293	458	350	191	163	134
Fairbanks	136	161	163	163	154	169	155	155	185	178	167	136	136
Falklands	224	204	191	158	290	343	348	369	402	375	294	247	224
Gibraltar	122	108	97	91	221	327	321	313	280	214	152	135	122
Hong Kong	119	98	117	204	413	393	304	244	178	157	117	101	119
Honolulu	131	154	159	157	154	150	128	121	128	200	167	136	131
Iceland	82	82	83	94	112	219	336	354	295	191	116	87	82
Jamaica	177	159	145	138	158	186	425	473	436	426	268	208	177
Lagos	227	210	180	180	426	465	439	432	407	338	286	247	227
Las Palmas	185	169	157	138	284	439	423	412	393	328	247	206	185
Lima	204	187	180	148	182	276	473	460	456	418	299	242	204
Los Angeles	130	143	143	143	138	149	149	194	421	307	188	154	130
Malta	129	129	114	128	329	399	371	364	313	234	153	138	129
Mauritius	185	174	153	271	407	420	415	401	371	296	225	206	185
Mexico	153	149	121	134	148	159	199	446	467	403	219	185	153
Moscow	100	88	98	117	315	423	423	383	298	173	116	103	100
Nairobi	199	181	154	255	435	451	437	435	378	304	246	216	199
New Delhi	138	136	130	274	455	434	421	324	257	182	141	135	138
New York	153	141	129	136	153	173	323	465	464	412	220	185	153
Osaka	136	134	134	145	293	275	191	180	136	149	115	115	136
Perth	149	153	138	295	368	356	336	317	298	228	161	147	149
Rio de Janeiro	224	204	195	157	276	407	420	431	431	375	298	248	224
Salisbury	211	186	161	239	394	425	439	436	385	312	266	229	211
Seychelles	178	174	150	277	418	449	437	439	362	291	206	205	178
Singapore	138	136	130	274	454	454	441	417	318	200	141	135	138
Suva (s)	155	162	167	155	161	288	333	318	235	159	143	136	155
Suva (l)	227	218	187	178	294	299	295	261	232	284	290	251	227
Sydney (s)	119	98	117	204	351	313	309	313	271	157	117	101	119
Sydney (l)	204	190	181	148	205	268	246	215	191	219	248	243	204
Teheran	150	155	138	295	458	487	469	431	322	223	161	150	150
Vancouver	117	154	157	155	155	161	159	172	248	242	168	144	117
Wellington (s)	150	141	149	131	270	307	327	305	229	148	112	134	150
Wellington (l)	224	205	197	161	258	249	210	195	208	239	257	249	224

Bands recommended are those between hpf and half hpf.

Propagation predictions

The editor regrets that the predictions were not received in time for inclusion in this issue.

The mean sunspot number for September 1978 from the Swiss Federal Observatory was 137·3. During the month solar activity was at a high and almost uniform level. The predicted smoothed sunspot numbers for January, February and March 1979 are: 121, 127 and 133 respectively.



council proceedings

A brief report of the Council meeting held on 22 July 1978

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

Apologies for absence were received from Messrs P. F. D. Cornish, A. W. Hutchinson and C. J. Thomas.

The President read a letter from Mr A. M. Allan, GM3ZBE, tendering his resignation due to pressure of work. Dr Evans had replied to this letter expressing his regret.

Council also expressed its best wishes to Tim Hughes, G3GVV, who was recovering well from a recent illness, and to Lady Wallace who had been in hospital.

Financial report

The President read a report prepared by the hon treasurer. The auditors had submitted a management letter following the interim audit, and action had been taken on their recommendations.

Following confirmatory advice from a management consultant service, it has been agreed to increase the disc and core capacity of the data processor. This would permit greater control of subscription accounting, VAT, purchasing and orders.

General manager's report

This had been circulated to Council members, and the general manager dealt with queries raised.

More office space was being created on the first floor and a quotation for stairs to the front basement had been accepted.

Mr P. Gallier had joined the staff as his assistant and was taking over much of the work concerning the data processor.

The membership at the end of June was 21,106. A survey of lapsed members had shown that 70 per cent replied to the first reminder, 10 per cent to the second, 10 per cent to the third, and the remainder did not renew their subscriptions.

Dud Charman's antenna lecture

Mr Parsons spoke of arrangements he had tentatively made for the filming of Dud Charman's 150th and last antenna lecture. He felt it would be a great shame not to have a permanent record of this famous lecture, and the Physics Department of Swansea University had agreed to make two copies of a black and white film for a nominal sum.

It was agreed that this opportunity should not be missed, and to leave the final arrangements with Mr Parsons.

Review of committee business

Education

Mr Anthony reported that details of the RAE centre at Derby had been finalized.

Finance & Staff

Dr Allaway outlined the latest position on the ballot on the 1977-8 accounts. It was agreed that this should be held before the 1978 AGM in the cheapest and simplest way.

A proposal that Lambda Investment Co Ltd redeem in full the remaining debentures on 30 June 1979 was agreed.

Committee HF

A recommendation that Dr E. J. Allaway, G3FKM, be appointed hf manager was agreed unanimously.

Mr Bazley spoke on the proposed RSGB HF Convention to be held in Birmingham on 15 September 1978. It was agreed to hold the convention as proposed.

The committee put forward an idea for a design/construction competition with a cash prize to inspire simple constructional articles. Mr Stevens said this had been tried before with very poor results; the Technical & Publications Committee was well aware of the need for such articles, but no-one seemed prepared to design a circuit and describe it for "Radio Communication". Recent appeals published in the journal had had a poor response. It was agreed to discuss this again at a later meeting of Council.

HF Contests

Mr Andrews reported that Mr Smith, G3IAS, had had to resign from the committee due to pressure of work, and it was agreed that Mr R. Unsworth, G3WPF, join the committee.

The two leading groups in HF NFD had an identical score and had agreed to share the trophy and have a joint presentation.

IARU Working Group

Dr Allaway reported on his recent visits to Germany and Yugoslavia; he had been well received in both countries, and the Yugoslavian society were particularly delighted to have a representative from RSGB.

Mr Stevens said he was rather concerned by the growing number of international meetings; there appeared to be a competition between societies holding these social events. The President agreed with this sentiment.

Membership & Representation

Council approved the appointment of the following area representatives: P. J. Sterry, G3CBU, Basingstoke district; T. J. Brooke, GW3GHC, Cardiff & district; D. W. Dalrymple, GM3OLK, Central Fife area; T. M. Allen, G4ETU, Chichester & district; W. J. Colclough, G3XC, Cornwall (east); M. Welling, G3ZFE, Eastbourne, Hastings & district; R. J. Harrison, G3TMQ, Farnborough; S. Jesson, G4CNY, Hereford area; G. Gaughan, GM4FEO, Helensburgh; P. Gilson, G3WSZ, Leeds; N. J. H. Grassby, G4CPY, Leicestershire; M. J. Coan, G4EOL, Norwich; J. Korndorffer, G2DMR, NW area of Region 7; G. Lancefield, G3DWQ, Preston; J. R. Compton, G4COM, Southampton; J. Heywood, G8BHQ, Stockport; I. Coulson, GM8KIE, Tayside area; K. Birch, G2FOS, Wirral; K. R. Cass, G3WVO, York.

Council approved reduced subscriptions in respect of 25 members.

Council granted affiliation to: Aberdeen Mountain Rescue Team; Decca ARG, New Malden; Douglas Valley ARS, Wigan; Duke of York's Royal Military RC, Dover; Exmoor Radio Club; Farnborough & D RC; Gravesend RS; Haverhill & D RS; Heriot-Watt University, Edinburgh; Grenlands Gr NRRL, Norway; Imperial College RS, London; Lagan Valley ARS, Co Antrim; Leith Nautical College ARC, Edinburgh; Kelly College, Tavistock, Devon; Lincoln Short Wave Club; Loughborough ARC; Macclesfield & D RS; Milton Keynes & D RS; Post Office RC, Sheffield; Post Office HQ ARG, London; RSGB East London Group; Southend Activities Group; Thurrock ARC; Trent Polytechnic Students' Union, Nottingham; Wirral & D ARC; Wombwell ARC, Barnsley.

Propagation Studies

Mr Hughes had replied to a letter about Council representation and said this would be discussed by the committee.

Mr Stevens said that the article referred to in the previous minutes had not concerned propagation.

Raynet

Mr Balestrini reported on the successful Leicester convention and said it was hoped to have two similar events next year.

Raynet members had attended a number of public functions, and on two occasions had been instrumental in obtaining immediate medical assistance for victims of heart attacks.

Microwave

Draft proposals for microwave repeaters had been formulated. Members' comments would be invited and the Repeater Working Group would be invited to a meeting to discuss them.

The President drew Council's attention to a request from Dr K. Smith, G3JIX, for suggestions for microwave projects at the University of Kent.

Mobile & Exhibition

Mr Balestrini commented on various suggestions arising from the Alexandra Palace exhibition. It was agreed to book Alexandra Palace for next year, and much discussion followed regarding improvements which could be made. It was generally agreed that the dinner be replaced by a more informal gathering.

Technical & Publications

Mr Stevens reported that leaflets describing each RSGB publication were being prepared for information at exhibitions.

Telecommunications Liaison

Mr Stevens reported on a meeting with the Home Office on the future of vhf repeaters. Fifteen Phase 2 repeaters had been agreed in principle.

The Home Office had commented on the RSGB being a responsible user service and that they preferred dealing with the Society rather than with some other organizations. Mr Balestrini said that a Home Office official he had met recently had echoed these remarks.

VHF

Mr Douglas extended the committee's thanks to the Telecommunications Liaison Committee for its work in connection with the vhf repeater

proposals. Thanks were also due to Mr C. Goadby, G8HVV, for the good liaison between the committee and the Repeater Working Group.

VHF Contests
Mr Stone reported on the VHF NFD.

Correspondence
A letter from the IERE regarding a land mobile radio conference to be held at the University of Lancaster on 4–7 September 1979 was discussed and referred to the VHF Committee.

Mr P. Gowen has written to thank Council for financial assistance to represent AMSAT at the IARU Region 1 Conference.

The President reported that he had received an invitation to give a lecture on microwaves to the ARRL in November.

obituaries

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

Mr K. M. Bearcroft, G3HBG
Keith Bearcroft, who died on 12 October, was a well-known amateur in the Surrey area.

Mr F. Goodall, G4EVO
Frank Goodall, who died on 9 October aged 77, had served at sea for 46 years as a Marconi wireless operator. He wrote a number of books, including the popular Ladybird achievement book *The story of radio*. As a radio amateur he never exceeded 5W QRP.

Mr A. Harper, G2HD
Aubrey Harper, died on 22 October. He was licensed as G2HD over fifty years ago and was active on cw until shortly before his death.

Mr W. H. Moffatt, G2CM
Bill Moffatt, who died on 10 September, had been a member of the RSGB since the 'thirties. He was also a member of the Medway ARTS.

Mr A. Porter, G2CDX
Arthur Porter died on 8 October. He was a holder of a pre-war artificial aerial licence but did not take his full licence until 1960. However, he quickly became very well known on top band and later on 144MHz. He was a long-standing member of the Cambridge & D ARC until he moved to Norwich in 1968, where he was chairman of the Norfolk ARC for several years.

Mr R. D. Scott, G6TS
Robert Scott, who died on 9 September, was a member of Wessex ARG, and was actively interested in amateur radio until his death.

Mr E. S. Silvester, G8FHB
Sam Silvester, who died on 13 October, was a retired Post Office telecommunications engineer, known throughout the country for his frequent portable/mobile excursions to the highest peaks in the UK, using a motor caravan equipped for vhf/uhf operation. He will be remembered for his technical and practical help to all who sought it, particularly younger amateurs, and for his hospitality during mobile rallies. He was a member of the local RAIBC net.

Mr J. R. Whiting, RS40086
John Whiting, who died recently, was a relatively new member of the RSGB. He had become an amateur radio enthusiast over the past year or so, and was to have started evening classes to achieve his transmitting licence.

We have also been advised of the deaths of:
Mr G. J. Ralph, GW3LNZ;
Mr T. Sagar, GM5PV;
Mr J. A. H. Scott, G4FZW, on 24 June;
Mr R. Wheeler, BRS40270, on 9 August.

your opinion

RADIO COMMUNICATIONS and the ITU

The Editor
Radio Communication

Sir—I have read with interest the two instalments of "Radio communications and the ITU", appearing in your July and August issues. I feel that the reference to Sir Oliver Lodge hardly does justice to his practical work in the early years of this century, particularly the remark "(he) never made an attempt to transmit any intelligent signals with electromagnetic waves".

He joined Dr Alexander Muirhead to form the Lodge-Muirhead Wireless Syndicate, and a station was built at Elmers End, Beckenham, which remained until the outbreak of war in 1914.

In the grounds of The Royal College of Surgeons at Downe, Kent, near to where Dr Muirhead lived, a plaque can be seen on an oak-tree with the following inscription:

> "In 1902 one of the first wireless messages was sent from an experimental station erected in this field by Oliver Lodge and Alexander Muirhead. The message was successfully transmitted for seven miles and was received at Elmers End".

H. W. Miles, G2NK

PHONETICS GALORE!

The Editor
Radio Communication

Sir—In your item on the AROS ("QTC" September 1978) you say (para 2) that "Our licence states that we should announce ourselves at the beginning and ending of each period of sending, and that phonetics be used." By incorrectly quoting the licence—you have missed out the very important word "may"—you might well persuade some stations to use phonetics for callsigns at all times.

This can sometimes lead to confusion rather than clarification, particularly when working a mobile, as extra unnecessary thought is required to carry out the "translation". It would be preferable to encourage phone stations to speak clearly, using phonetics only for confirmation or correction once the pattern of the call is established. This is surely part of the self-training for which we get the licence. Otherwise whisky hotel echo romeo echo whisky india lima lima india tango alpha lima lima echo november delta india alpha sierra kilo mike yankee sierra echo lima foxtrot.

A. Askew, G4BPC

WAB AND RAIBC

The Editor,
Radio Communication

Sir—To commemorate the 10th anniversary of "Worked all Britain" the WAB Committee has instituted the "10 × 10 Decade Award" for UK contacts in 1979 only, commencing 1 January. Claimants must contact fixed or mobile stations in 100 WAB areas with the two Ordnance Survey figures from 00 to 99. No QSLs required. The award will cost £1 and requires only a certified check list with QSO details to WAB Awards Manager G4AVA, QTHR. Profits will go to RAIBC and, to avoid overprinting, all claims must be submitted by 31 January 1980 for distribution of the awards in March 1980.

It would be appreciated if UK amateurs would call into the WAB Net on 3,760/7,060kHz, or join in the 1979 WAB cw and phone contests (details later), to pass reports from their area and thus help the Radio Amateur Invalid & Bedfast Club at negligible cost to themselves. Over the past nine years several hundred pounds have been sent to the RAIBC, and it is our proud claim that no individual radio amateur has ever received payment for his services to WAB.

WAB Record Books are available from G4CON, QTHR, price £2 plus 60p p&p. Due to inflation there is a lower percentage profit on the current price than on the original books which cost ten shillings (50p). Over 2,500 WAB Record Books have now been distributed worldwide.

J. Morris, G3ABG, WAB treasurer

contest news

144MHz Open and SWL Contest results

This contest, with the omission of the place location, gave the contestants a race to pile the highest number of contacts in conjunction with IARU Region 1 activity. The number of dx contacts into Europe was amazing, especially towards Spain. The favoured portable location was SE England, but not at a high QTH. There were no serious complaints of bad signals, despite the QRO.

The standard of logs was good but the adjudicator cannot accept logs received two weeks late with no reason given, especially when the tables had been prepared. A brief note instead of a completed 427 resulted in some entrants being marked down (Rule 20d).

Best wishes to Jeremy Wilcox, G4GBW, for a speedy recovery; he was using his orthopaedic bed as a ground plane for a 5/8 whip in an Epping hospital.

The Mitchell Milling Trophy goes to the March ARS, G3PMH/P; the Thorogood Trophy goes to Nottingham University CG, G3UNU; and the GM4HAM Trophy to the leading Scottish station. Runners-up in both sections receive certificates.

Thanks for check logs from: GU3YIZ, GW8BGI, G8FIS/P, G8FIT and G8KZP.

G8ACJ

PORTABLE SECTION

Posn	Callsign	Points	QSOs	QTH	Best dx	Km
1	G3PMH	9,147	731	AN61	HB9FG/P	865
2	C6UW	8,670	694	AK12	EA3OA	905
3	G3CWI	7,550	746	ZM26	DJ7KS	894
4	GW8BHH	7,171	681	YM44	EA3JM	1,197
5	G6HH	6,797	617	AK03	F1BDE/P	856
6	G4BRA	6,745	586	YL62	EA3JA/P	1,088
7	GW3OXD	6,665	564	YM54	F1BDE/P	1,070
8	G4BPO	6,379	594	AM67	DM2CJK	810
9	G3VCP	5,790	534	AL45	F1BMI/P	689
10	GW8CSA	5,693	576	YN75	F1EKU/P	956
11	G3PIA	5,390	573	ZL33	HB9MOL/P	845
12	G3ZIG	5,184	473	AM06	DF8GR/P	721
13	GW6UQ	5,132	594	YN75	HB9ARF	950
14	G4ALE	5,112	500	ZM27	HB9MOL/P	907
15	G3WKS	5,110	525	AL73	HB9MOL/P	698
16	GW4GMO	4,912	537	YL05	F1BDE/P	1,043
17	G4DZO	4,820	465	AK11	F1BDE/P	887
18	G4CCC	4,527	499	ZL54	F1AUB	904
19	G4CDU	4,296	333	YL72	EA3JA/P	1,084
20	GW3OUR	4,000	475	YN74	DK0ST/P	704
21	G4CAR	3,820	459	ZM21	EA1CR	1,088
22	G4ERP	3,527	439	ZL01	F1FBG/P	956
23	G3EFX	3,443	486	ZL26	F1BDE/P	965
24	G2XV	3,430	419	AM72	F1EKU/P	753
25	GW8KBW	3,367	306	XM17	F6CUR/P	1,102
26	GW4DLY	3,050	361	YN65	HB9AGG/P	975
27	G8PMR	2,886	320	AL23	F6CUR/P	772
28	G3PQY	2,868	316	ZO77	EA1CR	1,252
29	G3JEQ	2,651	358	ZL77	F6EYM/P	815
30	GI4BAC	2,619	195	WO80	F1EKU/P	–
31	G8KGI	2,501	275	ZK05	F1BDE/P	890
32	G8LTA	2,450	397	ZM24	F1EKU/P	857
33	G3XNO	2,398	342	ZN11	F1EKU/P	965
34	G8NCQ	2,356	352	ZN54	GJ8KNV	471
35	G8OHM	2,285	360	YM50	EA1CR	1,056
36	G3GRS	2,270	347	AL52	F5HV/P	347
37	G4CYA	2,253	349	ZN52	F1DPU/A	599
38	G8KUQ	2,238	271	ZL11	HB9MOL/P	868
39	G3YLG	2,217	331	ZM80	DJ9DL	503
40	G3YMD	2,177	221	AL76	HB9FG/P	662
41	G3NYY	1,943	172	AL76	F1BDE/P	889
42	GI4GTY	1,318	125	WO40	F6CTT/P	605
43	G8BBW	1,089	203	ZN61	ON5WL/A	528
44	G8NQP	1,064	120	ZL71	F6BUF/P	705
45	G4GXD	1,048	200	AL42	DL0XA/P	427
46	G8LVQ	962	168	ZN12	F6CTT/P	464
47	G4BVY	888	130	YM79	HB9ARF/P	869
48	G4GNB	875	185	ZM79	F1EKU/P	730
49	G8MQV	854	143	ZM47	ON4BG	410
50	GM8DVD	736	75	YP66	G4CDU/P	444
51	G8HHQ	309	37	YK32	GI4BAC/P	420
52	G8NLH	210	34	ZN42	F6CTT/P	432
53	GW3XWZ	135	23	XN69	G2XV	330
54	GM4AAF	82	18	YO35	GW4DLY/P	–

FIXED SECTION

Posn	Callsign	Points	QSOs	QTH	Best dx	Km
1	G3UNU	5,115	531	ZM04	DL0MI/P	735
2	G4DGA	5,082	543	ZL58	EA1CR	988
3	G8IQL	4,919	469	AL56	F6BUF/P	635
4	GD4GNH	3,055	253	XO67	F1DPU/A	809
5	G3ZRS	2,398	230	ZN28	DL3SR/P	640
6	G3OZN	2,078	286	ZN55	F1DFF	665
7	G4CLB	1,894	304	ZL37	F6CUR/P	774
8	G8JVM	1,844	240	ZL31	HB9AMH/P	819
9	G8AZA	1,727	181	ZO69	DJ9DX/LX/P	634
10	G3IGO	1,526	254	ZL68	DK7KU/P	521
11	G8LKR	1,466	231	ZM79	DL0GQ/P	504
12	G8LZA	1,345	261	ZL59	GI4BAC/P	498
13	G3AHD	1,288	178	YN46	ON6UG/P	535
14	G8KWC	1,056	150	ZL32	F1EKU/P	755
15	G3XFW	982	146	YK07	ON4YZ	490
16	G8BKR	948	122	YL48	F1EKU/P	770
17	G8KMH	944	92	YK33	HB9FG/P	907
18	G8LVM	794	150	ZM14	ON6UG/P	385
19	G4AHO	674	100	YN46	ON6UG/P	536
20	G3ZBI	666	122	ZM03	GM8PUO/P	465
21	G8CTT	655	124	AL41	DL0XA/P	430
22	G4FRE	649	103	ZM33	DL0XA/P	643
23	G8EHX	507	111	ZN75	ON6UG/P	419
24	G8ITS	441	115	ZL40	GW8KBW	341
25	GU8OVO	416	49	YJ48	GI4BAC/P	383
26	G4EYV	403	57	ZL40	F1BEG/P	461
27	GM8MJV	361	45	YP05	G4BRA/P	–
28	G8OCC	333	59	–	–	–
29	G8INO	327	51	ZN03	G4BRA/P	335
30	G3SZS	304	56	YL10	F6FGO/P	340
31	G8OMI	289	51	ZM41	F6FGO/P	360
32	GW4HBK	221	37	YL25	F1DPU/P	465
33	G8MHV	200	32	ZM39	DK0ST/P	475
34	G4GBW	192	52	AL21	G4BRA/P	260
35	G4EGG	187	33	YN38	F6CTT/P	446
36	G8PTA	73	31	AL31	ON6UG/P	272
37	G3ILO	24	6	YL29	G3PMH/P	–

G4EUZ—2,278 points claimed, disqualified Rule 20b.

FIXED SECTION

Station	Points	QSOs	QTH	Best dx	Km
RS8677	1,474	180	YL75	EA1CR	860
BRS15822	866	148	ZL40	F5HV/P	715
BRS33823	346	72	ZL27	G4EUZ/P	343
RS20323	266	59	YN47	–	–

Summer 1·8MHz Contest results

This event attracted only 49 entries, a disappointing outcome bearing in mind the many stations heard during the contest period.

Top honours went to Mike Farrant, GD4BEG, who amassed 126 QSOs, including 48 counties/countries. A homebrew 3–10 pa fed phased 75ft verticals, while a Drake R4C and 4,500ft lw were used on the receive side. Runner-up was Terry Bucknell, G4AFS, using a T4XC/R4B and 200ft inverted-L at 70ft. His entry included a bonus of 48 counties/countries and 125 QSOs. In third place was Ken Riddoch, GM3ZSP; running a TS520/transverter combination and a sloping $\lambda/2$ dipole at 60ft, his entry contained 139 QSOs and also 48 bonuses.

G3MYI comfortably won the multi-op category; an FT101 tx/rx and 80ft vertical were used to total 111 QSOs including 49 bonuses.

Congratulations to another 1·8MHz stalwart, Wolfgang Daub, DK3KD, who again won the overseas section; while Wilfred Graeper, DJ6TK, gained second place.

Examination of the 49 logs revealed at least 218 stations in 17 countries as active during the contest period. The number of participants in each country were as follows: G-122, GM-22, OK-21, DJ etc-18, GI-6, GW-6, HB-4, EI-3, GD-3, PA-3, F-2, GU-2, OH-2, and one each from K1, OE, YU and ZC. A large variety of antennas was used; at one end of the scale were those in use at GD4BEG, while HB9AJU's 3m whip at 50ft was among the more modest installations! Thirteen entrants used long wires; 4, Marconis; 4, inverted-Vs; 3, verticals; 1, inverted-L; 1, ground plane; and G4BEM used a rhombic with 100m legs. All these antennas varied in heights between 10 and 54ft agl.

Generally the usual high standard of log keeping was maintained. Some stations, however, lost many points through wrong callsign identification.

Certificates of merit go to GD4BEG, G4AFS, GM3ZSP, G3MYI, G3KEV, GU3HFN, DK3KD, DJ6TK, OK1HAS, OK2BCM, PA0INA and HB9AJU.

Finally, entrants are thanked for their support, queries regarding activity/antennas, and their interesting comments.

G4FAM

SINGLE-OPERATOR

Posn	Callsign	Score
1	GD4BEG	614
2	G4AFS	609
3	GM3ZSP	581
4	G3XUD/A	571
5	GI3IVJ	536
	G3YDX	536
7	G3SYM	533
8	G4BWP	517
9	G4FAM	508
10	G3XTJ	494
11	G3ILO	486
12	G4EDG	475
13	G3WGV/A	458
14	G4BXT	454
15	G4BYG	447
16	G3YMC	435
17	G3SJE	433
18	GW3KOR	425
19	G3GC	416
20	G3UFY	384
21	GW3JI	376
22	G3OSJ/A	363
23	G3OZM	351
24	G3WQK/A	324
25	G4EID	290
26	G3MCX	234
27	G3NOM	230
28	G8QZ	184

MULTI-OPERATOR

Posn	Callsign	Score
1	G3MYI	550
2	G3KEV	519
3	GU3HFN	514
4	G4BEM	393
5	G3ZDV/A	339
6	G3WKS/A	299

OVERSEAS ENTRIES

Posn	Callsign	score
1	DK3KD	375
2	DJ6TK	342
3	OK1HAS	290
4	OK2BCM	249
5	OK1AXD	233
6	DK3JU	220
7	OL5AWC	210
8	PA0INA	207
9	OK1KKH	203
10	HB9AJU	178
11	OK1AMS	152
	OK3KFO	152
13	OK1MAC	143
14	OK1KTW	73
15	OL8CJM	40

Many thanks to DL237/12237, G3USE, GM3OXC, GW3HCL, OK1DOT and OL8CJO for the most useful check logs.

RSGB HF Contests Championship 1977–8 results

Posn	Callsign	Contests 1	2	3	4	5	6	7	8	9	10	Total
1	G3FXB	60				35	100					195
2	G4FAM	0	30	60	0				60	35	0	185
3	G3MXJ	70					90					160
4	GM3ZSP		40		40	40					30	150
5	G4CNY	50					0		30	60		140
6	G2QT	0	25	40			60					125
7	G4BWP	0					0		50	50	5	105
	G4AFS				30						35	65
8	G4EHF	10			25	30						65
10	G3DYY		5				50					55
11	G3XUD/A				15						25	40
12	G3NOM						0		35		0	35
	G4APL	15		20								35
14	G3SJE	0				0	30				0	30
	G3WHK	0		10						20		30
	G4BXT	0		30							0	30
17	G3NKS		0	0			10		15	0		25
	G3PDL		20		5							25
19	G3ESF		0				20					20
	G3YMC	0	0		20			0				20
21	G4BYY	0		5						10		15
22	G3UFY							10		0	0	10
23	G4DUW	5	0									5

Contests
1 21/28MHz Telephony
2 7MHz CW
3 7MHz Telephony
4 2nd 1·8MHz
5 1st 1·8MHz
6 Commonwealth Contest
7 Low Power Contest
8 Round-up CW
9 Round-up Phone
10 Summer 1·8MHz

Awards
The G2QT trophy to A. J. Slater, G3FXB.
Runner-up certificate to C. A. P. Henderson, G4FAM.

HF NFD 1978

There was an error in the preparation of the 7MHz write-up for this contest. Salisbury R&ES, G3FKF/P, was credited as having been in second place on this band. In fact, this position was occupied by Farnborough & District RS, G3RRA/P, which scored 872 points. Operators were G3RRA, G3TMQ, G3VAA and G4FON. Equipment used was an FT101B, a delta loop and a rhombic.

Salisbury was, in fact, third, and Guildford fourth.

RSGB HF Contests Championship 1978–9 rules

1. RSGB hf contest general rules do not apply.
2. No entries for the championship are required.
3. The championship will be decided on the basis of RSGB hf single-operator contests held between 1 October 1978 and 31 July 1979.
4. Points will be awarded to the leading 10 UK stations in the results published in *Radio Communication* as follows:

Contest	Position 1	2	3	4	5	6	7	8	9	10
21/28MHz Telephony	80	70	60	50	40	30	20	15	10	5
7MHz CW	70	60	50	40	30	25	20	15	10	5
7MHz Telephony	70	60	50	40	30	25	20	15	10	5
2nd 1·8MHz	40	35	30	25	20	15	10	5	0	0
1st 1·8MHz	40	35	30	25	20	15	10	5	0	0
Commonwealth	100	90	80	70	60	50	40	30	20	10
Low Power	30	25	20	15	10	0	0	0	0	0
R Round-up CW	60	50	40	35	30	25	20	15	10	5
R Round-up Phone	60	50	40	35	30	25	20	15	10	5
Summer 1·8MHz	40	35	30	25	20	15	10	5	0	0

5. Points gained by stations using the same callsign and entering two or more of the 10 individual contests will be totalled and a table published in *Radio Communication*.
6. Club stations. To be eligible for inclusion, a club station must be operated by the same single operator during each contest. In the event of a club station meriting an award, the award will be made to the operator concerned and not to the club.
7. Awards. The winner will receive the G2QT trophy. A certificate will be awarded to the runner-up.

Affiliated Societies Team Contest 1979 rules

There is no significant change to the rules for this year's event. However, societies who can muster sufficient support may be interested in Rule 4(b).

1. The general rules for RSGB hf contests, published in the January 1978 issue of *Radio Communication*, will apply.
2. When: 1300 to 1700gmt, Sunday 14 January 1979.
3. The Affiliated Societies Team Contest is a competition between teams of stations, each team or teams representing an RSGB affiliated society. Each such society is encouraged to enter as many stations and teams as it can.
4. (a) A society entering one team will have its placing determined by the aggregate scores of the five highest scoring stations in its team.
(b) A society may enter more than one team. The aggregate scores of the five highest scoring stations will be placed in Team "A", the next five highest scoring stations placed in Team "B" etc.
5. (a) Eligible entrants. Each operator must be a member of the society he represents, but need not be a member of the RSGB.
(b) Each station may be single- or multi-operator, but no operator may use more than one callsign during the contest period.
(c) All stations representing a society must be operated within 25 miles of the normal society meeting place.
(d) No station may represent more than one society.
(e) In the case of a society with national coverage, eg RNARS, each team may define a different society meeting place, but this should be a place of recognizable significance, eg a naval base. For all purposes, other than the indication of affiliation, each such team entry will be considered to be entirely separate.
6. Contacts: CW (A1) only in the band 3,510 to 3,590kHz.
7. Exchanges: RST, serial number commencing with 001, and "AFS". Stations active during the contest but not submitting an entry are requested not to send "AFS".
8. Scoring: Five points for each contact; plus five points for each "AFS" received, subject to confirmation by corresponding log entry.
9. Logs: Column 5 to be headed "AFS received".
10. Entries:
(a) Each individual entry shall conform to the general rules. All such entries from one society are to be sent in one package to: RSGB HF Contests Committee, c/o C. A. P. Henderson, G4FAM, 76c The Avenue, Beckenham, Kent BR3 2ES. Packages underpaid and bearing postage-due stamps are liable to be returned to the sender.
(b) Each package must include a declaration signed by an officer of the society that each entrant is a member of that society.
(c) There should also be included a note stating the number of teams representing the society. If the package does not contain this information it will be presumed that the society wishes to enter only one team.
(d) Packages must be postmarked not later than 29 January 1979.

11. (a) An individual entry will be invalid if more than 20 per cent of the points claimed are for contacts with members of the entrant's own team.
(b) If it is clear that an entrant has deliberately failed to send "AFS" to certain stations, then the entry will be disqualified and the points claimed by his team for contacts with that entrant will be disallowed.
12. **Awards:**
(a) The Edgware Trophy will be awarded to the leading affiliated society.
(b) A certificate of merit will be awarded to the station having the highest individual score.

The Commonwealth Contest 1979 rules

TRANSMITTING SECTION

1. The general rules for RSGB hf contests, to be published in the January 1979 issue of *Radio Communication*, will apply.
2. **When.** From 1200gmt on Saturday 10 March 1979 to 1200gmt on Sunday 11 March 1979.
3. **Eligible entrants.** Members of the RSGB resident in the UK and radio amateurs licensed to operate within the British Commonwealth or British Mandated Territories.
4. **Contacts.** CW (A1) only, in the 3·5, 7, 14, 21 and 28MHz bands. Contacts may be made with any station using a British Commonwealth callsign, except those within the entrants's own call area. UK stations may not work each other for points. In accordance with IARU recommendations contestants are requested to confine their operations to within the lower 30kHz of each band.
5. **Scoring.** Each completed contact will score five points. In addition, a bonus of 20 points may be claimed for the first, second and third contacts with each Commonwealth call area (as listed in the accompanying table) on each band. All British Isles stations (G, GB, GD, GI, GJ, GM, GU and GW) count as one call area.
6. **Logs.** Separate logs are required for each band. Each band log should be separately totalled and should include, at the end, a check list of call areas worked on the band. Logs must include gmt, callsign of station worked, RST/serial number sent, RST/serial number received and points claimed. Separate band totals should be added together and the total claimed score entered on the cover sheet.
7. **Entries.** Entries may be single- or multi-band. Single-band entries should show contacts on one band only; details of contacts made on other bands should be enclosed separately for checking purposes. Multi-band entries will not be eligible for single-band awards.

Each entry will consist of the separate band logs together with a signed declaration that the rules and spirit of the contest were observed.

Entries should be addressed to D. J. Andrews, G3MXJ, 18 Downsview Crescent, Uckfield, East Sussex TN22 1UB, England. Adjudication of this contest will commence on Monday 14 May 1979. Any entry received after this date may be excluded from the contest. Overseas stations are therefore advised to forward their logs by airmail.
8. **Awards.** To the winner, the BERU Senior Rose Bowl; to the runner-up, the BERU Junior Rose Bowl; and to the leading UK station, the Col Thomas Rose Bowl. Certificates of merit will be awarded to: (a) first, second and third placings in home and overseas multiband sections; and (b) the leading home and overseas single-band entries on each band. Commemorative certificates will be sent to the leading station in each overseas call area. Commemorative certificates are also available to other entrants on request, and five ircs should be enclosed to cover postage.

RECEIVING SECTION

1. **When.** Times and dates as for transmitting section.
2. **Eligible entrants.** Members of the RSGB resident in the UK, and all swls resident in the British Commonwealth or British Mandated Territories. Only the entrant may operate his receiving station for the duration of the contest. Holders of transmitting licences are not eligible to take part.
3. **Scoring.** To count for points, a station outside the entrant's own call area must be heard in a contest contact. CQ or test calls will not count for points. A station may be logged only once on each band for the purpose of scoring. Where both stations in a contact are heard they should be logged separately and points may be claimed for both entries, provided that the stations are outside the entrant's own call area.

Each complete log entry will score five points. In addition, a bonus of 20 points may be claimed for the first, second and third stations heard in each Commonwealth call area on each band. All British Isles prefixes count as one call area.
4. **Logs.** A separate log is required for each band. Logs should show the following details: (a) date/time gmt; (b) callsign of station heard; (c) report and serial number sent by station heard; (d) callsign of station being worked; (e) points claimed; and (f) bonus points claimed. Each log must be set out on one side of A4 type of log sheets or paper, and must show the band to which the log refers. A check list showing the call areas on each band must be included.
5. **Entries.** (a) Each entry will consist of the log sheets, check list and a signed declaration that the receiving station was operated in accordance with the rules and spirit of the contest and that the entrant does not hold an amateur transmitting licence. (b) Entries should be addressed and sent as in Rule 7 of the transmitting section.
6. **Awards.** The BERU Receiving Rose Bowl to the winner. Certificates of merit to the leading entrant in each continent.

COMMONWEALTH CALL AREAS

The following call areas are recognized for the purposes of scoring in the 1979 Commonwealth Contest:

A2	Botswana	VR3	Fanning & Christmas Is
A3	Tonga Is		
A5	Bhutan	VR6	
C2	Nauru	VS5	
C5	Gambia	VS6	
C6	Bahamas	VX9	Sable Is
G/GD/GI/GJ/GM/GU/GW		VY0	St Paul Is
H4	Solomon Is	ZL/C	Chatham Is
J3	Grenada	VU	India
P2	Papua New Guinea	VU	Laccadive Is
S2	Bangladesh	VU	Andaman & Nicobar Is
S7	Seychelles		
T2	Tuvalu	YJ	
VE1		ZB2	
VE2		ZC4, 5B4	
VE3		ZD7	
VE4		ZD8	
VE5		ZD9	
VE6		ZE	
VE7		ZF	
VE8		ZK1	Cook Is
VK1		ZK1	Manihiki Is
VK2		ZK2	Nuie
VK2	Lord Howe Is	ZL1	
VK3		ZL2	
VK4		ZL3	
VK4	Willis Is	ZL4	
VK5		ZL5	
VK6		ZL	Auckland & Campbell Is
VK7			
VK8		ZL/K	Kermadec Is
VK9	Christmas Is	ZM7	
VK9	Cocos Is	3B6,3B7	Agalega & St Brandon
VK9	Norfolk Is		
VK0	Heard Is	3B8	Mauritius
VK0	Macquarie Is	3B9	Rodriguez Is
VK0	Australian Ant	3D	Fiji
VO		3D6	Swaziland
VP1		4S7	
VP2A	Antigua, Barbuda	5H3	
VP2D	Dominica	5N2	
VP2E	Anguilla	5W	Samoa
VP2K	St Kitts, Nevis	5X5	
VP2L	St Lucia	5Z4	
VP2M	Montserrat	6Y5	
VP2S	St Vincent & Dep	7P8	
VP2V	British Virgin Is	7Q7	
VP5	Turks & Caicos Is	8P	
VP8	Falkland Is	8R	
VP8	S Georgia	9G1	
VP8	S Orkney Is	9H	Maltese Is
VP8	S Sandwich Is	9J2	
VP8	S Shetland Is	9L1	
VP9		9M2	W Malaysia
VQ9	Chagos Is	9M6/9M8	E Malaysia
VR1P	British Phoenix Is	9V1	
VR1	Gilbert & Ocean Is	9Y4	

432MHz Fixed Contest rules

1000–1500gmt, 4 February 1979
All entries and check logs to: VHF Contests Committee, c/o Mr G. M. C. Stone, G3FZL, 11 Liphook Crescent, Forest Hill, London SE23 3BN.

The following general rules, published in the January 1978 issue of *Radio Communication*, will apply: 1, 2, 3, 5a, 6a, 7a, 8, 9a, 10a, 11–22. There will be two sections: (a) single-operator stations (fixed), (b) multi-operator (fixed).

Contests calendar

1978	
9–10 December	ARRL 10m (*Rules in December issue*)
1979	
1 January	AGCW-DL "Happy New Year" (*Rules in December issue*)
13–14 January	1979 Guglielmo Marconi International (CW)
14 January	Affiliated Societies (*Rules in December issue*)
21 January	70MHz CW
21 January	AGCW-DL QRP Winter (*Rules in December issue*)
27–28 January	1979 Guglielmo Marconi International (Phone)
4 February	432MHz Fixed (*Rules in December issue*)
10–11 February	1st 1·8MHz
3–4 March	144/432MHz and SWL
10–11 March	Commonwealth (*Rules in December issue*)
7 April	1,296MHz Open
8 April	Low Power
8 April	432MHz Open and SWL
22 April	144MHz CW
29 April	70MHz Open
5–6 May	432/1,296/2,304MHz
6 May	Region Round-up CW
20 May	Region Round-up SSB
26–27 May	144MHz Portable
9–10 June	NFD
16–17 June	Microwave
23–24 June	Summer 1·8MHz
7–8 July	VHF NFD
15 July	3·5MHz Field Day
29 July	144MHz QRP
11–12 August	European Meteor Scatter
18–19 August	70MHz Open
1–2 September	144MHz Open and SWL
1–2 September	SSB Field Day
October-November	432/1,296MHz Cumulative
6–7 October	432/1,296/2,304MHz
13–14 October	21/28MHz
20–21 October	7MHz Phone
21 October	70MHz Fixed
3–4 November	144MHz CW
3–4 November	7MHz CW
10–11 November	2nd 1·8MHz
2 December	144MHz Fixed

Mobile rallies calendar

1979
8 April—White Rose Mobile Rally, Lawnswood School, Leeds 16.
29 April—Southend & D RS Mobile Rally, Fitzwymarc School, Hockley Road, Rayleigh, Essex. Details from M. Daniels, G8KLD, 25 Sweyne Avenue, Southend, Essex SS2 6JQ.

Looking ahead

1979
13 January—RSGB Presidential Installation, Executive Suite, Warwickshire County Cricket Club, Edgbaston, Birmingham.
10 March—RSGB National VHF Convention, The Winning Post, Twickenham, Middx.
15 September—RSGB HF Convention, Birmingham.

sstv scene

P. Burnett, G4BLL*

To date nothing has been heard of the W9NTP medium scan "movement" transmissions on 29·150MHz (see *sstv scene* September 1978). However, monitoring around the frequency produced very interesting phone QSOs with two other States-side stations, so the waiting around was not entirely in vain and did prove that conditions can be favourable for extended periods. This augurs well for the success of the experimental movement transmissions when they eventually make an appearance.

G3UEU has now successfully completed his "Chinese" copy of the Robot 400, which is working well except for an annoying intermittent fault in the memory bank due to a faulty 22-pin ic socket. The whole unit, with the exception of the front and rear panel controls and power supply components, is built on three pieces of Veroboard placed side by side to form a complete board measuring 14 by 11¼in. John has also included a led indicator for sync tuning, and an auxiliary board for 'scope readout to enable the transmit and receive brightness and contrast controls to be set correctly. This works by displaying the dc levels at each end of the comparator chain and adjusting the brightness and contrast controls until the signal swing from black to white just sits between the two levels. Most users of the Robot 400 find the correct setting of these controls for best picture quality and minimum contouring to be quite critical—John's approach takes away the "hit or miss" and makes correct setting easy. An additional advantage is that if the position of the receive controls for correct brightness and contrast is noted one can then give an accurate report on the video swing of received "off-air" signals. It is hoped to present circuit details next time.

Congratulations to Simon Robinson of Stocksfield, Northumberland, who is now licensed as G8POO and is active on sstv with an MK monitor. This particular unit appears to be the most popular one with newcomers to sstv as it represents an easy "sure-fire" design. Simon reports that Texas have introduced a 64K 16-pin mosram, the TMS6164, which is ttl compatible and operates from a single 5V supply. It should be available in this country in 1979 at a price of around £80, which by 1981 should drop to about £4—good news for the scan-converter boys!

G3WW sent along a copy of "SSTV worked and viewed" taken from the Japanese magazine *CQ Ham Radio* for October 1978 and which was sent to him by swl JA8 3559. As Richard points out, the list is interesting in several respects and includes the following British stations: G4ACI, G4CZT, GM3KJF and G3WW. Two Russian callsigns also appear, UK3DAH and UK5UAC. Does this mean that Russian amateurs in general now have permission to transmit sstv? Can anyone clarify this point? AC5D (see *sstv scene* September 1978) is also listed as having been worked on 21·338MHz.

K4TWJ, in *A5* magazine, sets out proposals for the establishment of an "International Slow Scan Society" (ISSS). He states that "An established group to co-ordinate our many activities (both technical and operational) will prove beneficial to all." The proposed objectives are:
(1) To establish a worldwide communication network for the exchange of ideas.
(2) To provide an information centre which will catalogue circuits, innovations, services and other state-of-the-art information for the benefit of all sstv operators. The information will be distributed by regular mailings providing saes are deposited with the centre.
(3) To co-ordinate and sponsor various sstv activities including:
  (a) Worldwide sstv contests, with trophies for winners in each section.
  (b) A quarterly on-the-air sstv net, with awards for the most imaginative video and QSO.
  (c) A bi-monthly evaluation of technical innovations with special recognition for the designer.
  (d) An over-the-air weekly meeting of various ISSS groups to co-ordinate efforts on a national or international basis.

Sounds very interesting, so why not drop a line to Dave Ingram, K4TWJ, Eastwood Village, 1201 South Rt11 Box 499, Birmingham, Al, 35210, USA, and let him know that British sstv stations are interested and willing to provide the "pulse" to initiate the "scan" in ISSS!

We would still like to receive news and views from a lot more sstv fans—if your pen has run dry, try telephoning 0282 865552 any evening (except Wednesday) after 7.30pm.

Finally, *sstv scene* would like to wish all sstv enthusiasts and all radio amateurs and short wave listeners, because they are all potential sstvers, a very happy Christmas and a peaceful New Year.

* 12 Standroyd Drive, Colne, Lancashire BB8 7BG.

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* mailing label 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

The editor is receiving an increasing number of Members' Ads which do not include the required "recent mailing label" as proof of membership. In future, all such advertisements will be returned to the sender, to avoid abuse by non-members of this subsidized service.

FOR SALE

Trio JR599 custom special rx, all filters, a.m./fm/cw/ssb, little used, immac cond, £160. Taylor (Purley). Tel 01-668 8617.

6ch tx/rx, 1·8-3·8MHz, 24V, 25W tx, coastal radio, also lw, mw, £50. G8RHU. Tel Seaford (Sussex) 892358.

FT101, 10-160m, very little used, £300; rx part exch considered. *Wanted:* manuals for Vanguard V and Hudson FM115, buy or to copy. Tel Brighton (0273) 775308.

Back numbers of *RSGB Bulletin* '39-'67, *Short Wave Magazine* '50-'68, *Wireless World* '60-'69, *Practical Wireless* '56-'69, *Practical Television* '53-'69, *Radio Constructor* '58-'67; send sae (long) for lists, or stating wants and offers. G3XCS, QTHR.

Yaesu FT75 tx/rx, six months old, perfect cond, £325. Storno CQM 662, mobile, uhf, fm, with modified Vanguard control box, toneburst, channelled on RB4, RB6, RB10, SU8, 6W rf output, £110. Tel Ipswich (0473) 310442, weekends or evenings.

Icom IC202 vhf, ssb and cw tx/rx, in exc cond, one year old, comp with orig packing, works perfectly, £140. Tel Ipswich (0473) 310442, weekends or evenings.

G-whip tribander, 160-80m coils, £15. Electroniques 1,620kHz ssb i.f. strip, data, £10. Gen cov front-end, data, £15. Morris. Tel Deeside (Clywd) 818252.

Hallicrafters SX-122 rx, 550-34MHz, a.m./cw, ssb, 80-10m, £125. PF1 Pocketfones, vgc, £20. KW Atlanta tx/rx, 500W, 80-10m, £180. Gonset G-76 tx/rx, £30. *Wanted:* Eddystone EA12. G4AFY, QTHR. Tel Kidderminster 63358.

FDK Multi 2700, two vfos, analogue and synthesized, all modes, speech processor, calibrator, 16W, built-in Oscar converter, £400. East, G8PKD. Tel 01-486 8286.

Antenna bargains: 432MHz, 24-el quad loop Yagi, £15; 20m FHJ4 low loss coaxial, with plugs, £15; 2m Parabeam, £12; 4m 4-el, £8; 70cm four-way matching harness, £2; 2m two-way harness, £1. GW8AWM, 142 The Highway, New Inn, Pontypool, Gwent. Tel 04955 2254.

Nikon F2 Photomic, with 1·4 lens, incl case and electronic flash; or exch for high frequency tx/rx. Write. Richter, G5AVA.

Yaesu FLDX400, FRDX400, matching spkr, 2m and 4m converters, all filters, in exc cond, new Joystick, sacrifice at £320 or nearest offer. Securicor paid. GM4BHH, QTH. Tel 0349 882483.

Datong speech clipper, £32; Shure 444 mic, £23; Junkers morse key, £24; Drake LP1000, £11; KW dummy load, £14; Osker swr/power meter, £25; all unused, mint. G4FKN, QTH, Tel St. Ives, Cambs (0480) 65308.

Harvard H240 headphones; Worldstar multi-band radio; Bush a.m./fm radio cassette recorder; Winthronics radio cassette recorder, a.m./fm; all as new, exc order. All letters answered. L.D. Ireland, 16 Cathebedrou Road, Carnhell Green, Camborne, Cornwall. Tel Praze 236.

KW160 atu, £10. PM2000 pwr meter, £30. Datong clipper, £20. Shure 444, £15. TV3300 lp filter, £10. KW dummy load, £10. KW trap dipole, £10. SB610 monitorscope, £20. GC144T 2m colinear, £30. Carr extra. G3WTV, 16 Woodfield Road, Radlett, Herts. Tel 01-739 3464 ext 7752.

"RSGB Bulletin", *Radio Communication,* 21 years comp, September '57 to August '78, offers; or exch model railway equipment, why? Buyer collects by arrangement. Speake, 6 Firs Road, Llanfapley, Gwent. Tel Llantilio 281.

Shack clearance, must sell, many bargains, sae for list. GW3CBA, QTHR. Tel Barry 741520.

HW12A, with HP23 psu, mic, as new cond, £70. KW E-Zee match, £12. Hansen swr meter, £5. 2m Microwave Modules 28-30MHz i.f., £12. Tel Bolton 384640.

Drake R4C, noise blanker, filters for 1·5, 0·5, 0·25kHz, extra xtals for 160 and 10m, MS4 spkr and T4XC, AC4 and extra xtals, immac cond, £850. G4CNY, QTHR. Tel 0432 3237, evenings.

4 × 813 linear amplifier, nearly comp, £30. Alternatively, will break down and sell components which incl: 813s, £2·50; bases, £3; heater transformer, £5; ht transformer, 1600V, £5; 2½in dia 48t roller coasters, £5. G3RVM, 5 St Giles Road, Bredon, Tewkesbury, Glos.

Jaybeam 12X-Y 70cm beam, unused, £18. Datong AD170 active antenna, MPU1 mains psu, £14. Two pairs PF1 Pocketfones, nicads, less xtals, £20 pr. B40/144 145MHz transistor linear amp 10W in, 40W out, £30. Ampere 45W 70cm linear, £95. G4CGS, QTHR.

Liner 2 2m ssb tx/rx, preamp, usual extras, £110 ono. Also transformers: 480-0-480, £2.50; 14·5V approx 7A, £2.50. G8PDW, 31 Benson Close, Hounslow, Middx. Tel 01-570 9595.

TR2200GX fm tx/rx, fitted 4ch, R5, R7, S20, S22, nicads, mint cond, as new, £130; cash only. G4DIA, QTHR. Tel 021-544 6655, evenings.

Storno Viscount 2m tx/rx, xtal S20, with control box, mic, cables, vgc, £30 ono. G3UYQ, QTHR. Tel 0252 878325.

2kW TEK 80/10 dipole, £35. Microwave Modules 2m conv, £15. 2m ground plane, £10. Stephens-James multi tuner, 2-30MHz, £10. Mahon, 447 Wargrave Road, Newton-le-Willows, Merseyside. Tel 6518, after 5pm.

GR78 portable gen cov rx, £60. Hamgear preselector, 160-10m, £2. HF swr bridge, £1. HB Pye Vanguard FM25B/T, xtalled for 145·00, 145·5, 144·48, 145·125MHz, £22. HB Bantam, unmodified, £10. Mobile whip, 160-80m coils, £4. Pye Ranger, on 70·375MHz, £7. G3WXG. Tel 0273 602390.

TS520 cw filter, xtal unit YG-3395c 8-pole, new, £28 incl postage. G4EHZ, 16 Sussex Road, Worthing. Tel Worthing 39612, after 6pm.

Dynatron CP2 cassette rec/player, slave unit, perfect cond, in beautiful cabinet, £55 ono. G8NVT, QTHR. Tel Ottery St Mary (Devon) 2361, anytime.

Clearance late G3ZBO equipment: Trio TS820 digital, mint, to spec all respects, manual, orig packing, £685: Trio AT200 antenna tuner, new, boxed, £75; KW E-Zee match, £25; KW dummy load, £12; KW lp filter, £9; Hansen swr bridge, £7; HB 1·8/3·5MHz phone/cw tx (G2DZT design), similar to Codar AT5, psu, £12; TTC B1016 ptt hand mic, £7; class D wavemeter, £5; tradiper, £5 *Radio Communication Handbook* 4th edn, £1·50; lots of odds and ends, sae for list; buyers inspect and collect. G3UYG, QTHR. Tel 061-491 0688.

SB220 linear; FRDX400, FLDX400; tradiper gdo; Atlas 210X; Trio 7010, 2m, ssb; can deliver, or add carr. G3NZT, QTHR (Cumbria). Tel 044 83 550.

Tektronix 531A oscilloscope, DC-15MHz, with E, K and L plug-ins; would prefer to exch for Liner 2; otherwise offers around £110. G8LIU, QTHR. Tel Uxbridge 30006, after 7pm.

Nuvistor converter, 144MHz, £15. Mains psu, integral 6V6 modulator, £12. Home-built 144MHz sender, with mains psu, 25W, £25. Sundry xtals, 50p ea. SAE for list. G5UM, QTHR.

Beautiful Hallicrafters 5-10, 24-66MHz, S-meter, £40. DX40U and VF1U, £40. B40 rx, £40. Cambridge FM10B controls S18, S20-23, R5, £65. Viceroy 3/4, £65. Manuals available. *Wanted:* good telescope, part exch. Delivery possible. G3NGT, QTHR. Tel Gosport 84861.

The most rare one of all—Collins designed R-220/URR rx, 20-230MHz, most sophisticated vhf rx, offers invited. 51J-4 rx, R-C filter for a.m., brand-new Collins 3kHz mechanical filter for ssb, £275. TF801D/S, 10-485MHz, £125. Fletcher. Tel 0602 397446.

Europa B, plus CPS10 matching psu, hardly used, gone fm mobile, £100. Prefer buyer collects or carr extra. G3CHM, QTHR. Tel 061-437 1185.

Heathkit SB104A solid-state digital tx/rx, matching HP1144 psu, SB604 spkr, superb cond, must sell due to TR7, £485 ono. G3RRA, QTHR. Tel 0276 25040.

IC240A, as new, boxed, £155. G8KOP, QTHR. Tel 01-349 1122, days.

3-el 10m beam, coaxial feed, fit 2in mast, £30. G2DTQ, QTHR. Tel Cheslyn Hay (0922) 415048.

Exch: 1976 MZ Sports motorcycle, 250cc, only 500 miles; for amateur radio equipment. G8RLO. Tel Chester 374584.

Xtal filters, lsb 1·4MHz, containing six HC6/U type xtals, last few, £1.50 plus 50p p&p. FT75 tx/rx, vfo, ac and dc psus; each for best colour video recorder, offered wkg or not, cash difference if applicable. G3ZDB, QTHR. Tel Epsom 24814.

Gunn oscillator for G3OXX tx/rx, £8. 3ft dish, £12. 2K25 klystron, £3.50. 20A variac, £15. Spare variac core, £5. R208 rx, 10-60MHz, £6. Hi-band Murphy Rovers, £3 ea. G8JAO. Tel 06845 3977, evenings please.

Heathkit SW717 sw rx, three-and-a-half months old, perfect cond, bargain, £40. BRS40492, 1c Britton Avenue, St Albans, Herts. Tel 0272 32198.

Trio 2200G, xtalled five rep, six simplex channels, auto t/b, nicads, charger, VB2200 10W preamp, all exc cond, orig accessories and cartons, £130; or would exch plus cash for Trio 7500. GW3DSV, QTHR. Tel Oswestry (0691) 81 261.

Microwave Modules 144/432MHz transverter, £108. Trio TS700G, £295. Eddystone 680X, fb cond, £80. Drake TV-3300 low-pass filter, new, £10. Shure 444 mic, £13. Technical Associates speech processor, £13. Prefer buyers inspect, collect, G8DEE, QTHR. Tel Cambridge 64251.

Computer, comp 16k Z80 system TRS-80 level 11, many taped programs, 19 books of programs, works v/well, been on tv and radio, whole system costs £1,140, will sell for £750 ono. Buyer collects. Turner. Tel 0842 61648, evenings.

KW2000, psu, manual, first £100. FM Cambridge, 6ch, fitted R4-6, S20, S22, comp control box, mic, spkr, cables, £45. G3VGO, QTHR. Tel 0826 864255.

HQ1 Minibeam, £40. *Wanted:* KW low-pass filter; also R1392A R1132A, in good cond, for local ATC squadron. G4DVR, QTHR. Tel 01-337 2025.

Comdel speech processor, perfect cond, £40. G8TY, QTHR. Tel 01-368 3219.

KW202, spkr, manual, in perfect cond, £180. Adelman. Tel 01-286 3172.

Hy-Gain TH3Jr triband beam, good cond, £58. G3NUG, QTHR. Tel Radlett (09276) 4435.

Van, Mini, J reg, vgc, fitted for mobile/portable operation, many extras, r-equip incl 8ch S/Viscount, power meter and linear amp, 60A alternator, h/duty battery, b/alarm, etc, ideal second vehicle, offers around £295. G8KBW, QTHR. Tel Maidenhead 27105.

Trio 2200GX, nicads, charger, S0, S20-23, R6-7, Heathkit 2m 10W amplifier, Jaybeam 10XY 2m crossed Yagi, all good cond, £135; can split if required. G3XJI, QTHR. Tel Kendal 26406.

KW Viceroy, early model, in good wkg order, comp with mains psu, worked several hundred VKs and ZLs, £50. See or test by arrangement. Farmer. Tel 0632 810400.

Dexbeam DB-3 triband beam, good cond, £15. SSB home-built QRP tx/rx, 3·65-8MHz, uses Plessey SL600 ics, 4W output, wkg order, £17. Single manual electronic church organ, 15 voices wkg, £65. G3ZLJ, QTHR. Tel 0902 761339.

Storno Viscount, mod for 2m, was wkg but requires attn, single channel, xtals for S20, S22-23, S25, R6, £40 ono. Buyer collects. G8NZQ. Tel 0642 319676, evenings.

Icom IC22A, xtals S0, S20-24, R3-R7, rev receive R3, R4, comp with magnetic base, 5λ/8 ant, £125 ono. *Wanted:* Yaesu FL1200 linear amplifier, also KW160 atu. G3XSI, QTHR. Tel Sheffield 51417, after 6pm.

Icom IC22A, fitted R3-7, rev R6, R7, 145, S19-24, £110. G4CMD, QTHR. Tel 01-500 5107, after 7pm, or 01-626 2374, office hours.

Trio JR310 rx, comp with Trio spkr, manual, £80 ono. Elmac PMR6 all band rx, requires 12V and 200V, perfect for mobile work, psu 12V included. G5SN, QTHR. Tel Southend 554846.

Londex high power hf coaxial relay, £6.50; B & R high power vhf coaxial relay, £750; American uhf coaxial relay, £9; all new, with connectors, postage extra. USAF super stable vfo, 2-8MHz, xtal oven digital readout, manual, mint, £20. Collect. Tel 0995 40387.

RAK AL-48DXN 80/40m trap dipole, length 28m, 2kW p.e.p., £12, plus £1 postage. GM4HKW, 53 Dumyat Drive, Falkirk, Scotland. Tel Falkirk 25559.

Yaesu FT201, as new, c/w a.m. filters, hb 2m transverter, mic, spare o/p valves, comp, offers around £300. MMC 70/28 lo, as new, £15 ono. Junker hand key, £15 ono. G8MCN, QTHR. Tel 021-745 3765.

HW32A ac and dc psus, full band coverage, £85. 70cm 12XY, circular phasing harness, £15. Delivery at cost. Cragg, Dunstable (0582) 600358.

Standard 146A, S0, S20-22, R7, Base Master, two antennas, ext mic, nicads, carrying case, manual, £90. G4BGY, QTHR. Tel 01-777 9061, evenings.

FRDX400/FLDX500, spkr, filters, 2m/6m converters, good cond, £320. KW2000, ac/dc psus, £150. 18AVT vertical, £40. G3KSH, QTHR. Tel 0535 34256.

Military grade vhf sig gen, 95-155MHz, 0·5μV precision attenuator, built-in calibration and ext xtal socket, separate psu, buyer collects, £30. K. Viney, G8KDC. Tel Orpington 22443.

FLDX400, good cond, £145. Joystick and Joymatch LO-Z500, about 30ft wire, £27. KP202, S0, S20, R6-7, flexible antenna, nicads, home-built charger, earpiece, £80. G5ZH, QTHR. Tel Southend-on-Sea 612584.

Avo model 8, £27. Heath V/volt meter, 1M-13U factory wired gimbal mount, £15. M/C mic, h/l imp, alum housing, £3. Small horn l/s, 1929, £5. Tatty manuals: R107, AR77, R209, Class D Inoue rx, £1 ea. *Wanted:* Airmec rx. Tel Coventry 22201.

Pye 22in 90° solid-state tv, four year crt g'tee, one year old, £120. Delivery arranged if required. G8NVT, QTHR. Tel Ottery St Mary (Devon) 2361.

Eddystone 940 gen cov rx, vgc, property late swl, £100. Buyer to collect. G3ALK, QTHR. Tel 01-554 5824.

FDK Multi 11, 2m, S0, S20-24, R3-7, plus R3 input, as new, orig packing, £160. G3MBW, QTHR (Yorks). Tel 0943 74794, evenings.

AR22 rotator, suitable for vhf and light hf, just overhauled, with control box and cable, £30. 13·8V 6A regulated psu, mains, in neat case, £15. G3KLF, QTHR. Tel Ipswich (0473) 310442, weekends or evenings.

TS500, PS500, VFO500, £175. Cambridges: FM10B, £45; AM10B, £30; two Vanguards, £10 ea. 4CX250Bs, £2 ea. Base chimney, £4. Metalwork 2m linear, £2. Scopes: GM5603, with trolley, £12; Telequipment, £10. Murphy Rover h/b, £8. 2m halo £2.50. Tel Edenbridge 862014.

Heathkit SB102 tx/rx, HM102 power pack, SB200 linear amp, SB610 Monitorscope, atu (home-built), Shure 444 mic, £550. Buyer collects. RCA maritime rx AR8516L, modified with 6·3 valves and power pack, £150. RCA AR88D rx, manual, £50. G4OI. Tel 021-705 0413.

Trio 700S, mint, £425. VFO 700S, £65. TS820, digital, cw filter, £650. AT200 atu, £65. SB200, vgc, £210. CD44 rotator, unused, £65. KW/SMC monitorscope, as new, £55. G4EMG. Tel 01-471 1762, days; or 01-534 3460, evenings.

Lafayette HA-600A comms rx, 0·15-30MHz in five ranges, bandspread all transistor, three fets, 11 bipolar, 3W audio, product detector for ssb, cw, S-meter, int mains psu or 12V dc supply, £48 ono. Tel Luigi, Watford 24752, after 6pm.

Beltek W5400, c/w mic, handbook, £60. KW E-Zee match, £20. S8 cine Chinon 672, 6:1 zoom; Prinz dual projector, spare lamp; Chinon dual editor; splicer; £120. G4EGP, QTHR (Watford). Tel 01-428 2797.

Trio TR7100, 10W, fitted S20-23, R3-7, £95 or offers. Pye fm 933 tx, 100W, S20, S22, £20. G8GMU, QTHR (no callers). Tel 0203 611101, after 7pm.

Burns Electronics TC101 wavemeter, comp with probe, perfect, £22. Eddystone EB35, as new, £45. GW8IQC, QTHR. Tel Rhiwderin 4708, evenings.

FT200/FP200, all of 10m fitted, exc cond, little used, orig packing, £240. *Wanted:* Yaesu FLDX400. G4FCN, QTHR. Tel 0803 812117.

Eddystone 770U, £90. Mullard valve tester, plus cards; 1035 'scope; Avo 8; Avo cr bridge; 400 rx boxed valves; sae list; offers. *Wanted:* vhf marine. Cain, G3DVF. Tel Alnwick 2487.

Zygi beam, 3-el, per *Rad Com* October '75, comp, selling on account new QTH; £35. *Wanted:* Small winch. G3JNY, QTHR (?). Tel Leeds 863058.

Jaybeam XD/2m crossed dipoles, £5; Hy-Gain 14AVQ vertical, £30; BC221 freq meter, ac psu, int spkr, calibration charts, instructions, £20; all in vg used cond. KW107, mint, £70. Prefer inspection and collection. G3RLI, QTHR. Tel Leamington Spa (0926) 29726.

Trio TS820 digital, in mint cond, £689. *Wanted:* 240V motorized winch, for use with Westower 60ft model, all offers acknowledged. G4DXC, QTHR. Tel Bingley 3289.

Avo 7, needs attn, £20. Swan 12V psu, new, £20. Webster Band Spanner mobile ant, new projector stand 16/8mm Mustang beam with new spares, £60. Philips dual mic; Jap mic; Grampian stereo amp, no case; 240/115 transformer; two pairs phones. G3WNM, QTHR.

Comp stn, brand-new October '78, 160-2m, FT101E with fm, Europa C with rep shift and fan, cost over £756, £700 delivered Securicor, or £695 collected. Tel 061-761 2952.

Microwave Modules 1,296MHz 30W varactor tripler, £26; Shure 201 mic, £7; both as new. 2C39A and three bases, £6. QQV03-20A, £2. Honeywell 194 Electronik chart recorder, sensible offers. G3OHC, QTHR. Tel 021-308 2512.

Tifax teletext decoder, psu, remote keyboard, interface board and data, £120. House move forces sale. G4CJC, NOT QTHR. Tel Clacton 814320.

EC10 rx, battery/mains, vgc, fm disc, SSM 4-6MHz 2m converter, padded carrying case, £60. Pye PF1 tx and rx, xtalled on SU8, set of xtals for RB4, £25. G8HCK, QTHR. Tel 0925 813229.

"RSGB Bulletin" *Radio Communication,* 15 years, from vol 39 No1 July 1963 to present date; less six copies: November '69, June '70, May '75 and February/June/August '77; each copy as new; £18. G8PF, QTHR. Tel 0425 617576.

Trio TR7500 and PS6, four months old, £220. Diawa SW410 144/432 power/swr bridge, £49. Diawa λ/4, £5. Larson Kulrod 5/8 mag mount, £6. QQVO750, £4. New dc lead for FT101, £5. Plus carr. GM4DHJ, QTHR. Tel 041-889 9010.

Trio 7200G in 10W mobile tx/rx, fitted R0, R3-7, S20-24, boxed comp free mag mount with s/steel 5/8 whip, £120. G3CDC, QTHR. Tel Woodborough (Notts) (344) 3361.

Telequipment dual-beam 'scope D54R, case, 10MHz, £350. Yaesu counter YC355D, £110. Trio 7200G, £150. Modular Electronics 28-432MHz transverter, £50. Jaybeam 12XY, as new, 70cm, £20. Homebrew 500MHz counter, *VHF Communications* design, £60. Multi U11, £200. G8FFI, QTHR. Tel Cosham 86184.

Liner 2, preamp, 5/8 antenna, £100. Pair Pye PF1s, with batteries, wkg on RB10, vgc, £40. G8GYO. Tel 051-342 7155.

Trio JR500S rx, matching spkr, Codar Q-multiplier, £50. Garex Twomobile tx/rx, £70. G4FAI, 1 Tash Place, London N11 1PA. Tel 01-368 4588.

Going QRT at QTH and 100 per cent mobile, everything must go: FDK2700, 2m, all mode, exc cond, hardly used, £420 ono; 2030 Memomatic rota rotator and cable, 4-over-4 ground plane, offers, will split; Heathkit vtvm and transistor tester, MM dfm; SCS 80W linear; many other odds and ends, components etc; sae for comp list. G8KLX, QTHR. Tel 01-739 3433, 9am-7pm, weekdays.

G2DAF Mk2 h/b rx, £20; ditto tx, £15; ditto ps, £10. Heavy *SWM* rx ('fifties), Q-multiplier, selectoject, etc, 26 valves, £15. Heavy h/b lf sig gen, £5. Other h/b items, cheap, all wkg, buyers collect, offers. G8BLY, QTHR. Tel Topsham 4822, after 5.30pm.

Property late G6BX: TS700G, £330; frequency counter YC355D, £110; KW Viceroy, £75; KW Vanguard, £30; Hallicrafters SX100, £70; Inoue IC700R, £50; CR100, £10; Heathkit oscilloscope OSZ, £30; other items. G2DM, 64 Fleet Lane, Queensbury, Bradford. Tel Bradford 882924.

KW2000A tx/rx, ac psu, KW Q-multiplier, KW107 Supermatch, handbook, £200. Carr extra or buyer collect. Would exch for all mode 2m rig. Morrison, 9 Gordon Street, Barnhill, Dundee. Tel 0382 78740.

KW 201 amateur band rx, late model, new cond, xtal calibrator, manual, workshop circuit drawing, £100 ono cash sale. Buyer collects. G3FK, QTHR. Tel Breamore (07257) 436.

Icom IC202, extra cov, 144-144·6, 144·8-145MHz, £135. Creed 7B (230V ac), silence cover, base, £18. RTTY tu/afsk osc (ST5 design), attractive case, £18. Creed 6S/5 tape reader £4. 7TR/3 reperf, tape, £6. Carr extra. G8LKR, QTHR. Tel Hitchin 730550.

AR40 rotator, £20. Telegraphy Systems twin paddle cmos keyer, £10 ono. *Wanted:* Bird 43 elements for vhf and uhf. G4FMD, NOT QTHR. Tel Great Dunmow 3119, after 6pm.

Yaesu FT75B vxo control hf tx/rx, 100W input for mobile, with dc psu, £175. Icom ICZF fm box, £70. Homebrew cw keyer, using Bauer paddle, £30. GM4AWA, QTHR. Tel Bridge of Earn (073881) 2815.

35MHz oscilloscope; Advance OS2100, with 7Y and 3X plug-ins; dual trace 10mV/cm, solid-state, full handbooks; best offer received one week after publication secures; sae please for reply. G4FMD, 11 The Maltings, Dunmow, Essex CM6 1BY.

Mic/tel headsets, Hosiden BH001 200/15Ω, new, boxed, £6.50. 50p post. Edgewise meters, 2in scale, 0·5 or 1·0mA fsd, new, £1.75, 30p post. Transformers, double wound, 6·3V 0·5A, 18·5V 1·5A, £1, 40p post. G3YLO, QTHR. Tel Berkhamsted 73717.

SR200 amateur bands ssb rx, 160-10m plus WWV, xtal calibrator, S-meter, handbook, matching spkr, orig packing, £35. *Wanted:* Power unit 697. Set HRO bandspread coils plus h/b 15m bandspread coil. B2 tx plus coils. Stone, G3JFC, QTHR. Tel Crayford 522489.

Trio 2200G, mint, fitted S0, S20-22, R6-7, R5 and R4 (receive only), nicads, charger, orig packing, £100. G3NPJ. Tel 051-648 6389.

2200G, as new, S20, S22, S24, R3-7, nicads, charger, case, £100. G4AIJ, QTHR. Tel Ludlow 3197.

Multi 11, S20-24, S0, R3-7, mint, £145. 4m 4-el Jaybeam, unused, £8. Low band AM25B, £10. Pye base tx, on 2m, £8. Dash Cambridge, fm'd to 2m, xtalled LO, £45. 4m xtals, Cathodeon made for Pye Cambridge, £1 ea. G3PHS, NOT QTHR. Tel Caterham 47892.

Racal RA17L rx, £225. Pocketfones PF1s, spare nicads, £32. PSUs 13·8V, 3·5A, £12. Charger nicads, 12-way, £12. Pye music centre, £120. UHF plus 3cm, sae list. PSUs 12, 15, 20V 2A, £5. G8AFJ, QTHR. Tel Heysham 51734, after 6pm.

Colour solid-state video equipment: Shibaden helical scan vtr; Philips colour adaptor; professional colour monitor; RGB decoder; rx; test card generator; waveform generator; vectorscope; £450 the lot. Also monochrome monitor. G3WJG, QTHR (Herts). Tel Chorleywood 3337.

FT200/FP200, fitted with G3LLL rf clipper, Yaesu mic, £220. G3STB, QTHR. Tel Preston 35049.

IC215, eight months old, mint cond, fitted R3-7, S20-23, 145·8, auto toneburst, all accessories, manual, packing, £130. G8CCI, QTHR. Tel Oxford 880229, evenings/weekends.

FR50B, Kokusai mechanical filter, mint, £70. BC348L, vgc, £25. Codar PR30 psu, £8. Telford TC7 2m rx, rough but wkg well. *Wanted:* HW100 S-meter, must be vgc. Barton, 19 Leigh Place, Welling, Kent. Tel 01-854 4926.

Thirty-two MPD 411-4 4K dynamic rams tA = 150ns, plus four MH 0026 clock drivers, price with data sheets and TI low profile dil sockets, £48. My stock ≈ 100ttl (>½ MSI), £15. G8AVR, QTHR. Tel Templecombe 587, after working hours.

Linear amp trans, new, 1185-0-1185, 0-110-210, 230, 240, 250, PR1, easily do legal output 400W, £8 plus p&p. Pair 4CX250Bs, Eimac, as new, £20. G3SIO, QTHR. Tel Kingswinford 5924.

KW202 rx, immac, 16 months old, £190. Storno Viscount, comp, 4ch, xtalled S0, S20, S22, preamp, £45. Revco magnet mount, 5/8 and λ/4 whips, £10. G4FXI, QTHR. Tel Aylesbury 21542.

C146A Standard hand-held tx/rx, S20, S22, S0, nicads, helical whip case, good cond, £115; or would swop/part exch for Standard C432, TR3200 70cm hand-held rig. *Wanted:* Stolle 2010 motor unit. G8OOW, 112 Upgate, Louth, Lincs. Tel 0507 2220.

Sommerkamp FT277B, cw filter FV277, (as FT101B FV101B), £350. FT100B, ac/dc psus built-in, 10-80m, £115. TR7200G, 12ch, £90. C146A, nicads, case, charger, helical whip, £90. TF144G, £15. G3XBY, QTHR. Tel Claverdon 2541, after 6pm.

National rx NC100X, 550kHz-30MHz in five ranges, similar to HRO, coils in int die-cast enclosure, xtal filter, built-in ac psu, l/s push-pull output, £18. G5XB, QTHR. Tel 073 525 2195.

Heathkit Mohican gc rx, 550kHz-30MHz (transistorized), £30; Hy-Gain 18AVT/WB antenna, £35; Avo Multiminor Mk4, £8; all good cond, prefer inspect and collect. *Wanted:* Trio 7200G fm rig. Taylor, 26 Mortain Road, Rotherham, S Yorks. Tel Rotherham 70021.

KEN KP202 tx/rx, fitted S20-23, R5, toneburst, nicads, charger, whip and helical antennas, f to uhf adaptor, carrying case, h/book, as new, £115. G8ITB, QTHR. Tel 01-697 7254.

FT221R suffix D, immac cond, R5-7 xtals, orig packing, gone hf, £330 ono. G4HFR, 17 Alsa Gardens, Elsenham, Bishop's Stortford. Tel 0279 812300.

RTTY comp stn: Creed 7E/RP, silence cover, exc cond, punch not wkg; 6S/5 tape reader; terminal unit; £30 the lot. Buyer collects. G8AKM, QTHR. Tel 0635 43501.

Liner 2, fb cond, all access, fitted PA3 preamp, can be seen in Bristol, £110 ono. G8IMT, QTHR. Tel Camborne 713584.

S100 dynamic memory board, uses 4116 equals, 16k byte fitted, never used, circuit, offers around £150. Also Sony 13in Trinitron tv tube, new, unused, offers. G8AVR, QTHR. Tel Templecombe 587, after working hours.

Moving QTH: Solartron single beam 'scope CD513, manual, spares, £15; trolley, £5; 12AVQ antenna, £3; 20ft 2in aluminium pole, £5; *Wireless World* '47-'55, *SWM* '49-'51, *QST,* offers; smart mini rack, suit linear, £3. G3CWV, QTHR. Tel Worcester (0905) 53655.

Heathkit TFM/1 vhf/fm tuner unit, 88-108MHz, £30. BC624A rx chassis, new valves, full conversion details for 2m, £6. Buyer to inspect and collect. Griffiths, 10 Church Street, Glentworth, Gainsborough, Lincs.

FT200, FP200 psu, all 10m xtals, exc cond, £280. Traps for D22 dipole, unused, £5 the pair. Nye Viking M/SSK-1 squeeze paddle for el keyer, £18. *Wanted:* TS515, FT501 or similar. GI4GST. Tel 0247 878851.

Uniden 2020 80-10 tx/rx, mint, perfect, little used, £400. Binning, GM3XIJ, QTHR. Tel 0546 2127, ext 232.

Sockets type 359, 10H 2206, boxed, unused, £1 ea. Aircraft vac pumps 37J type B3, £10 ea. RPM indicators, oil pressure, txs, etc. Radio compass indicators type I-82-A pt 110Q13, £2.50 ea. Plus carr. G3AFN, QTHR. Tel Wormley (Surrey) 2364.

Pye base stn tx, 2m; Pye U450L rx, 70cm; Philips two-track tape recorder; telegraph distortion measuring set; offers. *Wanted:* atu. G4HHT. Tel Coventry 610408.

FT101E, £375, no offers. Tel Basildon 412435, evenings.

Mosley Mustang 3-el tribander, very good cond, selling due to erection of quad, offers? 7BP7 sstv tubes, £5 ea plus 50p post. G4BVH, 73 Dudley Road, Brighton, Sussex. Tel 0273 504634, evenings and weekends.

Pye Vanguard FM25B, 6ch, h/band, all accessories, £30. Pye Westminster W15AM, h/band, single channel, unit only, £20. MM conv 144-28LO, brand-new, £12. Hamgear preselector, 160-10m, mains input, £10. Whiston, G8RCL. Tel Penketh (Warrington) 4766.

Transformers: two 3 × (12·6V at 5A) 6·3V at 1A, £8 ea; one 2 × (4·5V at 1·3A), one 15-0-15V at 6VA, £2 ea; one 880-0-880 at 200VA, £8. Carr incl. Adrian Andrews, G8AVR, QTHR. Tel Templecombe (09637) 587, after working hours.

KW107 antenna tuning system, immac, £60. SEW type ED107 educational 0-1mA meter, new, unused, £4. G2AK, QTHR. Tel Aldridge 52518.

HW101 tx/rx, cw filter, real man-sized psu runs new 6146Bs to 240W input, spare valves, £175. Tektronix 545A 30MHz double-beam 'scope, probes, trolley, £150. G3OHP, QTHR. Tel Medway, Kent (0634) 220536.

Shack clearance: Trio TS510, psu, £185; 18AVT, £30; Shure 444 mic, £5; (or £210 the lot); Dentsu el keyer, £5; Heath OS1 'scope, £10; Heath RF1 sig gen, £8; buyers pay carr. GI3YDO, QTHR. Tel Randalstown (08494) 72609, after 6pm.

Unused xtal filters, XF9M (cw), XF9B (ssb), YF90H12 (fm), £15 ea; YF90F (ssb), £12. Xtals (lsb, usb), £1.50 ea. Bauer keyer lever, £4. G3BKF, QTHR.

Eddystone 720, collector's item, lw, mw, trawler band, offers. GM4GVJ, QTHR. Tel 031-332 3030.

Eddystone EC10 Mk1, mint cond, very little used, £75. Pocock, G4GTU, QTHR. Tel Rustington 4123.

Heathkit DX100 SB10U ssb adaptor, both with handbooks, etc, £60. G4GPS. Tel 0625 26885.

FT200 hf tx/rx, FP200 ac psu, all xtals for 10m, Shure 201 mic, £175. G8JON. Tel Chelmsford 55560.

KW Viceroy Mk2, psu, £50. BC221, incl ac psu, charts, £15. G3MBM, QTHR. Tel 0223 860178.

Drake R4B, all 10m, 160m and MSF xtals, £230. Hallicrafters SX117 rx, 110V, £75. Atlas digital dial for 210 or R4B, £100. Atlas digital dial, less case, for 210X, £75. G3NAC, QTHR. Tel 0954 60584.

2m Storno Viscount, fitted R6-7, toneburst, preamp, £35. G3MEO, 6 Anvil Avenue, Litlington, Nr Royston, Herts. Tel Steeple Morden 852465.

FT227R 2m tx/rx, tunes 143-150MHz in 5 or 25kHz steps, automatic repeater shift, toneburst, three-way scanner from 144·5-146MHz, all usual mods plus others, fantastic rig, £250 ono; or exch FT101. Tel Luigi, Watford 24752.

NEC CQ110E tx/rx, 160m-10m, 280W, ssb, cw, a.m., fsk, fax/sstv, 240V ac, 13V dc, mint cond, £460 ono. Prefer buyer inspects and collects, but carr can be arranged. G3SYL, 10 Sunflower Close, Kempshott, Basingstoke, Hants. Tel Basingstoke (0256) 51141.

Furzehill Lab sweep gen, 3-70MHz, adjustable sweep width, bargain, new, £35. 4CX250B uhf coaxial base, new, £15. UHF dummy load, 50Ω, 30W, as new, £8. G3SEF, QTHR. Tel Cheslyn Hay (0922) 415369.

FRDX400, all options fitted, £160 ono; matching spkr, £10; spare valves, list on request. GW3GHC, QTHR. Tel 0633 680481.

Icom IC215, fm, portable, 15ch, R1-9, 145, S20-24, six months old, going multimode, £150 ono. G8LVX, QTHR (Wembley). Tel 01-904 0878.

KW2000, good cond, ac psu, handbook, £95. Collect or carr extra. G3JDJ, QTHR. Tel 021-554 5472.

TS520S, comp with cw filter, SP520 matching spkr, £455. G3PEK, QTHR. Tel 0244 300897.

Drake T4XC, psu; R4C, eight extra xtals, 1·5kHz filter; MS4; manuals; £550. MN2000, £140. *Wanted:* pair 572Bs. Dentron MT3000A or 2000A atu, FT221R. G4DED, QTHR. Tel 086 75 2215.

EBC JR unique dual synthesis 2m tx/rx, needs adjustment, £125. TS820 cw filter, 12V dc adapter, £595. G5CQO, QTHR. Tel 01-348 4949.

WANTED

Two 200pf 3kV; one 350pf 3kV; multi-turn counter for roller coaster coil; all as per *QST* transmatch. *For Sale:* Hammarlund HQ170A, suitable for spares, handbook, £30. G4GEA. Tel 044 361 5645.

Projection lens for GBL516, 16mm sound projector; also any cine equipment, films or why? 16mm, super/std 8, 9·5mm. Will collect reasonable distance from Burton-on-Trent. Reynolds, G4BPW, QTHR. Tel 0283 813395.

Dish, 1¼m dia or bigger, suitable for 12GHz. GW8AWM, 142 The Highway, New Inn, Pontypool, Gwent. Tel 04955 2254.

Datong FL1. *For sale:* Avo sig gen, 2-225MHz, £25. 'Scope, 100kHz, £10. New multimeter, 20kΩ, £9. Multi-range ac/dc new BSR tape deck, £5. G2CDN, 13 Wood Lane, Isleworth, Middx. Tel 01-568 1331.

For Solartron storage 'scope QD910, Hughes aircraft Memotron crt type 6498, would consider duff 'scope with good tube. Also, still looking for AN/ARR8 vhf panoramic rx, parts or comp units. G8LIU, QTHR. Tel Uxbridge 30006, after 7pm.

Linear amp, to match FLDX400 tx, either FL2000B, FL2100B, or any other linear. *For sale:* TA33Jr, £35 ono. Many linear components such as 813s, bases, rf chokes and transformers, etc. G4DCI, QTHR. tel Nottingham 231430, after 6pm.

Any information on mods to AR88LF; also handbook to buy or loan to copy. All costs willingly refunded. L. James, 89 Johnson Road, Cannock, Staffs WS11 2BA. Tel Cannock 71029, anytime.

Post office No12 set, directional set, with loop and rod antennas; to trace source of local QRN; help please, have endured QRN for two years. Will buy or hire. G4CSB, QTHR. Tel 01-802 3378.

Urgent: lens, C mount 25mm f1.9 for 1in vid tv camera, cash waiting; or comp Pye Lynx. G8NVT, QTHR. Tel Ottery St Mary 2361, anytime.

HQ1 Minibeam. G2DTQ, QTHR. Tel Cheslyn Hay (0922) 415048.

SB200, SB220, any cond, wkg or not. G3PSV. Tel Camberley 61444.

18AVT/WB trap vertical antenna. G3CEU, QTHR. Tel 03265 4460, after 6pm.

RX, hf model, companion to the R216 vhf type; type, WD/number and handbook for the hf model, up to 20MHz. Also geology microscope. Any info to George Haylock. Tel 01-300 1649. (Active daily 21/A1, late afternoon for QSO).

Cards for Mullard valve high speed tester, set or half set. H. H. Wall, 14 Aragon Close, Southend-on-Sea. Tel 352300.

Antenna base NoC2 (large feed-thro' insulator assembly ex Canadian 52 set), part no ZA/C 00088 or CMC 114-059. Robbins Myers rotary transformer (ex 52 set), input 11V/25A, output 1300V/0·12A, 156W. Any 52 set items. Wireless Sender No53. RX R107 Mk2, in exc cond. G3UCT. QTHR. Tel Fleet (02514) 6998.

Old-timer pre-1939 QSL cards from dx countries, fair price given for clean unbent cards, what have you lurking under that junk box? G3BDQ, "Whitefriars", Friars Hill, Guestling, Hastings, E Sussex.

Prof hf tx, for cw use; Mk214 or why? Battery gc rx. Info on Labgear LTA6 remote tuned whip ant. G3RFI, QTHR. Tel Potton (Beds) 260800.

Geloso vfo N.4/101 or N.4/102. G3LQO, 10 Girdle Road, Hitchin, Herts SG4 0AN.

Swan Cygnet for /M. G3KIP, QTHR. Tel 0892 23836, evenings.

Elstone MR15 or MR30 output transformer, good cond essential. G3NMJ, QTHR. Tel 0424 215556.

Creed 75 rx only teleprinter, or similar. Also terminal unit, good cond. G2FXA, QTHR (Teesside).

4m transverter, also FRG7 rx. Could collect London. EI9BG, QTHR.

FT101, any model considered, must be vgc, all letters answered. Lonnon, G3ZUM, QTHR.

5·2MHz xtal filter, type QC1246AA 2·5kHz B/W, by SEI. BC453 or variant. Pre-WW2 *RSGB Bulletin, SWM, QST.* G3ICH, QTHR.

"Radio Communication" '67, dealing with G2DAF rx construction and alignment, whole year purchased, or would borrow for photostat copying and return. GD3RFH, QTHR. Tel Peel 2166.

Yaesu FL50B tx. Lloyd, G4HJT, 39 High Street, Twerton, Bath, Avon.

Electroniques i.f. strip xtal filter only 1·6 or 455. G3KRH, QTHR. Tel 01-455 5039.

ZA14346 ex-Navy rx manual, must incl circuit diagram due to circuit problems. Also of assistance, info on repair of this rx. Details and price. C. L. Dunn, 24 Mynchen Road, Beaconsfield, Bucks HP9 2BA. Tel Beaconsfield 3372.

18AVT/WB 10-80m trapped vertical antenna, good price paid according to cond. G3KTH, QTHR. Tel Droitwich 4624.

"Know How" booklets by Lenn Briggs, published by Pye, nos 1-6, particularly No6, loan or purchase. G2FWA, QTHR. Tel 0242 67 2229.

Eddystone 730/1A rx manual, loan for copying, or purchase. Foster, "Fresh Woods", The Meadows, Cherry Burton, Beverley, North Humberside HU17 7RL.

KW Vespa Mk2, in good cond, psu, handbook. G4FSR, QTHR. Tel Coventry 465692.

Yaesu FR101DD rx; FT221R tx/rx; state price and where seen. Milne, 3 Cottington Close, Kingsclere, Nr Newbury, Berks.

Trio TX599 tx, good cond. C. J. Wilcox, G8NOW, 10 Perrin Avenue, Kidderminster, Worcs. Tel Kidderminster 5146, after 6pm.

The editorial staff extend their best wishes to readers and contributors for a joyful Christmas and a happy New Year

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PUSH-BUTTON CONTROL
Model ASP sets remarkable new standards of performance and ease of operation for speech processing equipment. As well as providing the genuine 6 to 10dB of talk power improvement without harmonic distortion which has made our Universal RF Speech Clipper world famous, Model ASP adds the ultimate convenience of instant push-button selection of the degree of RF processing. This ranges all the way from 0 to 30dB in 6dB steps.

Input level adjustments or meter watching are completely eliminated and the automatic control system ensures that you always get exactly the amount of processing that you want despite changes in voice level, or even despite changes in microphone.

With Model ASP you simply select the processing to suit conditions: 0 to 6dB for semi-local work; 12 or 18dB for DX work; and 24 or even 30dB for when the going is *really* rough.

UNIQUE SET-UP AID
Having eliminated input setting controls, Model ASP goes even further and simplifies the setting of the transmitter microphone gain. Simply press the "TONE" button and the unit generates a sine wave with the same peak-to-peak amplitude as the processed speech output. Once your transmitter mic. gain (or the preset output level control on the back of Model ASP) is set to give the desired peak P.A. current using this tone, it will be virtually impossible to overdrive the transmitter or to radiate a bad signal.

The result is that you can always rest assured that your signal is exactly as you want it, without the need to watch meters or to carefully control your voice level.

TWO PROCESSORS IN ONE
Model ASP really consists of *two* processors in one case. The first is an audio processor and the second is a true RF clipper.

The audio processor is *not* intended to give any compression or talk-power enhancement; its job is instead that of an intelligent and unobtrusive yet thorough automatic peak-level adjustor which ensures that the subsequent RF processor always has an accurately defined peak-to-peak input level. It is exclusively the job of the RF processor to boost the talk power.

PROVEN RF CLIPPING TECHNIQUE
The main processor uses the well-proven RF clipping technique which has been so successful in our Models RFC and RFC/M. A high-quality SSB signal is generated at 60kHz using the phasing technique because of its smooth frequency response and its long-term reliability. This SSB is then clipped, filtered, and demodulated back to audio. The result is an increase in the average to peak voltage ratio of the speech waveform yet without harmonic distortion.

Unlike some AF or RF compression systems which make you sound louder without improving your readability, true RF clipping actually increases the intelligibility of speech in noise. This effect acts in addition to the simultaneous increase in your average power level.

ADVANCED AUDIO PROCESSOR
The audio processor has the demanding job of maintaining a constant peak-to-peak speech amplitude despite wide variations in input level and yet *without introducing any audible side effects*. The circuit has been especially developed for this specialised purpose and is highly sophisticated. It involves detection of both positive and negative speech peaks to allow for the marked asymmetry of many speech waveforms, and a five second 'hang' time after speech ceases so that the background noise remains constant during speech pause. So that the circuit is not fooled into a long-term gain reduction by loud transients (such as from dropping the microphone) dual time constants are used in the control loop together with special logic circuitry to discriminate against non-speech sounds.

ACCURATE CONTROL
As well as being highly convenient to use, Model ASP gives a far more accurate control of the degree of RF processing than processors which rely on the operator controlling his voice level to "talk-up" a meter to a desired reading. Moreover, the self-control needed for the latter method all too often evaporates in the excitement of DX operating. With Model ASP on the other hand, you can afford to get excited; the automatic control continues to look after your signal while you concentrate on the operating.

FULL MONITORING
Even a control system with the wide range of Model ASP has its limits and three light-emitting diodes are provided so that you can confirm at a glance that your input is within bounds. If your voice level is too low, the "LO" lamp will stay on. If your voice level is within the correct range the "OK" lamp comes on instead, and after a few seconds of speech (during which the processor will "learn" your voice level) it will stay on for about five seconds after you stop talking. This represents the "hang" time of the pre-processor. If both "LO" and "OK" lamps go off together your input is too large.

As a further refinement, the "SPEECH" lamp should stay on only while speech sounds are present. If it stays on between words there is too much background noise at the microphone for good intelligibility, and you should talk closer to it.

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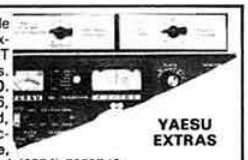

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336 pages; paperback; 244 by 183mm; 1978

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416 pages; hardcover/dust jacket; 248 by 183mm; 1976

RSGB Amateur Radio Call Book
(1979 edn)

Published annually, this is a comprehensive directory of amateur radio stations in the UK and the Republic of Ireland. This edition incorporates 6,350 new callsigns and amendments notified by the Home Office between September 1977 and August 1978. It also includes lists of RSGB affiliated societies and groups, beacons, repeaters and special callsigns.

184 pages; paperback; 241 by 182mm; 1978

Radio Data Reference Book
(4th edn)
T. G. Giles, G4CDY, and G. R. Jessop, G6JP

Presents a wide range of essential reference data in convenient form without needless repetition of basic theory.

Chapter titles: *Units and symbols; Basic calculations; Resonant circuits and filters; Circuit design; Aerials and transmission lines; Radio and tv services; Maps and meteorological data; Materials and engineering data; Mathematical tables.*

"...it is not in any sense a handbook peculiar to the needs of amateurs. In fact, it is the kind of volume any electronics engineer or technician would welcome on his bookshelf, because of the amount of data it contains"—*Electronics Australia.*

200 pages; hardcover/dust jacket; 223 by 140mm; 1977

Radio Communication Handbook
(5th edn)

First published in 1938, and a favourite ever since, this large and comprehensive guide to the theory and practice of amateur radio takes the reader from first principles right through to such specialized fields as radio teleprinters, slow-scan television and amateur satellite communication.

Chapter titles:

Volume 1: *Principles; Electronic tubes and valves; Semiconductors; HF receivers; VHF and uhf receivers; HF transmitters; VHF and uhf transmitters; Keying and break-in; Modulation systems; RTTY.*

Volume 2: *Propagation; HF aerials; VHF and uhf aerials; Mobile and portable equipment; Noise; Power supplies; Interference; Measurements; Operating technique and station layout; Amateur satellite communication; Image communication; The RSGB and the radio amateur; General data.*

"These volumes should be well worth the expense to an amateur who is interested in the technical aspects of the pastime."—*QST* (American Radio Relay League).

"The high standard evident in Volume 1 is fully maintained in Volume 2 and, together, they contain a wealth of information for the serious amateur. Highly recommended"—*Electronics Australia.*

Volume 1: 480 pages; hardcover/dust jacket; 248 by 183mm; 1976
Volume 2: 336 pages; hardcover/dust jacket; 248 by 183mm; 1977

Teleprinter Handbook
D. J. Goacher, G3LLZ, and J. G. Denny, G3NTT

Covers the complete theory and practice of modern radio teleprinter equipment, both European and American, and includes much servicing information.

Chapter titles: *Aspects of signalling; Teleprinters; Other rtty machines; Power supplies; Demodulators; Auxiliary equipment; Keying methods; Filters; Test equipment; Control systems; Operating procedures; Glossary of commercial equipment; Terminology.*

372 pages; hardcover/dust jacket; 248 by 183mm; 1973

Test Equipment for the Radio Amateur
(2nd edn)
H. L. Gibson, G2BUP

Explains the principles of measurement techniques, and gives constructional details of many items of up-to-date equipment of interest not only to the radio amateur but also to the electronics enthusiast.

Chapter titles: *Current and voltage measurements; Frequency measurements; Wavemeters; RF power measurement; Aerial and transmission line measurements; Noise measurements; Components, valves and semiconductors; Signal sources and attenuators; Oscilloscopes and modulation monitors; Power supplies; Reference data.*

151 pages; hardcover/dust jacket; 248 by 183mm; 1978

Oscar Amateur Radio Satellites
S. Caramanolis

A complete introduction to the orbital and electronic principles of communication satellites, with particular reference to the Oscar series of amateur radio satellites.

Chapter titles: *Planets and their orbits; Satellites and their orbits; Anatomy of a satellite; Satellites as relay stations; Fundamentals of telecommunication via satellites; Telemetry systems; Satellites of the Oscar series; Operating with amateur satellites; Learning with AMSAT-Oscar satellites; The future.*

"Any amateur would be well advised to add this to his satellite literature or even use it as a starting point. Highly recommended"—*Electronics Australia.*

192 pages; paperback; 206 by 147mm; 1977

OTHER RSGB PRODUCTS

Amateur Radio Logbook

A new improved version of the "standard" log which incorporates a superior wire binding, enabling the book to be folded back on itself to save desk space. The A4 size also allows much more space for remarks.

96 pages; wirebound; 210 by 297mm

Great Circle DX Map

This map, intended for wall mounting, shows the bearing in degrees of any dx station and is thus invaluable for the hf operator with a beam antenna. Also gives amateur radio prefixes. Printed in green and black, and plastic laminated for extra durability.

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USA PUBLICATIONS

Care and Feeding of Power Grid Tubes

Varian (EIMAC Division)

The classic applications manual for those designing and building linear amplifiers using EIMAC valves, including the popular 4CX250 type.

Chapter titles: *Introduction; What is a power grid tube?; Electrical design considerations; Linear amplifier and single sideband service; Neutralization; Operating conditions for various applications; Bibliography.*

156 + ix pages; paperback; 212 by 136mm; 1967

The Radio Amateurs' Handbook

(1979 edn)

This edition has been extensively revised by ARRL with a new layout and design concept. State-of-the-art features include narrow-band voice modulation, a 140W solid-state linear, a cmos morse keyboard and much more. First shipment expected later this month; order now.

544 pages; paperback; 276 by 208mm; 1978

Radio Frequency Interference

William Lowry, W1VV, Doug DeMaw, W1FB, Jay Rusgrove, W1VD, and Hal Steinman, K1FHN

Although primarily intended for the USA market and television systems, this new book provides some technical information which may supplement that to be found in UK literature, particularly concerning interference from electrical devices and power lines.

Chapter titles: *RFI: problem or opportunity?; Coexistence in an RFI-filled world; Citizens band interference; Interference from transmitters; Interference from electrical devices and power lines; How to identify and resolve radio-tv interference problems; Appendix.*

64 pages; paperback; 275 by 208mm; 1978

Hints and Kinks for the Radio Amateur

edited by Stuart Leland, W1JEC

This is a new and completely reset edition of one of the most famous books in amateur radio. Solutions to tricky practical problems abound, and there are details of many useful modifications to well-known commercial gear.

Chapter titles: *Aids for the station and shop; Test gear ideas; Transmitting and receiving kinks; Hints for the power supply; Antenna tidbits; Thoughts for cw operators; Portable and mobile quickies; VHF band-aids and tricks; Notions for various modes; Data for pc boards and solid state.*

136 pages; paperback; 279 by 209mm; 1978

Solid-state Basics for the Radio Amateur

Doug DeMaw, W1FB, and Jay Rusgrove, W1VD

This new ARRL book contains a complete beginner's course on the theory of solid-state devices. This is followed by thorough discussion and complete constructional details of simple modules which connect together to make a "breadboard" 3·5MHz direct-conversion receiver.

The same modules are then used, with some additions and rearrangement, to complete a 3·5MHz superhet receiver, while a similar approach later allows the reader to construct a 3·5MHz transmitter. Further chapters illuminate other aspects of solid-state design, including linear ics and digital logic, and the book concludes with four useful sections on practical construction matters.

Chapter titles: *Let's talk transistors; Learning to work with semiconductors—receiver section; Learning to work with semiconductors—transmitter section; Understanding linear ics; Learning to work with integrated circuits; Semiconductor basics pot-pourri.*

159 pages; paperback; 276 by 208mm; 1978

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RSGB members *can obtain a* **10 per cent discount** *on the prices listed below* **at the time of ordering** *(excluding* Ham Radio Magazine *and* Ham Radio Horizons*). To obtain the discount, deduct 10 per cent, calculated to the nearest penny, from the total value of the order (using the latest price list) and enclose a remittance for the balance. Also enclose a recent* Radio Communication *address label as proof of membership.*

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Radio Communication Handbook 5th edn, Vol 2	£8.12
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QST (including ARRL membership) (per annum) £9.25
Subscriptions for *QST* should be sent to RSGB, 35 Doughty Street, London WC1N 2AE.

Ham Radio Magazine (per annum) (incl air delivery)	£14.00
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Subscriptions and changes of address for *Ham Radio Magazine* and *Ham Radio Horizons* should be sent to: Ham Radio Magazine (UK), PO Box 63, Harrow, Middlesex HA3 6HS.

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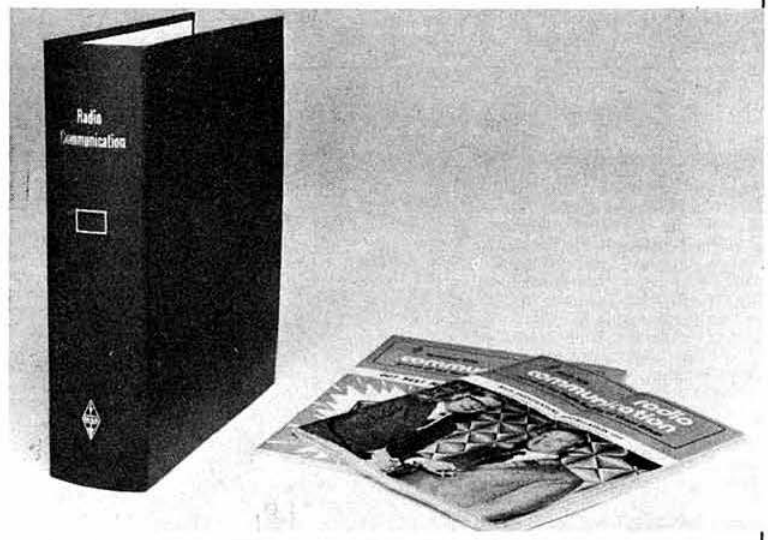

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Spurious output greater than 50db down.
Power requirement 9–15v DC. Size 42 × 88mm.
PRICE £12.00 supplied less channel switch & crystals.

The above four **"KENT MODULES"** make a first class switched channel VHF N.B.F.M. monitor receiver with a sensitivity of typically 0.2μV.

SPECIAL OFFER the above four **"KENT MODULES"** for only **£55.00.**

COMING SOON: An updated version of our FM add on unit for your FT101; this gives Tx & Rx facility with only one wire to alter in the FT101.

ALL MODELS FINISHED TO PROFESSIONAL STANDARDS AND FITTED WITH MOUNTING BUSHES

STEREO CAR CASSETTE PLAYERS famous manufacturers warranty returns fully overhauled and in working order 5 watts per channel output, controls = volume, balance, tone, fast forward and rewind, auto stop. Supplied less speakers and power lead but we do supply power plug and circuit. LIST PRICE over **£50.00** OUR PRICE ONLY **£20.00.**

BARGAIN BOXES of mixed components IFTs, coils, res. caps. PCBs with components on for breakdown, etc. etc. our selection **£4.00** + £1.00 pp.

AUDIO INTEGRATED CIRCUIT type TA7205P 5.8 watts output @ 13·2v. ex-new equipment and tested before despatch comp. with data sheet **90p.**

10·7MHz RADIOTELEPHONE MARKER OSCILLATOR UNIT built into small die cast box with internal battery brand new supply ex-stock **£14.04** post paid (other frequencies made to order).

PYE WESTMINSTER SINGLE CHANNEL OSCILLATOR BOARDS for W15AM 79·101MHz Tx. coil can be rewound to suit any frequency required for Tx or Rx. New @ only **80p** each. 5 for **£3.00.** 10 for **£5.00.**

PCBs marked COMPRESSION UNIT complete circuit with 7 transistors, if used with pre-amp this could possibly make nice mic. compressor, sorry we have no info, but connections are marked on board. **£1.00** each.

CO-AX PLUGS/SOCKETS: "N" plug for UR76 etc. **65p,** free "N" socket right angle cable mounting for UR67 **75p.** 75 ohm "N" plug for RG164 **75p.** 50 ohm BNC right angle adaptors **50p,** SPECIAL OFFER 75 ohm BNC plugs & single hole fixing sockets ONLY **35p** each. SO239 UHF sockets 4 hole fixing **50p.** Screening shields for SO239 sockets **20p.** 50 ohm BNC plugs for min. co-ax **60p.**

DOUBLE GANG 5k ohm 1 watt wire wound pots **20p.**

MIXED FERRITE CORES bag of approx 100 **50p.**

SOLDER IN F/T CAPACITORS 1000pf 500 vw. ⅜" dia. 10 for **20p**

F/T SOLDER IN GLASS INSULATORS 100 for **50p.**

DISC CERAMICS 0·01 mf 2·5 kv working **5p** each. 1000pf 500vw. 2.200pf 500vw. both types 10 for **15p.**

PLATE CERAMICS 22pf to 1000pf 50 in E12 series **3p** each.

RESISTORS ⅛, ¼ and ½ watt carbon film in E12 series 10 for **15p** (minimum supplied 10 of one value.)

CO-AX CABLE type UR57 75 ohm 10mm dia only 2·2dB loss >145MHz, 4·2dB 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.

PYE WESTMINSTER POWER LEADS W15 AM/FM etc, wired for positive earth, with in-line fuse holder new unused **£2.50.**

SIX-BANK PUSH BUTTON SWITCHES each bank 6 pco. Self cancelling **£1.00.**

HEWLETT PACKARD PIN DIODES type HP5082-3080 **50p** each or 4 for **£1.50.**

PYE COILS 5mm dia 10mm sq base OK for rewinding as used in all PYE R/Ts. **6p** each 10 for **50p.**

CATHODEON 1·4MHz CRYSTAL FILTER I.O. base for lower side band SSB, with base connections new unused **£4.00** each, two for **£7.00.**

MINIATURE NIXIE TUBES ITT – 5853S with left and right hand decimal point size only ½" × 7/16" nominal working voltage 170 volts DC, new unused 5 for **£2.50** 10 for **£4.50.**

DECADE COUNTER PCB made to suit the above nixie tube also takes SN7490, 7475, and 7400 ready drilled etc, **75p** each, set of 5 **£3.40.**

TRIMMER CAPACITORS 10mm dia. ceramic, 2–8pf, 3–10pf, 4–20pf, 10–40pf, all **10p** each.
7mm dia. ceramic, 3–9pf, all **10p** each.
Tubular ceramic, 1–6pf solder in type, **8p** each; **60p** for 10.
Mullard tubular ceramic 0·8–6·8pf bolt in type, **15p** each. Ceramic miniature compression P.C. mount 10–40pf, **8p** each.
Plastic semi-airspaced 2–25pf 10mm dia. **6p** each; 10 for **50p.**
Oxley airspaced 9mm sq base 1–10pf and 1–15pf, **18p** each; 2-30pf **20p** each.
Erie teflon tubular trimmers "530 series" 0·25–1·5pf 4mm dia. × 11mm, **10p** each.

10pf JACKSON TETFER TRIMMER Cat. No 5640 9mm sq base, **25p** each; also 8mm P.C. mount, **25p** each.

PLASTIC SEMI-AIRSPACED TRIMMER as used in Pye Westminsters P.A. stages 10–60pf, **15p** each.

STEREO CAR CASSETTE player amplifier boards with two amp. ICs NEC-uPC 1001 H2, some models with uPC 1025H, requires 12V D.C. 3½W per channel, removed from new equipment by manufacturer, size 120mm × 45mm, supplied with circuit, **£2.25** each.

FM RADIO FRONT END TUNER Units 88–108MHz (remove three Cs and it tunes Air Band) and 2m very high quality and stable unit with exceptional sensitivity FET RF amp. NPN mixer and separate osc. AFC and AGC inputs, works from 9–15V D.C., with circuit; new and unused BARGAIN @ **£4.00** each.

REVCO VHF AERIALS MA200 Magnetic base with ¼th 144–146MHz coil & whip approx 3dB gain **£19.00** p/p £1.00.

REVCO 144–146MHz ¼ mobile aerial **£8.50** also commercial R/T band 156–172MHz (approx 3dB gain both types) **£8.50.**

CRYSTALS OK for 2 Mtrs ie: x4 + 10·7MHz, 33·5 33·550, 33·600, 33·675, 33·700, 33·725, 33·750, 33·775, 33·800, all **£1.25** each.

SECOND CONVERSION CRYSTALS 11·170 HC6/U, 11·155 HC6/U, 11·155 HC6/U, 10·230 HC6/U & HC18/U, all **£1.75** each. 4,000MHz HC6/U **£2.00.** 7·00MHz HC6/U **£2.00.**

RF POWER TRANSISTORS

2N5070 (RCA) 30MHz SSB linear 25 watt p.e.p. output 28v stud mounting 13dB gain requires only 1·25 watt pep drive, manufacturers price about **£20.00** our price ONLY **£5.00.** New and unused with data sheet.

40081 (RCA) driver for 27MHz CB use 75m/w in 400 m/w out (12v). TO5 case, **75p** each.

2N2631 VHF driver (1 watt in @ 50MHz will give 7·5 watts out) (1 watt in @150MHz will give 3 watts out) 28v. supply. TO5 case for AM, FM, & CW use up to 150MHz. ONLY **£1.00** each.

BLY87A VHF driver/PA 8 watts output for 1 watt input @ 175MHz 9dB gain 12·5v supply. FT 700 MHz, for CW & FM use, supplied with copy of data sheet ONLY **£4.00** each.

2N5947 marked SRF1117 CATV device with an FT of 1500MHz special low price ONLY **65p** each.

BLY53A (marked FV05284) **£4.00** each.

BF224B **20p,** 3 for **50p;** BF115 **15p,** 3 for **40p;** BF152 **12p,** 3 for **30p;** BF166 **18p,** 3 for **50p;** BF180 **22p,** 3 for **55p;** BF194a **12p;** BF195 **12p;** BFY50 **15p;** BFY90 **90p,** 3 for **£2.50;** MPS918 **18p,** 3 for **45p** (plastic version 2N918); MPSA-14 **15p;** BSY52 **10p;** CIL108 **10p,** 3 for **25p** (plastic version BC108); BFR81 **15p;** (comp pair); BFT84 **15p;** ZTX107 **15p;** ZTX310 **15p;** 2G339 **15p;** BC172 **12p;** BC172a **12p;** BC172c **12p;** BSX20 **20p,** 3 for **50p.**

FETs & MOS FETs

2N3819 "N" chan. **20p;** 2N4381 "P" chan. **20p;** TIS88A "N" chan. **35p.** 3N204 mosfet **£1.10** 2·5dB noise @ 200MHz 24dB gain. (RCA).

THE GABLES, 20 BARBY LANE, HILLMORTON, RUGBY, WARWICKSHIRE CU22 5QJ

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