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RADio COMmunication

June 1987

THE RC14 – A BEGINNER'S RECEIVER FOR HOME CONSTRUCTION

Journal of the Radio Society of Great Britain

RSGB

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IC 735	*COMPACT HF TCVR*	**FRG 8800**	*GEN COV RCVR*
IC 275E	*25W 2M MULTIMODE*	**FRG 9600**	*UHF/VHF SCANNER*
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IC 02E	*2M HANDIE*	**FT 73**	*70CM HANDIE*
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ICR 7000	*UHF/VHF COMMUNICATIONS RCVR*	**FT 290 MK II**	*2M PORTABLE MULTIMODE*
IC 290D	*2M MULTIMODE MOBILE 25W*	**FT 690**	*6M PORTABLE MULTIMODE*
IC 28E	*2M MINI MOBILE TCVR*	**FT 727**	*VHF/UHF HANDIE*

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JUNE 1987

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FRONT COVER

Another RSGB home-brew project
The RC14 beginners receiver
Described in this issue by Steve Price, GW4BWE

CONTENTS

Technical articles on subjects of amateur interest are always welcome and should be sent to: The Editor, *Radio Communication*, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

All articles received are reviewed for technical merit by the RSGB Technical & Publications Committee, or an acknowledged expert on the subject, before acceptance. Payment at high competitive rates will be made for all articles published.

A contribution will only be considered for publication on the understanding that the person submitting it is the original author and owner of the whole copyright, and that on acceptance for publication such copyright will become the property of the RSGB in consideration of the above-mentioned payment by the RSGB to the contributor.

The editor will be pleased to send intending authors a manuscript preparation guide and to give any other advice and assistance requested.

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As a result of a corporate policy, the brand name "Kenwood" has been gradually introduced world-wide by Kenwood Corporation.

As from April, 1987, the Kenwood brand name will be used in the UK for all Kenwood Corporation communications products, to be sold through the existing network of authorised dealers.

Each carefully chosen dealer has the sales and service facilities to give the customer full support, and will carry the complete range of Kenwood amateur radio products, including accessories.

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Shibuyaku, Tokyo 150
Japan

Lowe Electronics Ltd.
Chesterfield Road
Matlock, Derbyshire DE4 5LE

It may be important

to other amateur radio manufacturers to offer equipment that, first and foremost, is built around an all-singing, all-dancing microprocessor. It may be that the real need of the radio amateur, to communicate with the least fuss possible, was forgotten long ago. The approach from KENWOOD has always been different. Equipment reviewers have spoken for many years of "excellent ergonomics", the ability to pick up a piece of KENWOOD equipment and operate it first time with no reference to the user's handbook.

The three new models featured on this page continue this design policy; equipment built to a high specification that are a pleasure to own and use.

the NEW handheld from KENWOOD, the TH215E

Having used a TR2600E since its introduction, I must admit I could not see how it could be greatly improved. However, by making one simple change from previous models, the TH215E 2 metre handheld has become much easier to use. On the earlier TR2500 and TR2600E two buttons had to be pressed each time a frequency in memory was required. On the TH215E a memory is selected by pressing one button. A small alteration, but one that has changed the character of the handheld and brought it even more into line with the amateur's requirements.

A rugged diecast metal case adds to the strength of the handheld. For greater flexibility the TH215E operates on DC voltages from 7.2 to 16 volts. An external power supply connection is included on the rig's top panel (use optional power cable PG2V or PG3C). Output power is dependent on voltage. Switched to its high power setting, the TH215E produces 2.5 watts at 8.4 volts. This increases to 5 watts when supply is 13.8 volts. On its low power setting the output is approximately 500 milliwatts.

Making the microcomputer work for you, as opposed to you working for the microcomputer, has resulted in a truly flexible piece of equipment. The stepping rate when using up/down frequency shift buttons can be user programmed in either 5, 10, 15, 20 or 25 kHz steps. The repeater offset can also be programmed to shift from 100 kHz to 9.900 MHz.

Length of operation has always been a problem with the handheld transceiver. The TH215E with its battery saver successfully gets over this by switching off the receiver. The actual length of time the receiver is off can be determined by the user. In addition a comprehensive range of optional nicad packs are available which will extend operation. These are the PB1 (12V, 800mAh), PB3 (7.2V, 800mAh) and the PB4 (7.2V, 1600mAh).

The TH215E has ten memories which store frequency, frequency step and whether the rig is to operate in simplex or repeater mode. Memory 1 is also used as a priority channel and memories 8 and 9 serve to define the limits of programmable scan. There are three modes of frequency scan, band, memory and programmable. The receiver also has three stop/resume scanning modes. These are seek (where the scan instruction is cancelled once a signal is found), time (where the set holds on an occupied channel for approximately 5 seconds) and carrier (where the scan is held until the carrier drops.)

The transceiver also has reverse repeater, an illuminated display for night operation, priority channel operation so that an expected call is not missed, a lock which disables either transmit or keypad functions and an indicator which tells that the battery voltage has fallen below the level for good communications.

The KENWOOD TH215E comes complete with PB2 nicad (8.4V, 500mAh), nicad charger and helical aerial.

TH215E "2 metre hand held" £258.00 inc VAT carriage £7.00

the NEW TM221E common sense in a high power mobile

telephone and ask us why.

£334.60 inc VAT carr. £7.00

and TW4100E.

The NEW TW4100E dual band (2 metres and 70 centimetres) FM mobile transceiver follows on from the well-known TW4000A. Producing 45 watts on 2 metres and 35 watts on 70 centimetres the transceiver is 150 mm wide, 200 mm deep and 50 mm high. Unlike its predecessor, the TW4100E has full duplex facilities (you can transmit on 2 metres whilst, at the same time, receiving on 70 centimetres or vice versa).

£766.37 inc VAT carr. £7.00

All prices subject to confirmation

LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995.

send £1 for complete mail order catalogue.

station accessories

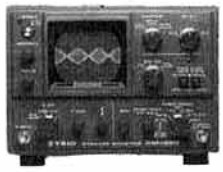
TL922 HF amateur band linear amplifier

The TL922 is a class AB2 grounded grid linear amplifier using two high performance EIMAC 3-500Z tubes. It covers 160 to 10 metres for SSB, CW and RTTY modes of operation. Engineering perfection, those who have seen a TL922 will know what I mean. It is one of the few items of amateur radio equipment which is truly hand built by a specialist engineer.

TL922 inc tubes . . . **£1495.00** inc VAT, carriage £7.00

SM220 station monitor

Based on a wide frequency range oscilloscope, the SM220 station monitor features in combination with a built-in two-tone generator, a wide variety of waveform observing capabilities. The SM220 aids efficient station operation as it monitors transmitted waveforms and it also serves as a sensitive wide frequency range oscilloscope for various adjustments and experiments. When fitted with the optional BS8 panoramic display and connected to one of the following transceivers (TS940, TS830, TS180, TS820 series) signal conditions in the vicinity of the receive frequency can be seen over a 40 or 200KHz range.



SM220 . . . £362.00 inc VAT, carriage £7.00
BS8 . . . £81.22 inc VAT, carriage £1.50

amateur band transceivers

TS830S HF amateur bands transceiver

Needing no description, the KENWOOD TS830S, which uses a pair of 6146B valves in the PA, is well known on the amateur bands (160 to 10 metres) for it superb signal quality. Modes of operation are USB, LSB and CW. Having variable bandwidth tuning, If notch, IF shift and provision for various filters, its receive performance is excellent too.

TS830S . . . £1095.00 inc VAT, carriage £7.00

TS530SP HF amateur bands transceiver

An HF amateur bands (160 to 10 metres) valve transceiver without frills but providing today's amateur with all the necessary facilities for reliable worldwide communications. Modes of operation are USB, LSB and CW.

TS530SP . . . £895.00 inc VAT, carriage £7.00

send for the KENWOOD detailed leaflet

amateur band plus general coverage transceivers

TS940S HF transceiver with general coverage receiver.

Top of the range, the TS940S has every operating feature that the discerning HF operator needs. Amateur bands from 160 to 10 metres plus a general coverage receiver tuning from 150 kHz to 30 MHz. Modes of operation are USB, LSB, CS, AM, FSK and FM. Forty memory channels, each effectively a separate VFO and easy keyboard frequency entry make operation and ownership of the KENWOOD TS940S a pleasure.

TS940S . . . £1995.00 inc VAT, carriage £7.00

TS930S HF transceiver with general coverage receiver

Much has been said and written about the ST930S and it now has a place high in the affection of radio amateurs. Modes of aperation are USB, LSB, CW, AM and FSK. Providing full coverage of the amateur bands from 160 to 10 metres and including a general coverage receiver tuning from 150 kHz to 30 MHz, the KENWOOD TS930S is the ideal rig for today's crowded bands.

TS930S . . . £1750.00 inc VAT, carriage £7.00

TS440S HF transceiver with general coverage receiver

A step forward in compact HF equipment, the TS440S covers the amateur bands from 160 to 10 metres and is also a general coverage receiver tuning from 100 kHz to 30 MHz. It has keyboard frequency entry, full and semi break-in on CW, one hundred memories and provision for fitting an internal ATU. Modes of operation are USB, LSB, AM, FM and AFSK.

TS440S . . . £1195.00 inc VAT, carriage £7.00

TS430S HF transceiver with general coverage receiver

A compact HF transceiver suitable for mobile or portable operation, yet having all the facilities necessary for effective radio communication. The TS430S covers the amateur bands from 160 to 10 metres and is a general coverage receiver tuning from 100 kHz to 30 MHz. Modes of operation are USB, LSB, CW, AM with FM optional.

TS430S . . . £995.00 inc VAT, carriage £7.00

All prices subject to confirmation

LOWE ELECTRONICS LTD.

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Telephone 0629 2817, 2430, 4057, 4995.

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AR2002 interface.

AR2002

RC PACK

Now available for the AR2002 is an RS232 interface (RC PACK) which consists of an 8 bit CPU with its own ROM and RAM.

Designed to be connected directly to the AR2002 or with an additional adapter to the AR 2001, the RC PACK gives two methods of controlling the receiver.

Using the internal software and with your own computer acting as a dumb terminal, the RC PACK provides 50 memory channels, 10 search bands, selectable up/down steps and adjustable delay times etc. You can also assign station descriptions to each listed memory.

If you wish to write your own programs using the RC PACK as an interface then "the sky's the limit".

For those who own a BBC computer we have designed an additional control system which is available in ROM.

The RS232 settings of the interface are 8 bit, no parity, 1 stop bit and either 2400, 4800 or 9600 baud (internally switchable).

AR2002.....**£487.30** inc VAT carriage £7.00
RC Pack.....**£255.63** inc VAT carriage £7.00
ARPROM (BBC).....**£10.00** inc VAT carriage £1.00

DAIWA meters.

CN410M. . .3.5 to 150 MHz, forward 15/150 W, reflected 5/50 W, SO239 connectors. . .**£61.72 inc vat.** carriage £1.50.

CN460M. . .140 to 450 MHz, forward 15/150 W, reflected 5/50 W, SO239 connectors. . .**£65.40 inc vat.** carriage £1.50.

NS448 with remote head. . .900 to 1300 MHz, forward 5/60 W, reflected 1.6/6.6 W, N type connections. . .**£86.60 inc vat.** carriage £2.50.

NS660P with switchable meter reading (average, normal PEP and hold PEP) and provision for optional remote head (U66V), 1.8 to 150 MHz, forward 15/150/1500 W, SO239 connectors. . .**£115.00 inc vat.** carriage £2.50.

U66V remote head. 140/525 MHz, max 300 W, N type connectors. . .**£55.27 inc vat.** carriage £1.50.

SC20 extension cable for U66V, approx 20 metres long . . . **£29.21 inc VAT,** carriage £1.50.

CN410M

NS660P

NS448

CN460M

data communications equipment.

CD600. . .RTTY, CW, ASCII, TOR, AMTOR decoder, output for UHF television, monitor and printer, can also be used as morse tutor. . .**£215.14 inc vat,** carriage £7.00.

CD670. . .A higher specification RTTY, CW, ASCII, TOR, AMTOR decoder complete with liquid crystal dot matrix display, variable RTTY shift, normal/reverse mode switch, outputs for TV, monitor and printer and can also be used as morse tutor. . .**£327.77 inc vat,** carriage £7.00.

CD660. . .Similar to the CD670 but without the built-in display. . .**£264.97 inc vat,** carriage £7.00.

LOWE RADIO EVENING IN TELFORD.

On Wednesday, 17th of June, meeting at 7.30 for a prompt 8pm start, LOWE ELECTRONICS have booked the functions room of the CHARLTON ARMS HOTEL, Church Street, Wellington, Telford, Shropshire for a radio evening. Two talks are planned, John Wilson G3PCY, technical director of LOWE ELECTRONICS will speak on "REMINISCENCES OF A RADIO AMATEUR" and John Thorpe on "THE DESIGN AND DEVELOPMENT OF THE HF125 SHORTWAVE RECEIVER". For those who don't know, this is a new receiver (30 kHz to 30 MHz, £375.00 inc VAT) designed by John Thorpe and being built in the UK by LOWE ELECTRONICS.

A cup of coffee and a biscuit will be available FREE OF CHARGE to the first 50 people to arrive and before, between and after the lectures a bar at the back of the room will be open. The latest models from KENWOOD plus the HF125 receiver will also be on view.

In order to navigate the Wellington town centre one-way system a knowledgeable talk-in station has been arranged which will operate on two metres (channel S22) from 7.00pm.

It promises to be an excellent evening. **Please don't miss it!**

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Thanet Electronics is dead

LONG LIVE ICOM (UK) LTD.

As from the 16th march 1987 Thanet Electronics Ltd have been trading under the new banner of ICOM (UK) LTD.

Nothing else has changed, still top quality ICOM equipment and service from one of the UK's leading Amateur radio importers.

ICOM

Communications

THE HOTTEST ITEMS THIS SUMMER

VHF/UHF FM Handportables
If you want a handheld with exceptional features quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM range of FM tranceivers, all ICOM handportables come with a nicad battery pack, AC wall charger, flexible antenna and wrist strap.

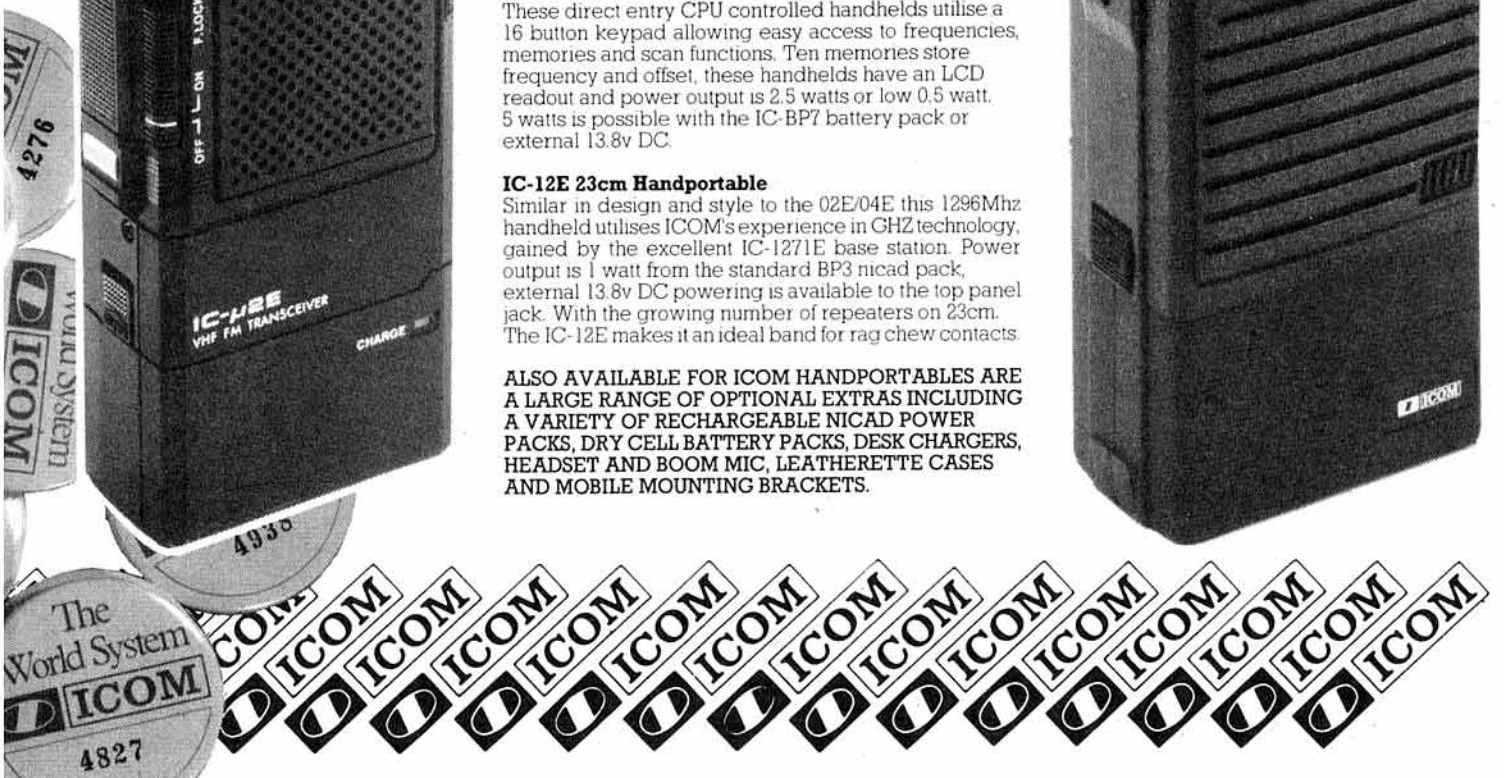
Micro 2E/4E
These new micro-sized 2 metre and 70 centimetre handportables give the performance and reliability you've come to expect from ICOM.
Measuring only 148 x 50 x 30 the Micro fits in your pocket as easily as a cassette tape. The Micro 2E/4E features an up/down tuning system for quick frequency adjustments, 10 programmable memories, a top panel LCD readout, up to 2.5 watts of output (optional).

IC-2E 2 metre Thumbwheel Handportable
This popular handheld from ICOM is still available.
For those amateurs who require a straightforward and effective FM transceiver the IC-2E takes some beating. Frequency selection is by means of thumbwheel switches (with 5Khz up switch) simplex or duplex facility. Power output is 1.5 watts or low 150 milliwatts (2.5 watts possible with BP5A battery pack).

IC-02E/04E 2 metre and 70cm Keypad Handportable
These direct entry CPU controlled handhelds utilise a 16 button keypad allowing easy access to frequencies, memories and scan functions. Ten memories store frequency and offset, these handhelds have an LCD readout and power output is 2.5 watts or low 0.5 watt. 5 watts is possible with the IC-BP7 battery pack or external 13.8v DC.

IC-12E 23cm Handportable
Similar in design and style to the 02E/04E this 1296Mhz handheld utilises ICOM's experience in GHZ technology, gained by the excellent IC-1271E base station. Power output is 1 watt from the standard BP3 nicad pack, external 13.8v DC powering is available to the top panel jack. With the growing number of repeaters on 23cm. The IC-12E makes it an ideal band for rag chew contacts.

ALSO AVAILABLE FOR ICOM HANDPORTABLES ARE A LARGE RANGE OF OPTIONAL EXTRAS INCLUDING A VARIETY OF RECHARGEABLE NICAD POWER PACKS, DRY CELL BATTERY PACKS, DESK CHARGERS, HEADSET AND BOOM MIC, LEATHERETTE CASES AND MOBILE MOUNTING BRACKETS.



ICOM

Communications

IC-275E/475E 25 Watt 2 metre/70 cm. Multimode Transceivers.

Tech Talk from ICOM: **THE EXCITEMENT OF SATELLITE COMMUNICATIONS**

An ever increasing number of radio amateurs are joining the excitement of Phase 111 – type satellite communications. This new medium combines the communications range of the 20 and 80 metre bands with the line-of-sight reliability of 2 metres. It's equivalent to a totally new band, and a vast technical background is not necessary for enjoying the action.

ICOM is able to help you enjoy the fascinating new capabilities of OSCAR and future amateur satellites. Its all mode 2 metre and 70cm base transceivers bring the operating conveniences of low band units to the VHF and UHF amateur bands. They can be used for local FM operations via repeaters or for SSB/CW communications via Phase 111 satellites. The IC-1271E all mode 23cm transceiver is in a class of its own, providing mode L satellite uplink capability. (Mode L: 1269MHz uplink, 436 downlink) (Mode U: 435 uplink 145 downlink).

Satellite relayed signals are somewhat weak in nature and the IC-275E's low noise/high sensitivity receiver gives the highest performance for hearing everyone regardless of their uplink performance. The noise blanker prevents pulse type electrical interference from masking desired DX signals, the selectable AGC can follow fast fades associated with spin modulation. There are also the 99 mode memories which can be used for inter-mixed FM repeater and SSB/CW operators. When the IC-275E is equipped with the optional mast mounted AG25 GaAsFET pre-amp, it becomes a satellite operations dream come true.

ICOM's IC-475E 70cms transceiver has a front panel continuously adjustable power output to allow for daily signal variations. This overcomes the practice of overloading a satellites on-board receiver. The IC-475E also includes 99 all mode memories for the ultimate in operation flexibility.

Using the ICOM CT16 satellite communications interface these base stations will track together via the ICOM CI-V system. If you are interested in joining todays most excitement era of amateur communications, ie, OSCAR and future Phase 111 satellites, ICOM is the logical choice for top performance equipment.

ICOM

Communications

CLASS B's and 6 metres.

During the R.S.G.B. National Amateur Radio Convention at the Birmingham N.E.C. Mr John Butcher MP, Parliamentry Under-secretary of State for Industry made reference to Class B licences operation on all bands above 30MHz. ICOM have available multimode equipment for the 6 metre band.

IC-505 50MHz Transceiver

This SSB,CW,FM (Optional) transceiver features dual V.F.O.'s and 6 channel memories with scanning facilities. The IC-505 accepts standard dry cell batteries, rechargeable nicad battery pack or 13.8v DC external P.S.U. Power output is 10 watts at 13.8v, 3 watts when used with internal batteries. 0.5 watts LOW. Options include EX248 FM unit.

IC-551/551D 50MHz Base Station

These multimode base stations cover 50-54MHz with 10 watt (80 watts IC-551D) R.F. power output. The IC-551 has an internal A.C. power supply unit and options include EX106 FM unit. EX107 Vox unit, EX108 Pass Band Tune unit.

The IC-551D requires an external power source such as the IC-PS15 20A P.S.U. the EX106 FM unit's optional. With this model the VOX and PBT units are installed as standard.

ICOM 70cm Promotion

Due to our new range of equipment we are able to offer the following equipment only while stocks last.

ICOM IC-471E	25 watt Multimode Base Station	£650.00
ICOM IC-471H	75 watt Multimode Base Station	£759.00
ICOM IC-47E	25 watt FM Mobile	£349.00
ICOM IC-U12	12 Channel 450-460 MHz Handportable, uses existing ICOM handheld accessories, details on how to get onto 70cms provided. Supplied as radio body only	£115.00

For further information on these or any other ICOM products. Contact your local ICOM dealer or ICOM (UK) LIMITED.

Telephone us free-of-charge on:

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Mon-Fri 09.00-13.00 and 1400-17.30

This is strictly a helpline for obtaining information about or ordering ICOM equipment. We regret this service cannot be used by dealers or for repair enquiries and parts orders. Thank you.

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YAESU

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FT 757 GX MARK 2

£969

BRAND NEW!!

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MH IB 8
Handy Scanning Mike

FC 757 AT
Auto Antenna Tuner

FL 7000
500w QSK HF Linear

FP 757 Series Regulated Power Supply

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This superb compact 13.4V, triple CPU—HF multimode transceiver now incorporates the latest state-of-the-art advances

* Operator selectable mode dependent tuning steps
* Ten memory channels (storing mode *and* frequency)
* Auto resume loop scanning
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* Clarifier memory
* Improved CAT System
* 40dB IF Notch filter
* AF speech processor
* Duct flow cooling
* Adjustable IF shift
* Switchable RF Amplifier & 20dB attenuater
* Adjustable noise-blanking pulse width
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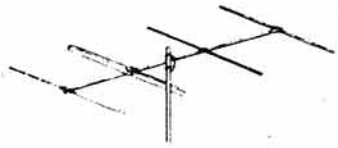

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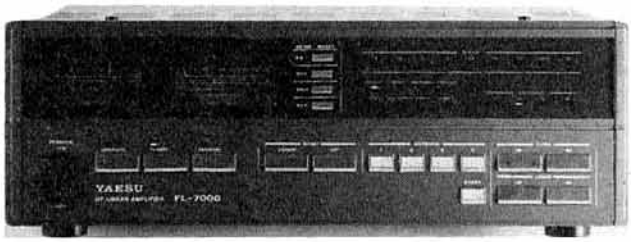

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NEW

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TM421E	70cms FM Mobile 35W	372.00	(4.00)
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TH415E	70cms Handheld Transceiver with keypad	315.00	(4.00)
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FT709RH	70cm H/Held	319.00	(—)
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SB2	PTT switch Box 290/790	18.00	(1.00)
SB10	PTT switch Box 270/2700	21.00	(1.00)
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NC26	Charger for FT290RMKII	11.00	(2.00)
FEX767-2	2m module for FT767	169.00	(3.00)
FEX767-6	6m module for FT767	169.00	(3.00)
FEX767-70	70cms module for FT767	215.00	(3.00)
FNB9	7.2V 200mAh nicad pack for FT23/73	23.00	(2.00)
FNB10	7.2V 600mAh nicad pack for FT23/73	25.50	(2.00)
FNB11	12V 600mAh nicad pack for FT23/73	42.00	(2.00)
FBA9	Dry cell battery case for 6 AAA-size cells	8.00	(1.50)
FBA10	Dry cell battery case for 6 AA-size cells	8.00	(1.50)
NC28C	Charger for FNB10	11.00	(2.00)
NC29	Desktop Quick charger for FNB9/10/11	49.00	(3.00)
PA6	Mobile DC adapter/charger for FNB9/10	14.50	(2.00)

Second hand List

Trio TS780 2M and 70cms Base Station, 10W output, box, mic and manuals	699.00	(10.00)
Yaesu FT101Z HF Transceiver 160-10M. C/w Box, Manual and Mic	399.00	(10.00)
Adonis AM503G compressor mic, fitted with 8 pin Trio plug	49.00	(3.00)
Yaesu FT209RH 2m handheld C/w charger, case, nicad and empty battery case (AS NEW)	268.00	(3.00)
FDK 750X 10w 2m Multimode transceiver. C/w Box, Manual, Mic and mobile bracket	260.00	(4.00)
Icom IC02E 2m handheld. C/w case, nicad, charger, headset and PTT box, BP4 empty battery case, mobile mount and manual (VGC)	260.00	(3.00)
Icom IC04E 70cms handheld. C/w case, nicad, spare nicad, charger, speaker mic, BP4 battery case with nicads, box and manual (VGC)	260.00	(3.00)
Trio TR9500 10w 70cms multimode transceiver. C/w BO9 base plinth, Box, manual, mic and mobile mount (Excellent condition)	450.00	(5.00)
Yaesu FT902DM 160-10M HF Transceiver, with mic and manual	550.00	(10.00)
Trio TS930S including AT930 auto Antenna Tuner, general coverage Transceiver. C/W box and manual. VGC	1399.00	(10.00)
Micro 7 70cms 3 Channel Handheld Transceiver	75.00	(5.00)
Microwave Modules MMT144/28 10-2M Transverter, 10W output	89.95	(4.00)
Yaesu FT209RH 2M Handheld, with Charger (Demo Model)	260.00	(4.00)
Datong PC1 General Coverage Converter. Adds 50KHz-30MHz to any 2M Receiver	95.00	(4.00)
Trio TH41E 70cms Handheld. C/W Charger, nicad, PB21H high capacity nicad and speaker mic	169.00	(4.00)
Icom IC-28H 2M 45W FM Mobile Transceiver. C/W box, manual and accessories. (AS NEW)	269.00	(5.00)
Standard C8900 2M 10W Mobile Transceiver. C/W box, manual and accessories. VGC	175.00	(5.00)
Microwave Modules MMT144/28R 10-2M 25W Transverter C/W box and manual. (AS NEW)	175.00	(5.00)
Trio SW100B SWR/Power Meter, 140-450MHz coverage	35.00	(3.00)

(All second hand goods carry 3 months warranty)

Icom

IC751A	HF Transceiver	1465.00	(—)
IC735	New HF Transceiver	949.00	(—)
PS15	P.S. Unit	158.00	(4.00)
PS30	Systems p.s.u. 25A	343.85	(—)
SM6	Base microphone for 751/745	46.00	(1.00)
IC290D	2M 25W M/Mode	542.00	(—)
IC490E	70cms 10W Multimode	617.00	(5.00)
IC02E	2M H/Held	299.00	(—)
IC04F	70cm handheld	299.00	(—)
BC35	Base Charger	70.15	(1.00)
HM9	Speaker mic	21.85	(1.00)
BP3	Std Battery Pack	29.90	(1.00)
BP5	High Power Battery Pack	60.95	(1.00)
BP4	Empty battery pack	9.20	(1.50)
CP1	Car Charging Lead	6.90	(1.00)
DC1	12V Adaptor	17.25	(1.00)
IC3200	2M/70cm Mobile Transceiver	556.00	(—)
NEW			
IC761	HF General Coverage Transceiver with built-in PSU and Auto ATU	2400.00	(7.00)
IC48E	10W 70cms FM Mobile	449.00	(3.00)
IC28E	24W FM mobile (Tiny)	359.00	(3.00)
IC28H	45W FM mobile (Tiny)	399.00	(3.00)
IC-Micro	2 mini hand portable LCD display 1W	239.00	(3.00)
IC275E	25W 2M Multimode Base	1039.00	(7.00)

Switches

Sigma	2 way SO239	20.20	(1.50)
Sigma	2 way 'n' Skts	22.95	(1.50)
Welz CH20A	2 way SO239	30.75	(1.50)
Welz CH20N	2 way 'n' Skts	54.00	(1.50)
Drae	3 way SO239	15.40	(1.50)
Drae	3 way 'n' Skts	19.90	(1.50)

Power Supplies

DRAE			BNOS		
4amp	40.50	(3.00)	6 amp	75.00	(4.00)
6 amp	63.00	(3.00)	12 amp	125.00	(5.00)
12 amp	86.50	(3.00)	25 amp	185.00	(5.00)
24 amp	125.00	(4.00)	40 amp	385.00	(10.00)

Aerial Rotators

DAIWA MR750E	Heavy duty rotator. Can have up to 4 motors	254.10	(4.00)
KR400	Med/H Duty	139.00	(4.00)
KR500	6 core Elevation	149.95	(4.00)
KR400RC	5 core Medium Duty	169.00	(4.00)
KR600RC	6 core Heavy Duty	219.00	(4.00)
KC038	Lower mast clamps	17.45	(2.00)
KS065	Rotary Bearing	26.00	(2.50)
AR1002	Lightweight VHF Rotator	52.95	(3.50)

CW/RTTY/Equipment

			P&P
BENCHER			
BY1	Squeeze Key. Black base	67.42	(2.00)
BY2	Squeeze Key. Chrome base	76.97	(2.00)
HI-MOUND MORSE KEYS			
HK708	Straight Key	21.50	(2.50)
HK707	Deluxe version of above on Marble Base	42.50	(3.00)
HK706	Straight key	23.00	(2.50)
HK707	Straight key	22.25	(2.50)
MK704	Squeeze paddle	20.00	(2.50)
MK705	Squeeze paddle on Marble Base	32.20	(3.00)
NEW			
RTTY EQUIPMENT			
PK-232	Packet, Amtor, RTTY, CW, ASCII transceive in one unit. Works with any computer equipped with an RS232 interface. 12V operated	269.95	(3.50)
FAX-1	NEW HF Fax receiver. Obtain weather maps, press photographs and satellite cloud cover detail on any Epson FX-80 compatible printer. 12V operated	279.95	(3.50)
AMT-2	Terminal Unit RTTY/AMTOR/ASCII/CW	245.00	(3.00)
AMT-2/CBM64	Software for the above for the Commodore 64	51.75	(2.50)
AMT-2/VIC20	Software for the above for the Commodore VIC 20	51.75	(2.50)
AMT-2/BBC B	Software for the above for the BEC B	44.85	(2.50)
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Star Master Key	Electronic Keyer	54.70	(3.00)
NEW Star	Masterkey electronics CMOS Memory keyer	95.00	(3.00)
TRX3	Morse Oscillator	13.65	(1.50)
Datong	070 Morse Tutor	56.50	(2.50)

Receivers

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HF125	General coverage receiver. British made 30KHz to 30Mhz continuous coverage receiver. AM, USB, LSB, and CW. FM and Synchronous AM (option)	375.00	(5.00)
NEW			
Trio R5000	General coverage receiver. 100Khz to 30MHz plus 108-174Mhz with optional VC20 VHF converter	895.00	(5.00)
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Yaesu FRG8800	General coverage receiver	639.00	(5.00)
Yaesu FRV8800	VHF converter for FRG8800 118-175MHz	100.00	(3.00)
Icom ICR71E	General coverage receiver	825.00	(5.00)
Icom ICR7000	Scanner 25-2000MHz all modes	957.00	(5.00)
Yaesu FRG9600	Scanner 60-950MHz	525.00	(5.00)
AR2002	Scanner 25-550Mhz and 800-1300Mhz AM and FM	487.00	(5.00)
R537S	Air Band Portable Tunable 118-136MHz plus crystal control	69.51	(3.00)
R532	Synthesised Airband Receiver 110-139 995MHz	224.05	(5.00)
KX3	Receiver Aerial Tuner Unit	67.28	(4.00)

Aerials

JAYBEAM			
2 metre antennas			
LR1/2M	Omnidirectional vertical colinear	35.71	(4.00)
LW5/2M	5 element folded dipole yagi	17.31	(4.00)
LW8/2M	8 element folded dipole yagi	21.85	(4.00)
LW10/2M	10 element folded dipole yagi	28.23	(5.00)
LW16/2M	16 element folded dipole yagi	42.45	(7.50)
PBM14/2M	14 element Parabeam	58.08	(7.50)
5XY/2M	Crossed 5 element yagi	33.41	(7.50)
8XY/2M	Crossed 8 element yagi	43.01	(7.50)
10XY/2M	Crossed 10 element yagi	53.95	(11.00)
70cms antennas			
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MBM48/70cm	48 element Multibeam yagi	42.44	(5.00)
MBM88/70cm	88 element Multibeam yagi	57.96	(7.50)
PBM24/70cm	24 element Parabeam long yagi	51.41	(7.50)
	12 element 2L special for 2M	25.00	(3.00)
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1-1 & 4-1	Baluns	12.95	(2.00)
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Dipole	Centrepieces	2.25	(0.50)
Copper wire	50M rolls hard drawn	7.95	(2.50)
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	Telescopic whip for above coils	6.10	(2.00)
	Basemount single hole fixing with 5M of coax	8.75	(2.00)
	Flexiwhip 10M antenna mobile	28.50	(3.00)
	Coils for above for 15/20/40/80/160M	8.75	(2.00)
	Multiselect 86 10/15/20M mobile auto selecting antenna	39.85	(3.00)
	Coils for above for 40/80/160M	8.75	(2.00)
	Telescopic whip for above coils	6.10	(2.00)
	Extendarod for fixed use with above aerials, improves LF band performance	15.40	(2.00)
	PL259 base loaded single band mobile aerials for 10/15/20/40	19.00	(2.00)
	PL259 base loaded single band mobile aerials for 80/160M (Above PL259 aerials will fit on normal SO239 mag mounts or SO239 gutter mounts)	20.20	(2.00)
BOOKS	Confidential Frequency List (NEW Edition)	5.95	(0.75)
	Air Traffic Radio	2.25	(0.75)
	NEW VHF/UHF airband frequency guide	5.95	(0.75)
	VHF/UHF airband frequency list	3.95	(0.75)
	The Complete guide to VHF/UHF frequencies 25-2000MHz (NEW)	4.95	(0.75)
	World RTTY HF Frequency list	3.95	(0.75)
	The International VHF FM guide	2.00	(0.75)
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THE NATIONAL SOCIETY WHICH REPRESENTS UK RADIO AMATEURS

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PATRON: HRH PRINCE PHILIP, DUKE OF EDINBURGH, KG

Membership is open to all those with an active interest in radio experimentation and communication as a hobby. Applications for membership should be made to the secretary, from whom full details of Society services may also be obtained.

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TWO NEW AMATEUR BANDS

It is not every day that the Society wins 2·5MHz worth of two new amateur bands for all Class B licensees in a prime part of the spectrum. It is not every day that the Society wins over 1·5MHz of new spectrum space for Class A licensees. It is not every day that the work of the Society to protect and expand the facilities of the amateur service pays off in such a spectacular way; but when it does, the value of being a member of the RSGB must be self-evident. The fact that the RSGB is not just a good magazine and a QSL Bureau must be abundantly clear and worthy of loud trumpet blowing.

The marvellous news is quite simply that from 1 June 1987 the 50 and 70MHz bands will expand and both bands will become available to Class B licensees for the very first time. A very special day which must finally lay to rest the false assertion that the Society does nothing for the Class B licensee—the very licence it helped to create in the first place. What is more, the status of the 70MHz band will be enhanced to secondary, thus being a guide to its long-term availability to the UK amateur service. This month's *News Bulletin* carries the full details of these new allocations.

The pressure on the radio frequency spectrum from the multitude of other users is constantly increasing, but we must regard these new allocations as a vote of confidence in amateur radio by the UK Government. We have to thank the Under Secretary of State for Trade & Industry, John Butcher, MP, and his team at the Radiocommunications Division of the DTI for making the right decisions at the right time.

What do these new allocations really mean? In our cities and urban areas the 144MHz band is heavily occupied and perennially busy. One of the very attractive consequences of the new allocations is that many amateurs will want to think seriously about moving away from the 144MHz band to the new bands where there will be less congestion. Both the 50 and 70MHz bands are ideal for regular club and local nets, and now, of course, Class B amateurs will be able to join in on these new bands. Another part of the answer is that UK manufacturers and retailers will have new sales and marketing opportunities which the Society hopes they will be quick to take up for the good of UK Ltd.

What is really important is that now, thanks to the RSGB and the DTI, every UK radio amateur has new opportunities for joining in the fun and challenges presented by these newly-won allocations—go for it and let's see you there.

David Evans, G3OUF

Members' Mailbag

THE EDITOR,
RADIO COMMUNICATION,
LAMBDA HOUSE,
CRANBORNE ROAD,
POTTERS BAR, EN6 3JE

The views expressed in published correspondence are not necessarily those of the RSGB, and readers are urged to verify independently any factual statements on which they may wish to rely as it cannot be guaranteed that such statements are correct.

TAKING AN ACTIVE INTEREST

Sir—I would like to say how much I enjoyed attending my first agm of the RSGB, although I was a little disappointed to discover that out of 37,000 members, only some 172 attended the meeting. I know it is a little difficult and rather expensive for some people to travel to the IEE in London, so perhaps it would be possible for some agms to be held in other parts of the UK occasionally.

I have been a member of the Society for some three years now, and would like to play some part in its day-to-day activities, such as being an area representative. I am hoping to attend as many agms and egms as possible in the future, and I am sure they will all be as enjoyable as the first. If more people did something constructive to help in the running of the Society, instead of trying to pull it to pieces, then I am sure our hobby would be better for it.

D Vickers, G4SEQ

TOMORROW'S WORLD?

Sir—I don't normally read the ads for black boxes (can't afford 'em!) but in your January issue I did peruse the Amcomm-ARE blurb on the new Yaesu FT767GX. Whatever has happened to *amateur* radio? It apears that one needs to attend a course of instruction on the purpose of the 71 buttons, switches, knobs, plugs or controls on the front panel, and 25 more on the back. The mind boggles! Ninety-six operations to master before use! My older Yaesu rig has but 16 switches, knobs, plugs or controls (no buttons) and they are quite enough to keep me happy.

I suppose that, having purchased an FT767GX and a computer with associated accessories, one will be able to connect them all together, switch on and go out to work, or for a day's golf. On returning there will be a record printed of the DXCC which one's robots have accomplished, with QSLs printed and ready to send. Now that's really something to look forward to; much more exciting than manually searching the bands, speaking into a microphone or pounding a key!

Long live the "kiss" brigade!

Walter Farrar, G3ESP, G-QRP-C 2857

Do other members feel the same?

VHF SPORADIC-E PROJECT

Sir—As chairman of the Propagation Studies Committee, may I use "Members' Mailbox" to convey our thanks to all who contributed reports to our vhf sporadic-E project. We were particularly appreciative of those who covered several years in their summaries, of those who had clearly taken the trouble to drum up additional support from their friends, and of support from operators living abroad—many of them Norwegian.

I wish that I could continue by reporting what a tremendous success the project has been. Unfortunately I must confess that the level of returns was well below that which had been expected. About 10,000 forms went out, including periodic dispatches to the 600 plus groups and clubs affiliated to the RSGB; of those, less than 10 per cent found their way back, a quantity that provides too unrepresentative a basis on which to build up a meaningful interim report on the frequency of occurrence and scale of the phenomenon over the period of the project.

All is not lost, however. All reports have been sent on to F8SH, who is the IARU co-ordinator for vhf sporadic-E in Region 1, for inclusion in his computer database, where they will ultimately be used in the most comprehensive and detailed analysis ever undertaken on this contentious subject.

To those who intended to help but never quite got around to it, may I conclude by adding that it is not too late to contribute, even now. There must be several thousand blank forms out there somewhere, and F8SH will be delighted to make use of any that can be returned with further information on them. Send them, please, direct to Serge Canivenc, F8SH, 6 rue de Pont Hélé, 22700 Perros-Guirec, France. My thanks, in anticipation.

Ray Flavell, G3LTP.

PROBLEMS WITH PACKET

Sir—After all those articles in the magazines about the magic's, it now becomes obvious that there are limits too. Surely this should have been foreseen by the experts?

Ian Wade, G3NRW, advocates higher speeds. I don't think that will help. Higher speeds will be offset by more corrupted bits, ie more repetitions.

The cure in my opinion would be to abandon the 100 per cent error freedom and replace it by a more tolerant, ie more intelligent, system allowing for, say, 10 per cent errors. Surely this would no longer be good enough for data transmission but it would still be good enough for communication. That's what we normally want.

With packet, rarely any message would have gone through the telegraph-line between Britain and India in the old days.

Hans Kreuzer, DL1AN

Any comments from the UK packet fraternity?

A NEW LEASE OF LIFE

Sir—I would like to take this opportunity to express my gratitude to all who have helped me through a very difficult period to reach the final goal of obtaining my "A" licence. In the period of learning the morse code, I suffered four heart attacks and had to have heart surgery. This meant considerable breaks in my practice.

Tutors and colleagues of my local radio club, friends on 144MHz and the RSGB slow morse stations all gave much of their time. The examiner's fair and relaxing attitude helped with the nerves during the test. And, finally, the medical profession gave me a new lease of life to enjoy amateur radio.

I thank you all.

P Humphreys, G0HAI, ex G6YMR

AMTOR STANDARDS

Sir—Please may I make a plea for better observance of technical standards by Amtor stations? My copy of CCIR 476, though not the most recent one, specifies 170Hz frequency shift, but I observe a number of stations adopting a rival value of 200Hz. There are many commercially-made transceivers having an i.f cw filter too narrow to accept the wider (200Hz) shift, and many operators also have terminal units designed specifically for the more widely accepted 170Hz.

To introduce yet another unnecessary value of shift—I will not refer to it as a standard—is, to my mind, irresponsible.

G C Bagley, G3FHL.

TECHNICAL FEEDBACK

Sir—Pat Hawker's comments in your January issue regarding the increasing complexity of modern gear raises a question about repair when it goes wrong. How does one know when it's right? Equipment reviews in this and other journals show that faulty units are by no means unknown, and how the average amateur is to detect those faults, other than the blatant, is beyond me. However, I fear G3VA is right in his last sentence on the subject; that by and large amateur radio is no longer a technical hobby but, like hi-fi and photography, a vogue activity supported by ever-changing consumer (semi) durables.

Turning to Derek Guy's simple swr meter (page 26), may I caution against believing swr values based on the indicated readings. The basic problem is the very low current flowing in the sensing circuit, particularly at maximum sensitivity, which results in the diodes working in the non-linear region of their characteristics. An apparent 3:1 ratio (50 per cent voltage indicated) being more likely about 10:1. The situation may be significantly improved by biasing the diodes "in" via a standing current, as my article: "An improved swr meter circuit" (*SWM*, November 1982) details.

J W Barker, G3WAL.

ARISING FROM THE MINUTES . . .

Sir—Like many other members of the RSGB (known in these parts as the Royal Surrey Gas Board) I am becoming increasingly concerned at some of the antics reported in *Radio Communication*. How you can expect to attract new members after reading the report of the last annual general meeting is beyond my comprehension.

What sort of chairman allows "unidentified speakers" to have their say? I am sure that members will want to know the identity of speakers and an assurance that they are, in fact, paid-up members in good standing.

I note, too, that a non-member, Mr I Abel, G3ZHI, had rather a lot to say for himself and/or Mr F Pickersgill, G3XXN, for whom he claimed to be acting as proxy. Mr Pickersgill may have good reason not to appear himself and appoint a proxy, but I find it strange that we tolerate a proxy who is not a member of the Society. If Mr Abel is so interested in the Society as to travel to London for the agm and speak as he did, then he should consider applying for membership.

The chief executive is always asking us to recruit new members, so here is a golden opportunity for "our David" to set an example by recruiting Mr Abel as soon as possible.

Lynn Millard (Mr), G8LWK

Sir—Having read the minutes of the Society's annual general meeting, I feel that congratulations are in order to the writer for such a well-presented report. I cannot help wondering whether he made copious notes at the time or borrowed Mr Abel's tape recording of the proceedings to refresh his memory afterwards!

I am convinced that it would have been a sad day for the Society if the proposals to restrict further the activities of new members had been carried. As was pointed out, the fact that such persons are new members of the RSGB does not mean that they are necessarily new to the hobby or naïve in business matters. (I personally have only recently joined the RSGB but have been an active swl for more than 30 years.) At the same time, it cannot be automatically assumed that young persons are unfit to be Council members. On the very day that I read the minutes it was announced that a young man of 24 had been elected a Member of Parliament and I could not help wondering how many 24-year-old RSGB Council members there had been in the past or were likely to be in the future.

It seems to me that if a person is willing to part with a not insignificant amount of money to join the RSGB he should be granted full privileges at the outset, though I imagine that almost all members (including new ones) would accept that new members should prove their interest is not merely transient by waiting a year before becoming eligible to serve on the Council.

It is obviously important that members of the RSGB Council should be suitable persons (though, of course, opinions will differ as to what that means) and one cannot deny that there is little to stop wreckers, extremists and status seekers from standing for election. That, however, is their prerogative and it is up to the members to decide which persons they want to represent them.

Few candidates for election will be known to more than a handful of members, and I therefore wish to suggest that the Council should concentrate on that aspect rather than restricting the democratic rights of members to make themselves available for selection. At

present candidates confine themselves to a list of their credentials (chairman of one club, member of another, RSGB member for so many years etc) and their present interests. Why not invite them to compile a manifesto of, say, a maximum of 500 words stating their interests and the policies they would want to pursue if elected? In that way, the electorate would be far more confident in awarding its votes, and this ought to lead to a much greater participation in elections than has been the case in the past. It is hardly likely that the vast majority of members would be hoodwinked by persons standing for election for the wrong reasons.

A Miller, BRS88969

No, we didn't need to borrow Mr Abel's tape recording: in order that accurate minutes of the annual meeting can be written, the Society hires a professional company to record the proceedings and then transcribe them. This usually comes to between 70 and 80 pages of A4 typescript, which are then used as the basis of the record which appears in Radio Communication.

Mr Millard's point about unidentified members is not quite true. "Unidentified member" in the report refers to one who either forgot to give his callsign when handed the microphone in order to make a comment, or whose callsign was not clear on the recording.

With regard to the point concerning who may speak at an annual meeting, the Society is currently taking legal advice. We expect the matter to be clarified prior to the next meeting.

I don't agree . . . . . but do you?

10MHz SSB NOW

THE "HONEST BROKER'S" REPORT

Many of the people who wrote in response to the cases put by G6XN and G3ZAY (*Radio Communication*, February, p100) took the trouble to record their respect for G6XN's achievements, and their appreciation of his book. Having said that, very few people totally agreed with him that ssb should be allowed on 10MHz.

Background

Thanks to some hard lobbying by IARU at WARC79, we have become worldwide secondary users of 10·100–10·150MHz. Secondary users must not cause harmful interference to primary users, and in the political world of the ITU Radio Regulations there is no hint of give and take. In the real world, we may well interfere with the primary users from time to time, and they know it. When everyone returns to the political table at the next WARC, what will matter is whether the level of interference has been tolerably low, and whether we have been *seen* to have tried to minimize it.

Promptly after WARC79, IARU had to take a lead on planning the 10MHz band. They wanted somehow to minimize interference to the commercial primary users, yet they also wanted to establish an amateur presence on the band, to demonstrate our need for it. With those conflicting technical and political objectives, and no time for widespread consultation, there was bound to be controversy when the decision was announced.

IARU decided to recommend the use of cw and rtty only, with no competitive activities and no 10MHz credits for awards. However, IARU bandplans are voluntary; some people argued against the restriction to narrow-band modes, and went ahead and used ssb.

Two separate issues

Everyone agrees that 10MHz is a most valuable band. Most agree that it is under-used; the original restrictions were excessive. Would it help for IARU to allow ssb activity? There are two separate issues here; interference from amateurs to the commercial primary users, and interference between amateurs.

Amateur-commercial QRM

This kind of interference is difficult to control, or even to detect. Because of skip effects, a frequency which appears to be clear could be occupied by a commercial one-way link whose transmitter is inaudible, but whose receiving station would experience severe interference if an amateur QSO starts up. This is the so-called "inaudible link" problem. Any solution must be based on the *likelihood* of disrupting the commercial circuits.

G6XN argues that if a cw signal happens to be on exactly the same frequency as a narrowband commercial receiver, it is more likely than ssb to cause interference because all its energy is concentrated on that frequency. While the wider bandwidth of an ssb signal increases the likelihood of mild interference, argues G6XN, it is less likely to actually disrupt a commercial narrowband circuit because the energy in the ssb signal is spread more thinly. On the other hand, replied G3ZAY and several others, not all commercial activity on 10MHz is narrowband, and a strong-enough ssb signal could disrupt more than one circuit. Also the energy in ssb speech can occasionally be concentrated into quite narrow bandwidths. From hereon, the arguments become quite rarefied, with much talk on both sides about information rate and time-bandwidth product.

I found none of the arguments totally persuasive. Within the enormous variations in hf propagation and frequency usage, you can find circumstances to fit any argument you choose! Sometimes cw will be the more disruptive to primary users, and sometimes ssb. The difference is certainly not clear-cut.

Amateur-amateur QRM

The clear difference between cw and ssb emerges in terms of amateur-amateur QRM. The general consensus that there are plenty of narrow slots for cw operation, but only three or four ssb channels on the band at any one time.

But there are many amateurs who would *like* to use ssb on 10MHz. The only thing that restrains them is respect for IARU band plans. In other words, there is room enough to support the present level of ssb activity by a minority, but only by courtesy of the majority of amateurs who refrain from using the mode. As one correspondent put it, "If IARU opens the floodgates to ssb, where would the valuable propagation research be then? Lost in the QRM!" To sum up, the strongest reason for not permitting ssb on this narrow band is to avoid amateur-*amateur* QRM.

A farthing damages

If I were a judge in this case, I would have to find in favour of IARU. But IARU has not handled this matter well; the initial restrictions were excessive, and have attracted criticism because the reasons given were not clear. Until recently, that criticism has not received a fair public hearing or anything better than stock answers. Although G6XN could have been given a proper opportunity to state his case in *Radio Communiction* much sooner, RSGB now deserves credit for having put its own case on trial as well.

Amateurs follow the IARU 10MHz bandplan, not because it is especially meritorious, but out of respect for bandplans in general. If support for voluntary bandplans weakens on 10MHz, it weakens everywhere across the spectrum. Several people cited Top Band as an example of what happens when there is no effective ssb/cw bandplan.

Worldwide amateur radio will not run itself; leadership has to come from somewhere. As the organization with that responsibility, IARU deserves our support. What IARU lacks is some way to make itself accountable and responsive to individual radio amateurs. The really important decisions, like the ones made during WARC negotiations, have to come straight from the top because there is no time for the lumbering and incredibly bureaucratic process of consultation among national societies. And IARU has no mechanism for accepting input from the individual radio amateurs on whose behalf the whole organization ultimately exists.

It does not help when IARU officials or member societies attempt to defend established positions by responding to arguments (be they right or wrong) with stock phrases and platitudes, That old habit simply turns critics into enemies, and does nobody any good: not IARU, not the national societies, not individual radio amateurs—and certainly not amateur radio.

The role of "honest broker"

As "honest broker" for the first of the controversy columns, my interpretation of the role has been to start with an open mind; to summarize the whole situation accurately; to take account of the views of the members who wrote in; and then to state my own conclusions, independently of RSGB or anyone else.

Ian White, G3SEK

(Any further comments should be made as letters to the editor, and not to the "honest broker", whose task is now completed—Ed)

Please send your suggestions for future controversy columns direct to G3RZP, QTHR. *You can suggest that a topic deserves an airing, without having to take sides yourself. However, it would always help if you can suggest who might present the two sides of the controversy. One side may well be RSGB—but it shouldn't always have to be!*

AN RSGB HOME-BREW PROJECT

THE RC14 BEGINNERS RECEIVER

DEVISED AND DESCRIBED BY STEVE PRICE, GW4BWE

THE RC14 is a simple direct-conversion hf receiver for home construction. It will provide an exciting challenge to newcomers and is an excellent choice for a first homebrew project. In order to help those who have little or no experience in the building of electronic equipment, the RSGB has arranged for a complete kit of parts to be made available (see below).

The ever-popular 14MHz hf band covers the range 14,000—14,350kHz, and within this 350kHz allocation amateurs can enjoy worldwide communications using a variety of transmission modes, including morse (cw) and speech (ssb) which are the most used. The 14MHz band is a very crowded segment of the hf spectrum, and you could be forgiven for thinking that only a top-flight commercial receiver can provide the necessary performance. Fortunately for the budding home-brewer, this isn't really the case. Nevertheless, it would be foolish to assume that an extremely simple receiver which uses just a few junk-box components is going to prove adequate. In practice, such a design is unlikely to be capable of providing the necessary sensitivity, selectivity and stability.

The RC14 therefore employs many "state-of-the-art" techniques in order to achieve high sensitivity, adequate dynamic range and commendable frequency stability. The vfo (variable frequency oscillator) is varicap controlled, which allows tuning to be carried out by the use of ordinary carbon-track potentiometers, thus avoiding the need for an expensive variable capacitor and reduction drive. The RC14 also boasts excellent selectivity due to the incorporation of a steep-slope active filter which has its passband optimized for clear reception of ssb.

In order to avoid the complex switching arrangements found in general-coverage and multi-band receivers, the RC14 is restricted to 14MHz. Potential constructors should not be discouraged by this fact, however, as the very high level of international activity on this band almost guarantees that there will be a number of interesting QSOs audible whenever 14MHz is open.

How it works

Figs 1 and 2 show block and circuit diagrams of the RC14. It will be seen that integrated circuits are used extensively, resulting in a straightforward design offering consistent and predictable performance.

Signals picked-up by the antenna are routed via the tuned circuit, L1 C3, and its associated coupling winding, L2, to the input of a high-level mixer IC1. The RC14 employs the direct conversion principle, so the vfo operates at signal frequency; the vfo output is also fed to the mixer, thus providing IC1 with two inputs. Not surprisingly, IC1 has the task of mixing the signal with the vfo frequency to produce an output, or product, at audio frequency. This product, which appears at pin 14 of IC1, is then amplified by IC2a, filtered by IC2b and IC3a and then further amplified in IC3b before being fed to a pair of headphones.

In order to clarify the direct-conversion process, imagine that we wish to listen to a cw transmission on 14,050kHz. The vfo is tuned to 14,051kHz; ie, a frequency just 1kHz higher than the signal. The mixer will subtract these two frequencies and thereby generate an output at precisely 1kHz (14,051—14,050 = 0,001). We now have a cw signal that has been converted to a much lower frequency and following amplification, is audible to the human ear.

Unfortunately, a cw signal at 14,052kHz also gives rise to a 1kHz product (14,052—14,051 = 0,001) and so it is clear that a direct-conversion receiver will render audible signals appearing either side of the vfo frequency. This effect is called the "audio image" and means that the effective bandwidth of a dc receiver will be twice that of a properly-designed superhet. However, a high-performance superhet is inevitably far more complex and normally requires an expensive crystal or ceramic i.f filter, so the compromise involved is quite acceptable.

The dc receiver copes with ssb in a similar fashion, and will also render audible many other modes; eg, rtty, Amtor, packet data and sstv. The

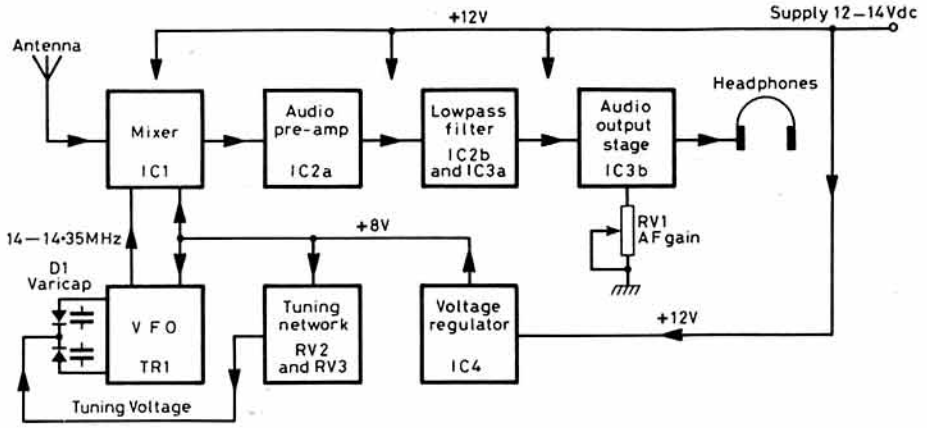


Fig 1. Block diagram of the RC14

filters built around IC2b and IC3a are of the lowpass type and have the job of attenuating all frequencies above 2.8kHz; ssb speech is therefore unaffected, but high-frequency heterodynes (whistles) and 'splatter' from adjacent transmissions will either be significantly reduced, or removed altogether.

The voltage regulator, IC4, generates a stable 8V supply rail which has three uses. First, the mixer, IC1, requires a secondary supply, Vcc, that is fed to pin 4. Second, the vfo is powered from this regulated supply via R22. The remaining function of IC4 is to provide a stable voltage for the tuning network. D1, a variable capacitance diode or "varicap" for short, is used to provide tuning of the vfo, and substitutes for the variable capacitor found in many other receivers. The voltage presented to D1 via R19 determines its precise capacitance, so altering this voltage achieves tuning over the desired range of 14,000–14,350kHz. A slider potentiometer, RV2, provides coarse tuning by enabling us to set a voltage of between approximately 3·5V, assuming R25 is adjusted midway (see later) and 8V. The tuning voltage thus developed can be very slightly modified using RV3 (fine tune) giving a ± 10kHz variation in vfo frequency. Incorporating a fine-tune control does away with the need for a reduction drive and/or expensive multi-turn potentiometer.

The RC14 kit

One of the greatest pleasures to be derived from amateur radio is the thrill of operating equipment that you have actually constructed yourself. Listening to signals from far away countries using a commercial hf receiver will teach the beginner quite a lot about varying propagation conditions and operating practices. But these matters, important though they are, constitute only part of the story. In short, if you are seeking a more complete understanding of modern telecommunications, it is obviously a good idea to acquire at least some knowledge of what actually goes on inside your receiver or transceiver.

Studying articles and text books which deal with the intricacies of radio

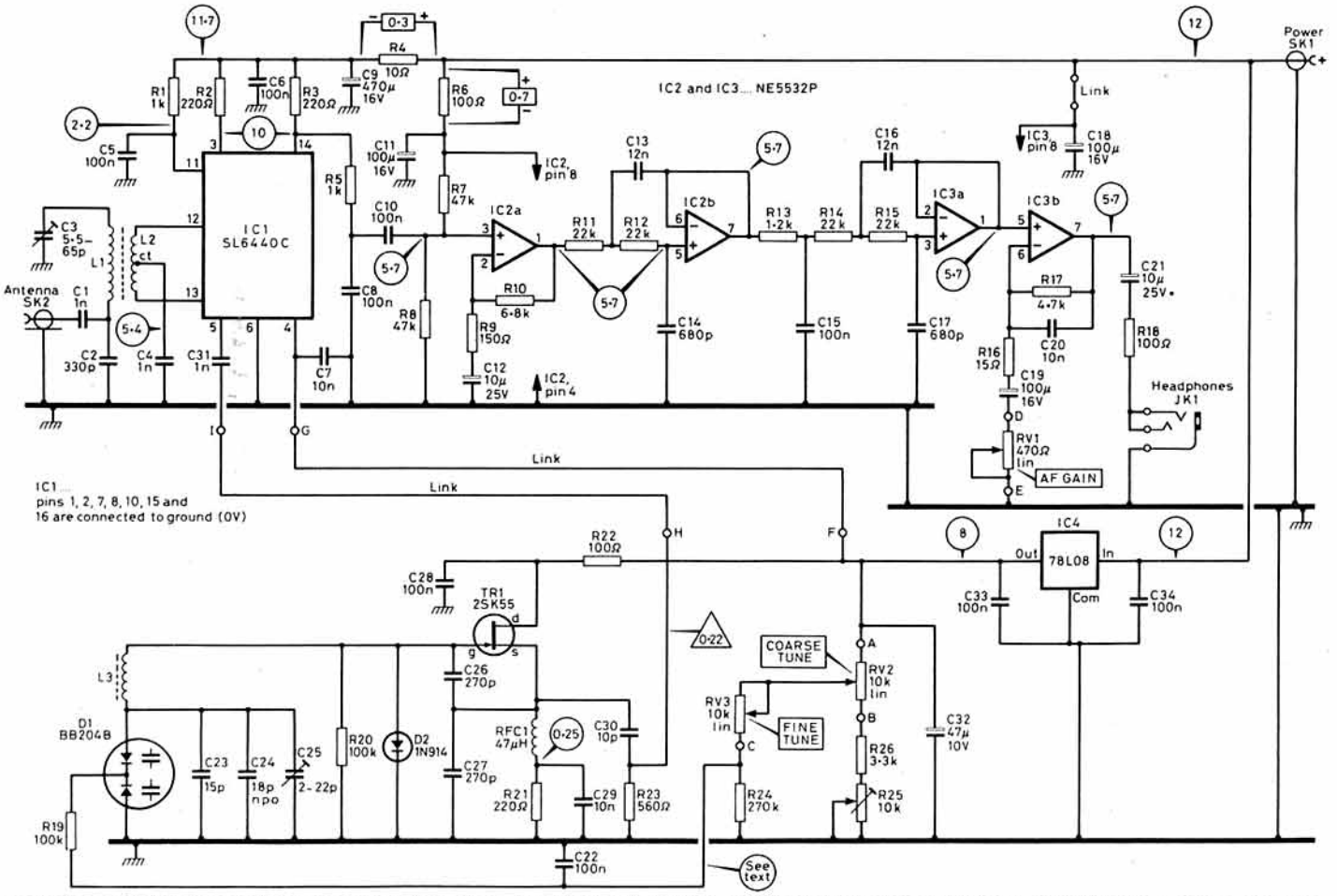


Fig 2. The complete circuit. Voltage measurements shown encircled are made with the negative test probe connected to ground (0V). The boxed measurements are obtained by using both test probes, as indicated. the triangle indicates a peak voltage reading using a diode probe

hardware can prove rewarding, but there comes a time when the amateur radio enthusiast craves some real, hands-on experience. Many old timers who read this will probably now be giving a wry smile as they remember the long hours they once spent attempting to get their first homebrew project "up and running".

True, the complex technology often employed in contemporary communications equipment can seem quite daunting, but that does not mean the newcomer should give up any notion of constructing receivers and transmitters at home.

In the knowledge that every beginner must start somewhere, and in order to help make that all important first project a success, the RSGB has arranged for a complete kit of parts, accompanied by highly detailed instructions, to be made available from Cirkit Ltd. The RC14 kit comprises every conceivable item—right down to the last nut and bolt, including a high-quality printed circuit board and pre-drilled aluminium case. All the constructor will need to possess are some basic tools (including a soldering iron) and a multimeter.

The price of the kit (including VAT and carriage within the UK) is £36, and can be ordered from: Cirkit, Park Lane, Broxbourne, Herts EN10 7NQ. Tel: 0992 444111.

Using the RC14

In order to extract the highest performance from a communications receiver, and the RC14 is no exception here, we must provide an effective antenna. "Effective" should not be taken to imply elaborate, as a single wire of between 6 and 10m in overall length can work wonders if correctly sited. Aim to get both ends of the wire as high as possible and try to avoid running it too near large obstacles such as trees and buildings. For safety reasons the antenna should not be allowed to pass anywhere near overhead power cables. Also, direct-conversion receivers are somewhat prone to hum pick-up, so keeping the wire clear of any mains wiring or electrical equipment—particularly items that contain large transformers and/or motors—is sensible. If the RC14 is operated from an upstairs room and placed near a window frame or ventilator grille through which the antenna wire can be threaded, it will normally be easy to meet the above requirements. The far end of the wire may be anchored to a tree or post, but for best results the anchorage should be insulated. A simple way of achieving this is to tie a suitable length of nylon fishing line (5-10kg breaking strain) onto the end of the wire and attach this to the support. The wire itself may be stranded, tinned copper with pvc covering.

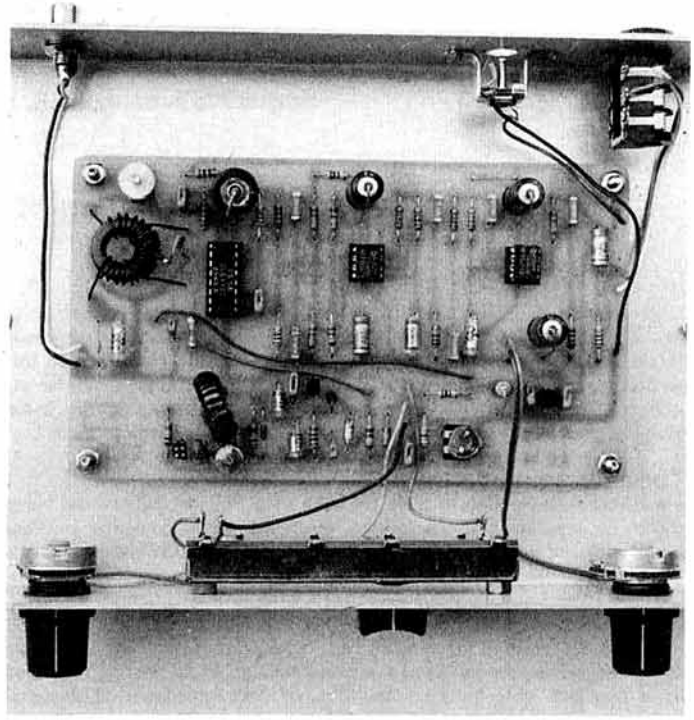
An earth connection is desirable, and this can be made to the outer of the antenna phono socket—attach the earth wire to a convenient water pipe having first removed any insulating layer of paint. If a mains psu is in use this may already have an earth connection via the wall socket. Adding an additional earth is not dangerous but it may form a hum loop and cause buzzing in the headphones. If this should prove the case do not, under any circumstances, remove the psu earth connection from the mains plug—simply dispense with the additional earth and rely on the mains earthing only. With the finished antenna connected, C3 should be trimmed for maximum signal level at the centre of the band.

Details of alternative antennas such as the ever-popular half-wave dipole can be found in both the *Radio Communication Handbook* and *HF antennas for all locations* by L Moxon, RSGB 1982.

The RC14 requires a dc supply of between 12 and 14V at 60mA. A regulated psu is strongly recommended because unregulated supplies can give rise to significant levels of background hum. A simple design based on the 7812 1A ic voltage regulator is perfectly adequate. As an alternative, the receiver can be run from batteries—but bear in mind that the current drawn will be fairly high. For this reason rechargeable batteries are the most practical and cost-effective option; either nickel cadmium or lead acid being suitable. If a battery supply is employed it is important to provide a 500mA line fuse in the positive power lead as a protection against short circuits.

Any type of headphones (except electrostatics) designed for use with personal stereos and hi-fi systems are suitable. Do not worry about the precise impedance and frequency response characteristics. Our cover photo shows the RC14 being used with a pair of budget priced Sony MDR-010 Roadrunner headphones.

If you haven't experienced the joys of hf reception before, listening to the RC14 will prove a real 'ear-opener'. Tuning ssb is a little difficult at first, but the fine-tune control really comes into its own here. First locate a strong signal with the coarse-tune control, and then employ fine-tune to complete the adjustment. It will not necessarily matter if you happen to tune past a signal using coarse-tune because the fine-tune control provides considerable latitude and will normally enable you to re-locate the transmission. The voice pitch varies markedly as RV3 is rotated—aim for a natural sound, and remember that there will be both male and female operators! Most cw occupies the bottom 100kHz of the band and is particularly easy to tune.



Interior view of the RC14

Remember that propagation conditions vary enormously, depending on such factors as the time of day, season and state of the ionosphere. Indeed, the band will sometimes appear almost completely dead, but it normally springs back to life again a few hours, or perhaps a day, later. Also, if you wish to listen for stations in a specific country, remember to check what time it is there—the operators may well be sound asleep! Stations in contact with each other will almost invariably use the same frequency, but because of propagation anomolies you may only be able to hear one of them. Paradoxically, it is often the closest station which proves most difficult, or even impossible, to receive. Indeed, very few "locals", ie UK stations, will ever be heard.

Finally, bear in mind that the RC14 does not have automatic gain control, (agc)—signals are therefore presented with their true relative amplitudes preserved, so you will often have to reduce the af gain setting in order to prevent overloading by strong transmissions. Fading (QSB) is also more noticeable.

Acknowledgements

The RSGB Technical & Publications Committee has been involved at every stage of the RC14 project, and special thanks go to Giles Humpston, G4GYO, who designed the pcb, and Peter Hart, G3SJX, for his photography and painstaking performance measurements on the prototypes. □

Steve Price, who obtained his amateur radio licence in 1973 at the age of 18, is a civil servant in the DHSS. He recently moved to North Wales.

Apart from an abiding interest in all aspects of electronics and telecommunications, he also enjoys foreign travel, music, photography, the occasional pint of real ale, and Indian food.

"WERE YOU ON YOUR RADIO LAST NIGHT?"

Angus McKenzie, MBE, FIERE, FAES, CEng, G3OSS*

Part 2. EMC testing of tv sets and typical results

LAST MONTH I EXPLAINED how rf breakthrough can get into a tv installation, and I also gave details of the typical performances of some filters which can be used to cure many breakthrough problems. In this second part I describe how my friends and I set about testing nine tv sets in the four areas referred to last month; direct coaxial inner pick-up, braid pick-up, mains lead pick-up and direct pick-up on the chassis.

The test equipment

I was fortunate enough to have the loan of a Philips professional video waveform generator and transmitter, which was used to generate excellent static pictures with every conceivable kind of colour and grey scale indications. This transmitter had a 50Ω output impedance, and could be switched to various channels used in the testing. The output level was high, and was attenuated with high quality Marconi uhf attenuators, such that the final level reaching the set was of the order of 1mV (emf/2). A Marconi 2019 signal generator was used as a breakthrough signal source, amplified by a Marconi wide band rf amplifier of 50Ω impedance. The signal generator was modulated at 1kHz, 80 per cent a.m. The output from the amplifier passed through a Marconi uhf attenuator into the injection system.

A large, thick metal sheet was securely mounted on the test bench, and a terminal banana socket soldered on to its end, so that this could be interconnected with the earth connections of the various injection boxes. Each tv set in turn was placed on the sheet, and connected to the mains injection box, and to either the coaxial inner injection or the braid injection systems.

For the chassis injection tests, each set was placed in the cradle, which allowed the set to be rotated horizontally and vertically in the transmitted field. Off air signals had to be used for these tests, as the Philips generator was slightly disturbed itself by the strongest fields. Extremely good filtering was employed, both on the inner and outer, to ensure that a completely clean signal on Band 4 was reaching the antenna socket. The mains was also extremely well filtered at the set, so that any breakthrough was clearly caused by direct pick up within the set itself.

A Surrey Electronics active antenna system was used for measuring the field strengths induced in the neighbourhood of the sets, the active antenna output feeding into a Marconi 2382 spectrum analyser. Field strengths at 144MHz were estimated by using back to back balanced dipoles, and comparing the levels transmitted from a Trio TS711E with the level received on the Marconi 2382 analyser. These levels were compared with calculated field strengths, and proved to be very close to them.

For the low frequency field tests, I used my three band trapped dipole —which goes over the roof of the house for the 1·8, 3·5 and 7MHz bands. For hf tests, I rotated my high-gain TH6 to create the highest field in the set's vicinity on the 14, 21 and 28MHz bands. I used my Trio TS940S transceiver through a Drake L7 linear, with a Bird throughline wattmeter in the antenna feed for measuring power, also noting this on a separate p.e.p meter.

Coaxial direct injection tests

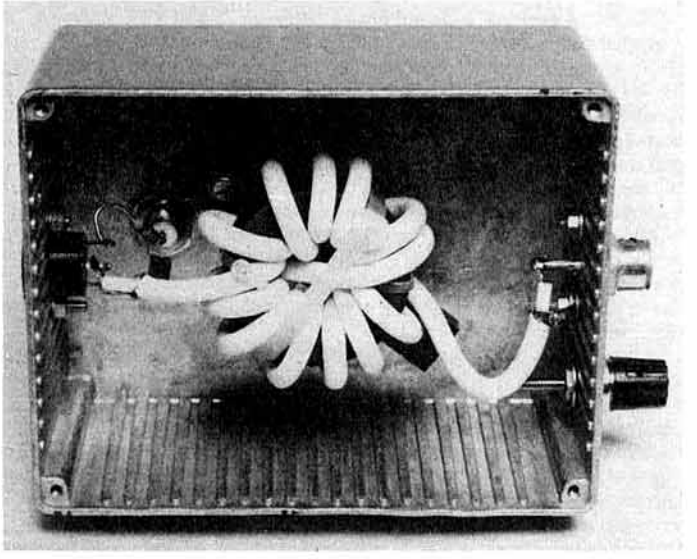
I chose to use an MCL 50Ω hybrid transformer, rather than a resistive pad, for coupling the tv signals with the interfering signal, as the system loss would be lower. This allowed higher breakthrough injection levels to be achieved. The output from the hybrid was resistively matched to 75Ω, and the cable to the tv set was kept as short as possible, consistent with the hybrid transformer etc being well earthed to the earth plane. Either a BNOS 150MHz lowpass filter, or a Microwave Modules 432MHz bandpass filter was used in series with the breakthrough source. This ensured that there was no significant noise or generator harmonics being injected from the wideband amplifier in Bands 4 and 5 when the intended breakthrough signal was from 1·8 to 150MHz, or at 432MHz.

Each set was adjusted to give the best possible picture from the fixed transmitted pattern, and the audio gain was set in a typical position required for a reasonable reproduction level. Modulation from the Philips generator was then switched off, and the breakthrough injection switched on at a high level. Not only did we check the picture grading at pre-set breakthrough levels, but we also varied the level to see at what point picture quality would be Grade 2, and on the borderline between Grade 4 and Grade 5. Grade 2 represents what we all agreed was an unbearable degree of breakthrough on what was a reasonably-discernible and stable picture. Grade 4 was described as very slight breakthrough which would not be considered serious at all. Not only were all the amateur radio bands checked between 1·8 and 432MHz, but the generator was also swept slowly from 1·8MHz to 150MHz, particular attention being paid to frequency bands in which there is a likelihood of strong commercial, public, military and pmr transmissions being received in a domestic environment (eg general shortwave frequencies, Band 2 fm radio, air band, and various pmr bands). For the sake of time, the generator was stepped in 100kHz intervals up to 30MHz, and in 1MHz steps above this frequency. Apart from some predictable problem frequencies, such as 6MHz, the video/audio channel spacing, previous tests had shown that spot frequencies in between the megahertz steps always corresponded with the results achieved on the 1MHz step points, breakthrough vulnerability generally being fairly broad banded at vhf.

Coaxial braid injection tests

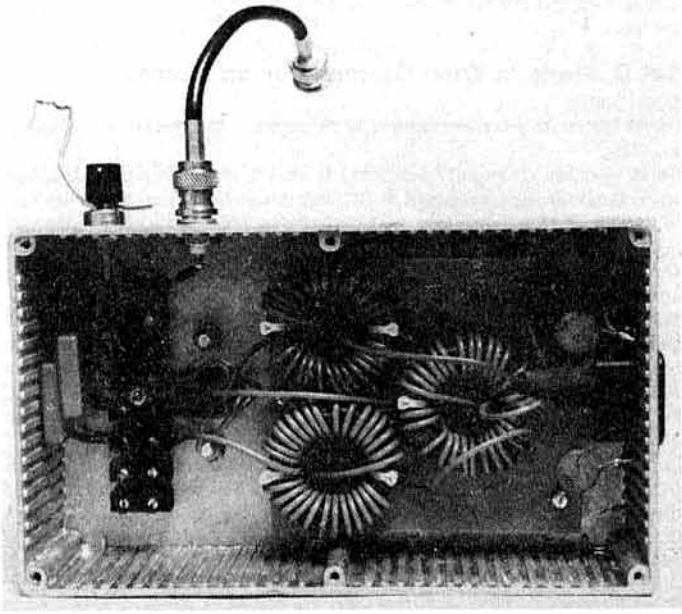
One of my helpers constructed a box in which the interfering signal was injected in series with the braid. The input coaxial cable was earthed to the box, and this was bonded to the earth plane and to the earth on the mains injection box. A 50Ω screened dummy load was plugged onto either the mains injection box input or the braid injection box input when these were not in use at the time.

Various filters were placed in the leads between the injection boxes and the set in order to check that they were appropriate, and both the braid and inner filter systems worked very well on each set. We often found that the position of a braidbreaker was critical, bearing in mind that the braid could itself radiate directly into the set's chassis. Sometimes it was better to put the braidbreaker at the injection box end rather than on the set's antenna socket, and this is an important guide to a solution in many typical cases.



Interior view of braid injection box

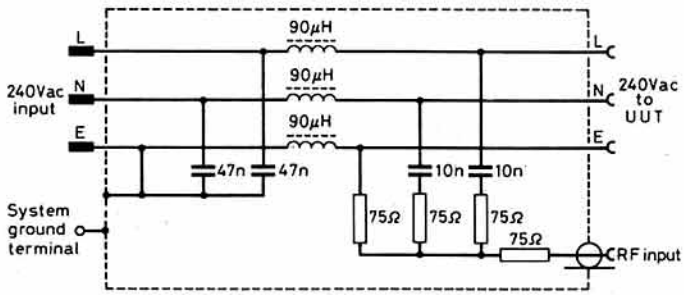
*57 Fitzalan Road, Finchley, London N3 3PG.



Interior view of mains injection box

Mains injection tests

The mains injection box, again a screened metallic one, has an IEC mains input socket at one end, and a feed socket at the other, allowing it to be inserted in series with the mains. The injection signal, fed via a 50Ω chassis mounted BNC socket, was fed onto live and neutral lines, the earth being directly connected to the metal earth sheet underneath the set. Note that all the tv sets had only a two wire mains connection lead, which was kept as short as possible. This was achieved by folding them haphazardly, but with care, to avoid inserting any significant amount of inductance between the injection point and the set, as the organization which loaned the sets was not too keen on us shortening the mains leads! Injection levels corresponded to draft recommendations being discussed in Europe at the moment.



AC mains rf injection box circuit diagram

Video and audio breakthrough

Pre-prepared forms were filled in on the spot, and a distinction was made between picture deterioration and breakthrough of the interference modulation into the audio circuits. No attempt was made to effect any improvements within a set itself, nor was there any time to determine precisely where, within a set, which particular circuit was causing a problem. In general, Fiona, my wife, graded the picture quality, and I graded the audio. However, quite frequently one of my friends joined in the evaluations, and we were all pleasantly surprised that judgements were very consistent.

RF field/chassis pick up tests

These tests were carried out in three separate groups, the lower frequency band tests being done over one period, the hf ones on another and finally the 144MHz breakthrough tests. Note that each set was individually rotated horizontally and vertically in the cradle for the worst pick-up for each band, and this position was used for the measurements. The following maximum field strengths were used for the various bands: 1·8MHz—5V/m, 3·5MHz—8V/m, 7MHz—10V/m, 14MHz—10V/m, 21MHz—9V/m, 28MHz—5V/m, 144MHz—6·5V/m. The total amount of time taken over the actual tests, and in the report writing, was about one month, although many weeks of preliminary work was carried out earlier in the year, the main tests being in October 1986, for publication in a consumer magazine in January 1987.

THE TEST RESULTS

All the sets tested would be classed as being made by well-known tv manufacturers, and there was good representation of Japanese, German, Dutch, British and other European-made sets. After much consideration, I feel that it is correct to name the two best sets, but the identity of the remainder will not be disclosed. Only one sample of each set was tested, and I am totally satisfied with a good result, but poor results can occur on a one-off basis—although I am reasonably confident that the results are typical of each brand. In this article, I am primarily concerned with the emc of the different sets with reference to amateur radio bands, but vulnerability to any of these bands will almost inevitably cause a set to be just as vulnerable to other transmissions as well in the same frequency region.

The Bang and Olufsen LX2500

Direct injection. From 1·9 to 30MHz this set gave a superb performance, no breakthrough being noted to video or audio, even at 1·4V, the maximum level used in this test. However, above 48MHz problems were noted; at 50·2MHz the performance was bad, while at 70·2MHz results were poor. The onset of breakthrough was very rapid indeed above 48MHz, for only a 6dB increase was required to degrade the picture from five down to two. The vulnerability was also poor up to Band 2, but had improved markedly by 144MHz to become good. At uhf, a fairly low-level signal caused a marginal deterioration, but an extremely large increase was required to create a really serious problem. Even a 1V signal did not cause really serious break up, and there was no audio breakthrough at uhf. Thus, the only bands likely to cause a real problem would be 50 and 70MHz, but a highpass filter should completely cure any breakthrough, and for this reason the set's immunity was considered excellent, the best of any set tested.

Braid injection. The set was excellent up to 30MHz, with just a very slight breakthrough at 14·2MHz with the highest interfering level. A tendency to audio breakthrough was noted on all the vhf bands, although video breakthrough was not a problem. A braidbreaker should amply sort out the audio problem.

Mains injection. The only problem noted in this test was at the 6MHz spot frequency, thus showing first-class mains filtering within the set.

Field immunity. The performance was spectacularly good on all amateur bands tested, (1·8, 3·5, 7, 14, 21, 28 and 144MHz). A set that shows no discernible trouble at 3·5V/m and only marginal trouble at 6·5V/m on 144MHz ssb is one that might be considered a standard against which others might be judged. This is the type of performance that we are all looking for in a tv, showing considerable care and attention being taken at the design stage.

As this set was so good, and both the picture and audio quality was among the best noted by my family and others, I actually decided to purchase one of these models, and there has not been a peep from Fiona over the months that we have had the set, despite my being active on all bands.

Toshiba 26154B

Direct injection. This set was remarkably good right across the board from 1·8 up to 432MHz, the antenna input circuit clearly having an excellent high pass filter action.

Braid injection. All the lower frequency bands had excellent immunity, and just slight audio breakthrough was noted at hf at extremely strong injection levels. On the 50 and 70MHz bands, immunity was quite good, but with a slight tendency to audio breakthrough from strong interference levels. Although breakthrough on 144MHz, primarily on audio, was fairly good, more breakthrough was noticeable around 139MHz. 432MHz rejection was excellent.

Mains injection. Audio breakthrough was slightly noticeable here and there between the 3·5 and 21MHz bands, although by 28MHz there was no problem even at high levels. Strong injection signals were required to cause any audio breakthrough on the 50 and 70MHz bands. Even at 144·3MHz, the immunity was quite good at the highest levels, and a ferrite ring braidbreaker should be sufficient if placed very near the set. No problem was noted at 432MHz.

Field immunity test. Immunity on the lower frequency and hf bands was excellent, and some 9V/m were required at 21·2MHz to cause very slight audio breakthrough, which is considered remarkable. On the 144MHz band, video immunity was very good, but audio breakthrough became progressively more and more marked when the field strength was increased

above 0·75V/m. Audio breakthrough was annoying above 1 to 1·4V/m, and this is a pity on an otherwise superb set.

Set A. A Far-East company product made in the UK

Direct injection. This set performed adequately at lower frequencies and well at hf and vhf. At uhf, performance was clearly better than average. However, this particular set showed bad picture deterioration after about half-an-hour from switch on, and the picture without breakthrough was itself no better than Grade 4.

Braid injection. This set was very poor overall above 4MHz up to uhf. The set could be said to be disastrous between 6 and 8MHz, and extremely poor at hf and at 144MHz. This is one of the worst sets tested in 1986 in this parameter, and it is quite clear that it could give trouble in many areas from many different types of local transmitters. An unfortunate example of a set with good rejection on the inner, but very serious problems in the complete earth plane within the set.

Mains injection. This set proved to be more than usually troublesome over a fairly broad lower frequency and hf spectrum, although by the 144MHz band there was almost no trouble at all. Some audio breakthrough was picked up at 432MHz. Strange problems were noted at 6MHz together with its harmonics, eg 18 and 24MHz. This set might very well require an efficient ferrite ring mains filter near the set, as well as a very effective braidbreaker on the antenna lead.

Field immunity. The chassis immunity was surprisingly good on lower frequencies, hf and lower vhf, but at 144MHz strong signals did cause quite a severe problem, especially to the video. The field strength had to be reduced to only 0·35V/m on 144MHz for breakthrough to be eliminated.

Set B. Made in the UK by a British company

Direct injection. This set performed admirably from 1·8 to 100MHz, no trouble showing up either on video or audio. However, at 144·3MHz video breakthrough was extremely bad at the 1V level, but the signal only had to be reduced by 10dB to obtain a perfect picture; audio showing no deterioration. At 432MHz the set muted completely, and Grade 5 video required a breakthrough signal reduction by 15dB to only 55mV. The picture was as bad as Grade 2 at 125mV, muting occurring at 250mV. The problem is clearly that of insufficient front end selectivity, and reception was perfect with a 1V input signal when a six-section filter was inserted on the antenna input socket, a tuned notch filter giving an almost perfect picture. All the problems were video rather than audio.

Braid injection. This set showed serious problems on almost all bands from 7 to 144MHz in varying degrees, 144MHz breakthrough being primarily to colour information and on to the audio. At 432MHz audio was mainly affected. Even a good braidbreaker on the input socket was insufficient to effect a cure, as re-radiation from the coaxial lead braid to the chassis created a problem.

Mains injection. There were no significant pick up problems below 30MHz, and above 30MHz the performance was quite acceptable, although very high injection levels on 144MHz did breakthrough, the onset of the problem being quite sudden, primarily onto audio at vhf and uhf.

Field immunity. Chassis immunity was excellent on the lower frequency and hf bands, but on 144MHz breakthrough to video was very bad at high field strengths, and did not clean up until the field was reduced to 0·5V/m, audio breakthrough being somewhat less marked. Although this set is not the worst, it would definitely be regarded as a troublesome one at 144MHz.

Set C. A West German made set

Direct injection. Video immunity was good up to 21MHz, but from 28 to 150MHz it was fairly poor; however, no audio breakthrough was noted. Surprisingly, 432MHz presented no problems at all, showing the set to have a good highpass filter in the front end.

Braid injection. Although this set was satisfactory at lower frequencies and on 14MHz, there was a serious problem from 18MHz upwards, fairly strong signals on 21 and 28MHz, and only fairly strong signals on 50 and 70MHz causing complete video muting. At slightly lower levels, the video turned on and off repeatedly. At 144MHz the problem was much less severe, but strong pick up levels could still cause a problem. At 432MHz the problem was fairly marked again. One would need a very efficient braidbreaker to effect a cure for this strange phenomenon.

Mains injection. The video muting problem again occurred from breakthrough on the 28, 50 and 70MHz bands, but it was absent on 144MHz and 432MHz. A good ferrite ring mains filter should cure the problem.

Field immunity. Immunity was excellent on the lower frequency and hf bands, and an extremely high field was required to cause video muting on 144MHz, normal strong signals being coped with fairly well. It is curious that video muting usually occurred long before the picture was degraded to as poor as Grade 2, so it seems that this set is a go/no go one, and I suspect that an emc component or two might have been omitted from UK market models.

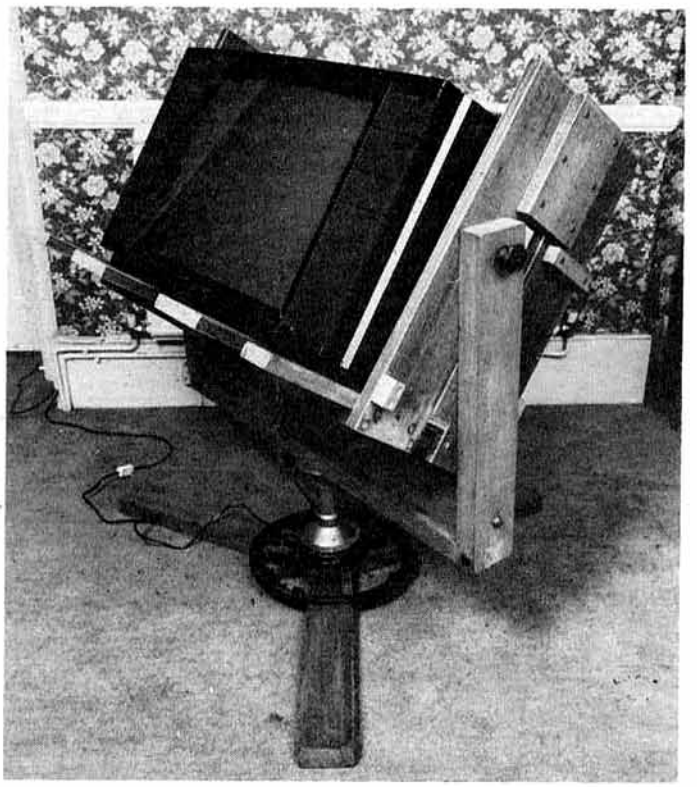
Set D. Made in West Germany by an international company

Direct injection. Excellent immunity throughout the spectrum, including 432MHz.

Braid injection. Immunity was good from 1·8 to 70MHz on video, but audio breakthrough was noted on hf, becoming very serious at the top end of Band 2. PMR a.m breakthrough could be very bad on this set. Video was poor and audio bad at 144MHz, but there was absolutely no trouble at 432MHz. I again suspect that some emc component might have been omitted from sets marketed in the UK.

Mains injection. Although there were no video breakthrough problems, audio breakthrough was very bad from hf up to 100MHz, 50 and 70MHz being particularly vulnerable. 144MHz was not serious, and no problems were noted at 432MHz.

Field immunity. All lower frequency and hf bands were excellent, except for 21MHz, where audio breakthrough was noted above field strengths of 3V/m. The set was extremely vulnerable to both video and audio breakthrough from 144MHz, and the field had to be reduced to below 0·25V/m to remove the breakthrough completely. Note that this borderline is some 22dB worse than that for the Bang and Olufsen set, so woe betide pmr, as well as 144MHz operators, if there is one of these sets close by!



The testing cradle

Set E. Made in the UK by a Japanese company

Direct injection. Although this set had excellent immunity from 1·8 to 150MHz, there was a bad problem at 432MHz—a level on the inner of only 0·16V was sufficient to cause the beginning of picture deterioration because of inadequate filtering within the set. An AKD RBF1/70 was almost sufficient to reject very strong signals, while both the old Post Office/DTI FS72A and special six-section filters completely eradicated any problem.

Braid injection. This set's immunity varied from quite poor to very bad between 7 and 144MHz bands, both video and audio breakthrough being noted, the latter being particularly bad on the 28MHz band. Slight audio breakthrough was also noted at 432MHz. This set will need a very good braidbreaker, or even a combination of two types to resolve serious problems.

Mains injection. Video immunity was generally good, other than on 28MHz, where it was fairly poor. However, audio immunity was very poor

Table 1. Field test performance

Set	1·8 to 14MHz	21MHz	28MHz	144MHz V/A grades for 6·5V/m	Comments	144MHz video for 3·2V/m	Audio for 3·2V/m	Field for Grade 5 V&A V/m
B & O LX2500	5	5	5	4/4		5	5	3·5
Toshiba 26154B	5	4	5	4/1	Almost entirely audio breakthrough on 144MHz	4·75	2	0·75
A	5	5	5	0/0		2	2	0·35
B	5	5	5	1/2·5	Almost entirely video breakthrough on 144MHz	2·5	5	0·5
C	5	5	5	0/0	Set muted	3	4	1
D	5	3	5	0/0	Very bad video and audio breakthrough on 144MHz	0	0	0·25
E	5	2·5 (V&A)	4·5 (A)	1·5/1·5		2·5	3	0·4
F	5	4 (V)	5	1/5	Picture degrades fairly slowly with increased level at 144MHz	2·5	5	0·28
G	5	5	5	2/1		3·5	2	0·26

generally, although no problems were experienced either for video or audio on 144 and 432MHz. A good ferrite ring filter system on the mains lead near to the set should be sufficient to remove any problem.

Field immunity. Video and audio immunity was very good on the lower frequency bands and on 14MHz, but slight breakthrough from strong fields was noted on 21 and 28MHz. Bad audio breakthrough was noted on 144MHz, and the field had to be reduced to 0·4V/m to clear it completely, although video breakthrough was not so severe, but still a problem. Set orientation dramatically changed the vulnerability rather more than usual. This set was considered fairly poor overall, but not the worst.

Set F. Made in the UK by a Japanese company

Direct injection. This set gave an excellent performance in this test between 1·8 and 144MHz, but serious problems occurred on 432MHz. A Grade 5 picture was not obtained until the injection level was decreased to 0·1V; above this level, video blurring and colour blotching occurred with considerable severity above 0·5V, the audio muting completely at above 280mV. Possibly an FS72A would remove the problem, but a six-section filter would probably be needed for the installation to be completely free of trouble from 432MHz.

Braid injection. Immunity was excellent up to the 28MHz band, and 50MHz was fairly good, but on 70MHz serious audio problems were encountered with high level injections. The onset of trouble was very sudden at around 1·25V, and at levels only slightly higher than this both video and audio completely went, and did not recover when the interference was withdrawn, the set having to be turned off for a while and turned on again to perform normally! Transformer-type braidbreakers near the set did not offer sufficient protection to overcome the problem completely when used on the antenna input, so there was clearly re-radiation from the feeder into the chassis. Results on 144MHz were poor, and dependent on the coaxial cable positioning. No trouble was experienced from 432MHz.

Mains injection. The set performed well right across the board, with only very minor problems showing up here and there with very high injection levels.

Field immunity. All bands tested from 1·8 to 28MHz were very well rejected here, other than 21MHz which was only a minor problem. At 144MHz there was absolutely no audio breakthrough even at 6·5V/m, but video breakthrough was bad, the field having to be reduced to only 0·3V/m to eradicate any breakthrough completely.

Set G. Manufactured in the UK by a European multinational company

Direct injection. Immunity was excellent all the way from 1·8 to 150MHz, but at 432MHz immunity was very poor, and while an RBF1/70 might give adequate rejection, a six-section filter would be advisable for rejecting very strong received signals.

Braid injection. Video immunity was very good up to 100MHz, fairly good on 144MHz, and excellent 432MHz. However, audio breakthrough varied from very poor at hf to very bad at vhf. This set has a serious problem in the audio area, and strong fields picked up by the downlead braid from any vhf, a.m, ssb or cw transmissions could introduce marked audio breakthrough. Such transmitters could include police, fire and ambulance a.m services, and even a.m pmr. Radio amateurs could well be picked up as breakthrough when they were on the 28, 50, 70 and 144MHz bands, the last three being particularly troublesome. Ferrite-ring braidbreakers might well help a lot, but it would also be worth trying in-line transformer braidbreakers.

Mains injection. Mains rejection was good on this set at all frequencies except 144MHz, where it was just fair, but a simple ferrite ring filter should fix the problem.

Field immunity. Immunity was excellent on the lower frequency and hf bands, but audio breakthrough was a serious problem from high-level fields on 144MHz, although video breakthrough was somewhat less serious. The field had to be reduced to only 0·26V/m for the breakthrough to be completely insignificant. The main trouble with this set was breakthrough to the audio section, and it seems highly probable that components normally inserted in continental sets were omitted in the UK version to reduce manufacturing costs.

CONCLUSIONS

Although it may seem that I have given quite a lot of details on each of the sets, I have to admit that I have only scratched the surface, since we actually noted nearly 200 measurements for each set, and I have had to leave out many lab notes for the sake of space. Even a quick perusal of the results for each set will show that the types of problem that may be encountered are usually very different between various models, but there are some broad conclusions which can be drawn. You are unlikely to have emc problems directly attributable to antenna pick-up on the lower frequency bands, and most sets were surprisingly good at hf. Furthermore, even braid and mains lead pick up of strong 1·8MHz band signals is unlikely to occur. Braid pick up in general is most likely to be a problem on lower frequency and hf bands, but some of the sets were very poor at 144MHz. Mains breakthrough will probably not be encountered so frequently, especially if the tv installation is on the ground floor. I am fairly certain that careful attention to the use of filters should give adequate protection to a tv set, and please check back with Part 1 of this article for details of the use of filters. I am most concerned about direct chassis breakthrough, and here it is clearly vhf which causes the biggest problem, often to audio rather than video.

Enquiries made during 1986 have confirmed that many earlier sets designed or made on the Continent for Continental markets, sometimes have emc components left out of sets made for the UK market because of the absence of satisfactory legislation. In Germany, legislation is very strict, and so there are far fewer emc problems there. It is to be hoped that manufacturers will co-operate with the RSGB and many other bodies, so that models can be developed with far better immunity. Even the excellent Bang and Olufsen set would not quite meet the latest draft proposals as far as the lower vhf spectrum is concerned, and Bang and Olufsen most certainly took my comments seriously, and stated that they would strive further to impove their sets immunity.

It is to be hoped that a similar project might be undertaken one day on video recorders, because while the tv set itself may be excellent, the video recorder may well be the weak link in the chain. The field is very wide, and I would like to see emc reports on various models of telephones, hi-fi and radio and computer installations—the last including measurements of breakthrough transmitted as well as received.

Acknowledgements

I would like to acknowledge not only the considerable help of individual members of the EMC Committee, but the assistance given by many engineers in the tv industry, who were keen to see the testing carried out fairly, and with approved techniques. In particular, I would like to thank Les Robotham, G8KLH, for making the enormous cradle platform to hold the tv sets and for helping with so many of the tests, and Arthur Harding, G1OOX, for assisting in much of the testing, and in helping my wife and me move so many tv sets around the house. Peter Tucker, G4DWZ, and his wife Nikki, kindly let us use their home for many field trials. John Armstrong, G8MVH, and his colleague Roger Wagstaffe also gave much help, not only with the testing, but in making up, at short notice, two well constructed, balanced, 144MHz dipoles for use in the field tests. □

THE KILLING GROUND

EARTH YOUR STATION SAFELY

Peter E Chadwick, G3RZP*

MOST MODERN HOUSES, especially on estates, have the ac mains wired to them on the protective multiple earth (pme) system. This can present particular hazards to the radio amateur who wishes to provide an external earth to the station for rf purposes, and more so to those who need to apply an external earth to other equipment to overcome emc. But first, what is pme?

Protective multiple earthing

PME started to be used extensively in the 'sixties. Before this, electricity supply systems used three-phase supplies with neutral and earth, and the earth was usually provided by metallic sheathing of the cable. The main earth was at the sub station, and this could have a high resistance. The neutral is at (or near) earth potential anyway, so the idea of pme was born. Here the neutral is the earth, Fig 2.

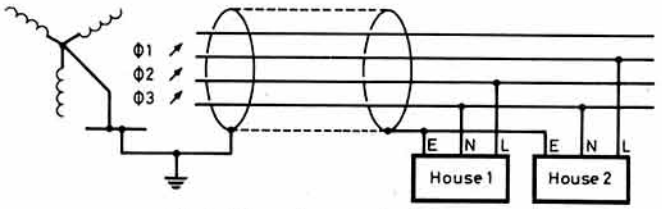


Fig 1. Three-phase neutral plus earth

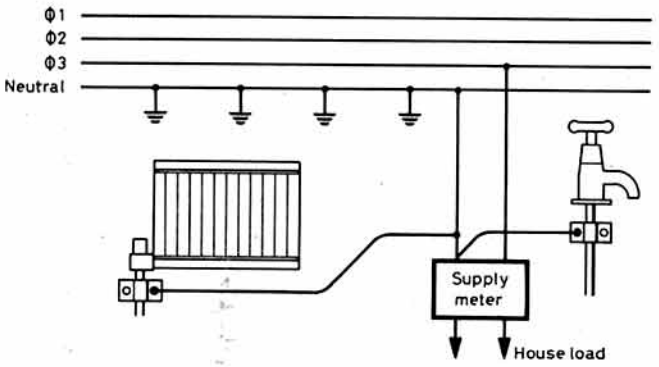


Fig 2. Protective multiple earthing

By bonding the neutral conductor to earth, not only at the substation but at many other points, the earth resistance is now much lower. In a pme system, the water and gas pipes bonded at the house to the neutral conductor and an earth is provided every so often along the run of the neutral. With the 'sixties change to plastic water pipes, the old capabilities of providing a good earth tended to disappear, so bonding of the water pipes is important if, for example, a faulty immersion heater or washing machine is not to make the whole plumbing system live. So in a modern house, the gas and plumbing are all connected to the neutral of the mains near the consumer unit (fusebox), and the neutral is connected to earth in many places along the cable run from the sub-station. This is pme. By measuring the current in live and neutral, it is easy to detect an unbalanced load—such as a radio amateur!, see Fig 3.

The current flowing to earth from the live conductor does not flow back through the neutral, and by measuring the difference, it is easy to switch off the supply if an unbalanced load is presented. This is done by an earth leakage trip. There are two forms of earth leakage trip. One is called a voltage trip and is actuated by a rise in the neutral-earth voltage. (Actually by current in the earth lead.) These are only fitted in older installations. The other form is a current operated trip which is also known as a residual current device (rcd) or a residual current circuit breaker (rccb). This is more usual, but isn't normally fitted in the house.

One problem that can occur is with mains filters as shown in Fig 4. Since the 240V appear across C1 and C2 but no volts appear across C3 and C4. Thus an unbalanced load is provided, and most earth leakage trips are set for about 30mA which provides for filters and some leakage, such as immersion heaters etc. But very good rf filters, such as used in professional screened rooms for instance, have leakages of 1·5A or more, and thus can cause problems. Medical electronics have much lower leakage requirements, making rf filtering very difficult.

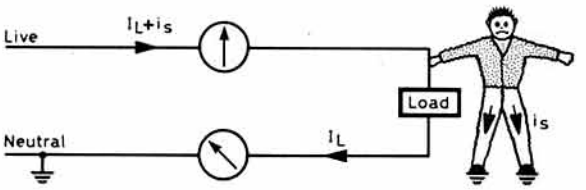


Fig 3. Unbalanced current flow when an earth load is connected

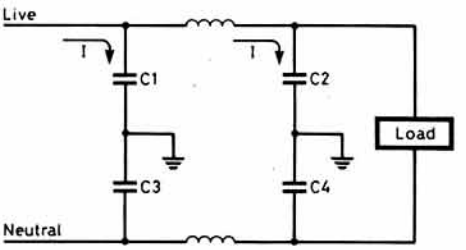


Fig 4. Mains filter with unbalanced current flow

A disadvantage of pme lies in the effect that results if the neutral, but not the live, is broken. In the worst case, the neutral at the consumer unit can reach 240V above earth; see Fig 5. As all the metal work in the house is connected together, no shock hazard exists, because nobody can contact true earth and the metalwork. Because all the metalwork in the house is floating, the occupants are in a Faraday Cage and it doesn't matter what potential they are at. In pme systems, precautions are taken to minimize breakage of the neutral, but it can—and does—occur.

Where's the problem?

Enter John Q Newham. He reads in the books about needing a good earth, separate from the mains earth for earthing his station. He knows—or should know—that a good earth can help prevent emc problems. So, down goes an earth stake, lots of copper wire is bonded to it and buried, and John runs a thick lead into the station, and connects it to the equipment. This is where the problem comes. Look at Fig 5 again. Supposing a fault existed when John brought in his rf earth. With the equipment, radiators and all metalwork floating at 240V, it is likely that John would be electrocuted when he touched his rig. But assume a ruptured neutral occurs later, and look at the set up that John has now got; Fig 6. Current flows from the neighbour's house to earth through John's house, and through the mains lead to his rig and down to his earth. The electricity supply may have a number of earths on the neutral in parallel with John's earth, which will reduce the current, but in the worst case John could have two or three house loads feeding current into his earth. The likelihood of his mains wiring or lead from the wall socket melting are high and earth leads must **NEVER** ever be fused.

*"Three Oaks", Braydon, Swindon, Wilts SN5 0AD.

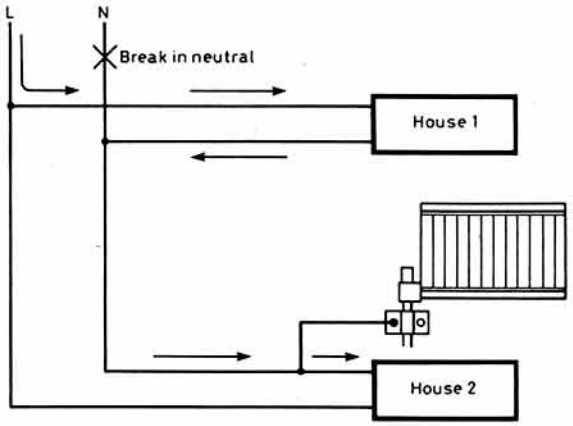


Fig 5. PME fault—all bonded network at live potential

Let's say that John does not connect the earth lead in the 13A mains plug. Now the metalwork in the house, such as radiators, electric fires, kettles, coffee-pots etc, will sit at 240V above true earth. John's rig is earthed and the chance of 240V appearing across John is high. True the elcb, if fitted, might protect him. When did you last check your elcb? Press the test button once a month—in daylight, as the house supply should vanish.

So John Q Newham could rapidly be a silent key by having an earth lead.

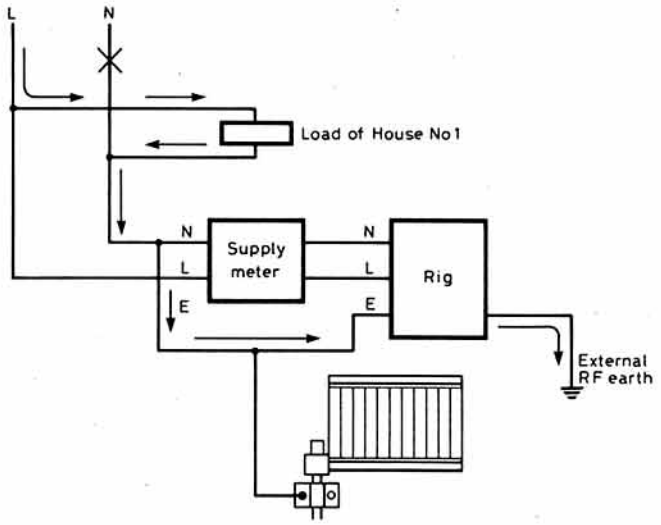


Fig 6. Current flow in pme with fault and external earth

Safe earthing

There are two ways round this problem. One is to have an earth-free room, in which everything connected to the rf earth is a minimum of 2m away from anything bonded to the electricity earth, and then **disconnect** the earth lead from the plug on the equipment mains lead. Fit a circuit breaker (eg RS Part No 334-094 on the cable) or replace the wall socket with one incorporating a breaker (eg RS 331-095 or 331-102). Then remember that **nothing** connected to the mains earth is allowed within 2m of the equipment. This includes light switches where an exposed metal screwhead connects to the mains earth. No kettles, coffee pots, vacuum cleaners, soldering irons—nothing connected to the mains earth. So if a fault occurs, it is impossible to get a shock. But don't disconnect the earth lead **until** you've fitted a circuit breaker. It is **vital** that the earth lead doesn't flap around inside the plug—so bring it back through the cord grip and insulate it *outside* the plug. Then attach a label to the plug saying "DANGER, NOT EARTHED". This means that if you lend your rig to someone—or send it away for repair—the people plugging it in are aware that it isn't earthed. Attach a label to the rf earth where it's joined to the rig saying: "SAFETY EARTH—DO NOT REMOVE".

If you can't establish an Earth-free zone, then a simple way out exists. This is to bond the rf earth to the electricity supply earth at the consumer unit and nowhere else. The earth lead must be at least 80/0·44mm so that it can carry a heavy current (a less-flexible (10mm²) lead is 7/1·35mm). When the extra earth lead is installed, it should conform to the IEE wiring regulations. These will be found in your local library—but if in doubt, consult a competent electrician.

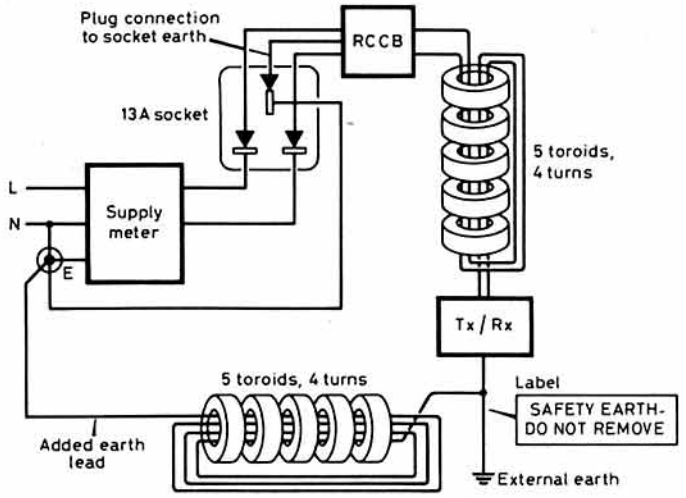


Fig 7. Earth lead for pme with rf choke—the SAFE method

The problem still exists of keeping rf noise that is on the mains away from the rig. Here the use of ferrite rings is indicated. These are available from RSGB HQ, and by winding the earth lead around the rings, an rf choke is formed. The product of turns × number of rings should be about 20, and with a thick earth lead it is best to use about 3 to 4 turns with 5 to 8 rings. Now, the earth lead is connected at the wall socket, and it is a good idea to use a circuit breaker. The mains lead to the rig is wrapped around ferrite rings to keep rf noise out. But don't forget the label where the added earth lead from the mains supply joins the rf earth. John Q Newham's installation now looks like Fig 7. If the earth lead is very long, it is often worthwhile screening it; Fig 8. The screening is only connected at the earth end.

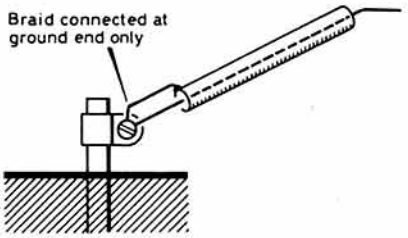


Fig 8. The screened earth lead

Earthing equipment externally in a modern house (or possibly even a recently rewired one) can lead to the danger of fire or electrocution. If these simple guidelines are followed, then there will be no safety problems.

Let's just go back to John Q Newham. Starting on 144MHz he says he doesn't need an earth, so this doesn't apply. If he doesn't mind his antenna floating at 240V in an accident, no. If he doesn't mind the lack of lightning protection, it doesn't apply. But a sensible installation will earth the antennas for dc where possible, and provide a good solid earth for lightning protection. Remember that nothing protects against a direct strike, but lightning conductors do provide a discharge of the atmosphere. Relying on the mains earth can be very expensive.

If you haven't got a good external earth on the antennas, disconnect them *before* you work on them. If a neutral fault occurred while you were working on them it could kill! If you own an old-fashioned power tool with a metal case which is connected back to the mains earth, **don't** use it outside —or, of course, in an earth-free area. If you've got pme and an outside water tap, consult the Electricity Board.

You don't have to have pme. It is possible to have the pme bonding removed, **but** do get this done professionally. Have an rccb fitted to supply the total house load, and, for good measure, have some earth rods driven to provide a good earth. Ensure that the bonding of the rf earth to these is by a heavy conductor—it's unlikely that any rf on the earth will cause problems except in your house! **Do** make sure you test the **rccb** once a month!

Finally, how about the neighbour whose equipment is suffering because of emc difficulties? The same rules apply on earthing, only more so. Electrocuting a neighbour or setting fire to his house won't make you popular—even if it does stop him complaining! Earthing is easy—just as long as it is done correctly. That's how John becomes John Q Oldham.

Technical Topics

by Pat Hawker, G3VA

EVER SINCE broadcasting began in the early 'twenties, radio amateurs have faced problems of electromagnetic compatiblity (emc) and electromagnetic interference (emi or rfi), first in the form of bci, then as tvi and more recently the possibility of upsetting almost anything electronic, especially systems using cmos devices.

Yet it is only in the past few years that electronic engineers, as a whole, have been forced to wake up to the way in which so many of their cherished electronic systems have become vulnerable to strong local rf fields—and still do not recognise that almost any low-cost digital system itself generates and radiates hash. Because rf shielding and/or filtering add to the cost of consumer electronics, many manufacturers have tended to shut their eyes and ears to emc problems, most of which are far better solved at the design stage than by having to add on extra filters, screens etc.

At a recent IEETE symposium on "Electromagnetic interference: practical design and construction techniques" Professor Mike Darnell of Hull University made a strong plea for more emphasis to be placed on emc during engineering training. Emi and emc, he pointed out, were still largely neglected as academic disciplines by institutions of higher education. In fact, he stressed, many advanced electronic/electrical courses ignore the area completely. He suggested that the importance of emc is still not fully appreciated in the academic sphere; is not recognized as a true academic discipline; and no specialist emc engineers are being produced within the higher educational system.

My own feeling is that all electronic engineering training should include some awareness of emc/rfi etc and that this field of expertise should not be left only to specialist engineers. But then, as we have stressed before, training in electronics engineering is more and more being concentrated on fashionable "digital", with "analogue" and "rf design" largely ignored.

Broadbanding the dipole

A perennial topic is the *Q*, and hence the effective resonant bandwidth, of an antenna. The higher the element *Q*, as in any resonant circuit, the narrower the bandwidth, the more critical the tuning, and the greater the detuning influence of nearby objects. For amateur radio, and for many professional communications applications, it is usually a significant advantage for an antenna to have a low *Q* structure. This implies either a wire at least a full wavelength long or some form of "fat" dipole which may use large diameter tubing (as for most hf and vhf arrays), wide copper or aluminium foil, or multiple wires which can range from the separate twin wires of a folded dipole to the classic multi-wires of a "caged dipole" or the various forms of discones, biconical monopoles, etc. Such structures radiate much the same power as a simple half-wave resonant wire dipole, but over a greater span of frequencies.

In practice, a simple wire dipole has a bandwidth to its −3dB points of something like ±2·5 per cent of its resonant frequency. This is adequate for most amateur bands, with the exception of the North American 3·5MHz band (3,500 to 4,000kHz) *provided* that the antenna stays accurately trimmed to mid-band frequency when elevated. Short elements inductively-loaded have very high *Q*; "stretched" dipoles capacitively-loaded have low *Q* and are much less affected by nearby wires or trees etc, but need a good deal more space.

The classic folded-dipole with twin wires of equal diameter remains an extremely useful single-band antenna. There is still considerable room for experiment in the use of different diameter conductors to provide any desired feedpoint impedance (Arch Doty, K8CFU, has just completed an extensive and very interesting study of the impedance transformation characteristics of folded monopoles which I hope to refer to soon). With equal diameters, folding a dipole raises its feedpoint impedance by a factor of four (ie nominally 300Ω for a single-element antenna).

However, many years ago it was shown that a folded dipole in which the element itself is largely formed from coaxial cable does not exhibit this "times four" factor and can be fed directly from similar cable: Fig 1(a). A variation on this antenna (but including a 1:1 balun) was patented a few years ago in the USA (R D Synder "Broadband antennae employing coaxial transmission line sections" US Patent 4,479,130 October 23, 1984) and has been marketed for professional or amateur radio use, with rather extravagent claims as to its performance, as the Synder dipole: Fig 1(b). This antenna has recently been analysed by a well-known American antenna engineer ("Evaluation of the Synder Dipole" by Robert C Hansen, *IEEE Trans on Ant & Prop*, February 1987, pages 207–10). Although Hansen is critical of the claims made for the Synder dipole and points out that the bandwidth is roughly equal to that of a dipole of the same fatness, with a lumped resonant circuit at the feedpoint terminals, or to that of a conventional folded dipole, he does show that these coaxial-type elements do not raise the impedance by the factor of four. This would seem to me to indicate that the original version (Fig 1(a)) can still be an effective single-band antenna, fed by coaxial cable without a balun, without infringing the Synder patent.

A rather different technique for increasing the bandwidth of a fat dipole element is *resistive loading*. Correctly applied, this can result in a really broadband dipole, capable of being used over virtually the entire hf spectrum. The best-known example is the so-called "Australian dipole" with 300Ω feed, due to Guertler and Collyer and described in *TT* June 1974

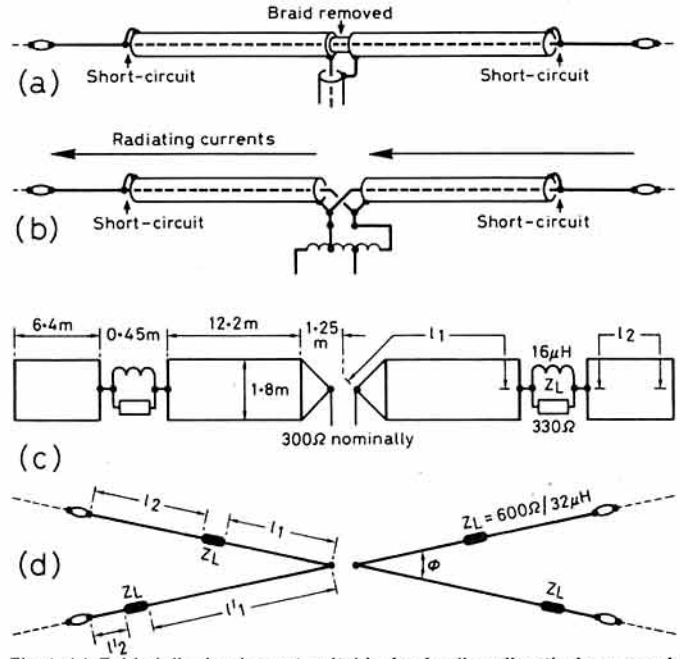


Fig 1. (a) Folded-dipole element suitable for feeding directly from coaxial cable. Overall length of the element is an electrical half-wave with the coaxial section also an electrical half-wave taking into account the reduced velocity ratio of the cable. (b) The Synder dipole with 1:1 balun. (c) The "Australian dipole" as described in *TT* June 1974 and September 1984. (d) Broadband resistive-loaded antenna reported by Austin and Fourie in *Electronics Letters* covering 3 to 30MHz with good efficiency when fed from 500Ω line

and September 1984, and in "sloper" or monopole form in *TT* September 1984: Fig 1(c). It could be argued that the T2FD antenna (*TT* July 1986) is a much earlier though less sophisticated form of a resistive-loaded antenna.

Dr Brian Austin (ZS6BKW and now also G0GSF) whose detailed computer studies of the G5RV-type antenna (*TT* May 1982 and *Rad Com* August 1985, pp 614–7, 624) attracted considerable attention, has more recently become intrigued with the possibilities of resistive loading ("Wire antennas for tactical hf communication" Part 1, *Elektron* June 1986 Part 2, July 1986). Together with A P C Fourie he has recently described an "Improved hf broadband wire antenna" (*Electronics Letters*, 12 March 1987, pp 276–7). In this he reports an inverted-V form of "fat" (diverging wires) resistive/inductive loaded dipole (Fig 1(d)) which can result in an antenna covering the entire range 3–30MHz with an swr not exceeding 2·5:1 and a radiation efficiency better than 40 per cent even at the low-frequency end (40 per cent may not seem high but in fact it is very much higher than with most broadband antennas!) when fed from 500Ω transmission line. This seems a highly promising development of the Australian dipole, and with Dr

Austin now based at Liverpool University it is to be hoped that he will find time to describe some of his recent work in *Radio Communication*.

In-channel-select fm threshold extension

Erwin David, G4LQI/VE2UQ and ex-PA0CG, draws attention to a short piece he wrote for the East Kent Radio Society's *Carrier* newsletter, based on an item by PA0SE in *Electron* November 1986. This describes a new "in-channel-select" (ics) technique that can significantly improve the sensitivity and selectivity of vhf/uhf fm receivers. A commercial "black box" adapter is being made and marketed by the German firm H&C Electronik Hansen & Co of Berlin, which is claimed to improve the s:n ratio of weak fm signals by 6dB and rejection of in-channel splatter from stronger adjacent-channel signals by some 20dB.

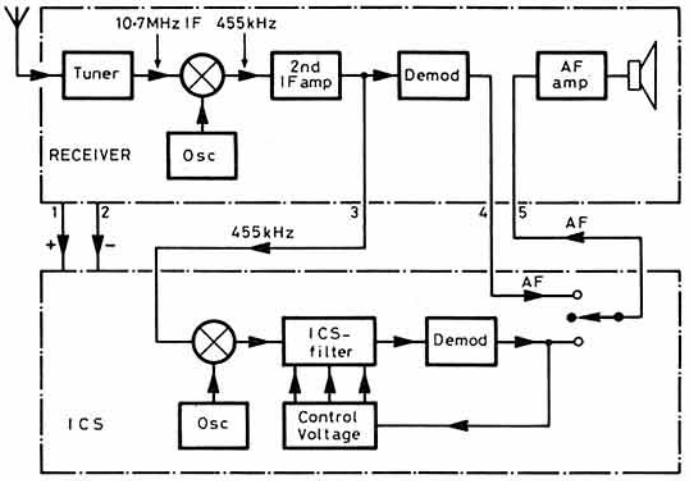


Fig 2. "In-channel-select" unit as marketed by a German firm to enhance intelligibility of weak fm signals and improve adjacent channel selectivity. The 1,800Hz filter tracks the signal

As far as I can judge, the ics technique appears to be a form of threshold-extension demodulation, as originally developed for professional reception of weak satellite signals, but implemented in a form suitable for use with typical amateur radio fm transceivers. The German unit, shown in outline in Fig 2, features a very narrow voltage-controlled filter that automatically tracks the fm signal. For 145MHz (25kHz channelling) the filter bandwidth is only 1,800Hz, ie about one-tenth of the usual i.f filter bandwidth. The receiver's fm detector output voltage, proportional to the instantaneous deviation, steers the ics filter so that it tracks the incoming signal. In demonstrations at a Dutch/German hamfest last year, PA0SE reports that audibility of weak signals was improved by the unit from Q1 to Q4, though never completely to Q5. For strong signals it is usually advisable to switch threshold-extension demodulators out of circuit. The German hardware is being offered primarily as an external unit for base-station receivers, although the principle can be applied to mobile receivers. A threshold extension demodulator does not, of course, improve the front-end noise factor of a receiver, but there is no doubt that the technique does make it possible to copy signals that would otherwise be unintelligible. It certainly seems a development worth keeping in mind.

R-C-L parallel impedance bridge

From Jan-Martin Noeding, LA8AK, comes a simple form of antenna impedance-measuring bridge. He believes that there are still many amateurs who are puzzled about the nature of antenna impedance and who believe it is possible to assess this as though it is always a pure resistance. Others use elaborate circuits to measure the reactance, yet arrive at results that have little bearing on reality, since they often discover that the measured capacitive or inductive reading of the antenna or transmission line varies with the impedance.

After examining and building a number of bridges, LA8AK has settled on the Wheatstone arrangement shown in Fig 3. He writes:

"This bridge is very easy to build and calibrate. It has no coils, and the circuit is theoretically independent of frequency. In practice the critical factor is the lay-out. I built the unit in a box, 155mm wide, 75mm deep and 50mm high. Within the 1 to 18MHz range of my signal generator, the reading shows very little variation.

"Inductance is measured with a capactive representation, from the formula $L = 25{,}300/(f^2 \times C1)$, assuming that C1 and C2 are calibrated for equal minimum capacitance. The complete impedance or admittance is calculated from the measured values. The device uses a sensitive form of quasi-logarithmic amplifier (IC1) to compensate for the non-linear diode characteristic. While values as low as 10pF are easily measured in parallel with 50Ω (less at 3MHz), the available accuracy is dependent upon the gain of the dc amplifier. However, the user should recognize that it makes little sense to measure 10pF in parallel with 10Ω at 3MHz since the equivalent inductance would be 281μH!

"To calibrate the bridge, connect a 100Ω resistor across the input, and then use a series of fixed capacitors of known value across the variable capacitor *not* being calibrated (ie across C2 while calibrating C1). For example, with C1 at minimum and a fixed 10pF across it, then C2 must be increased by 10pF to achieve balance, and so on.

"Since it is difficult to obtain potentiometers having good performance at rf, I used somewhat larger than usual trimming potmeters, screened from

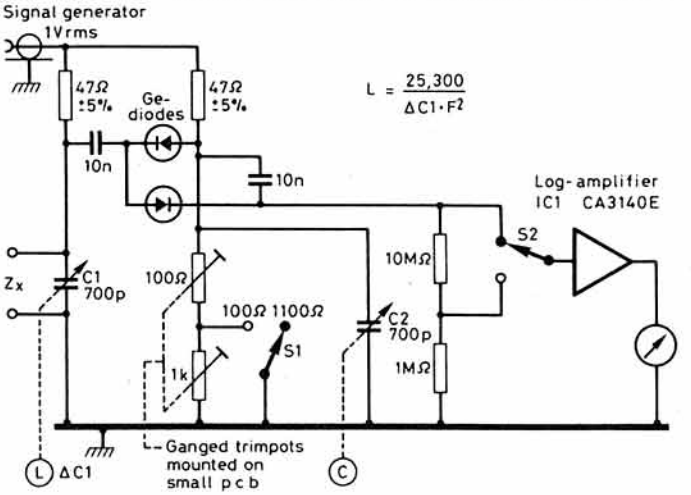


Fig 3. LA8AK's Wheatstone bridge for R·C·L measurements between about 1 and 20MHz

each other by a piece of aluminium sheet between them, with the potmeters ganged by a plastic shaft cut from another potentiometer.

"An excellent explanation about parallel to series impedance conversion will be found in the article "A single-stage linear amplifier for 50MHz" by John Matthews, G3WZT (*Rad Com* June 1986, pp404-8).

"A noise-bridge version of this instrument may also be considered. However, it is rather impractical to operate a receiver in the garden when adjusting a 1·8MHz antenna. With the bridge as shown, one needs only a coaxial cable from a signal generator located in the shack. On the other hand, a noise bridge has the important advantage that it does not produce unwanted signals on the bands, though it may be difficult to use when a band is crowded. The basic bridge arrangement, however, is suitable for both versions."

Receiver circuit ideas

Dave Parnell of Pickering, North Yorkshire, has sent along some novel ideas that he has used in home-built hf receivers; suggestions that could be adapted to suit specific requirements, rather than intended for precise duplication.

Variable-bandwidth crystal ladder filter. The bandwidth of a crystal ladder i.f filter can be made variable over a useful range simply by making the middle capacitor variable. This can be done conveniently by using a varicap diode or, in his case, a 1W zener diode acting as a variable-capacitance diode: Fig 4. With 8MHz crystals, he finds that the −6dB points can be varied continuously from 1·1kHz to 2·8kHz by varying the control voltage from 0 to 8V. The bandwidth variation is not symmetrical about the centre frequency but is entirely on the high-frequency side of the passband response. Clearly, this simple form of bandwidth control must

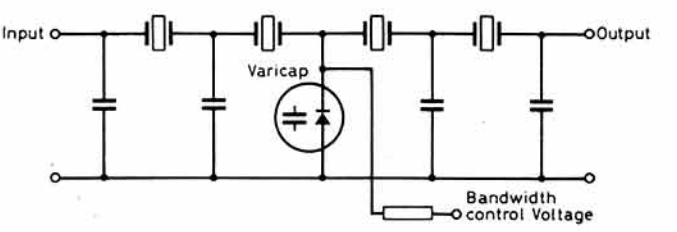


Fig 4. Simple technique for varying the bandwidth of an 8MHz crystal ladder filter from about 2·8kHz down to 1·1kHz

result in a slightly sub-optimum stop-band response, but in practice this seems to be insignificant.

2nd i.f amplifier with agc. Dave Parnell has used the Plessey SL6270 "vogad" ic device at a second i.f of 140kHz: Fig 5. This is very effective provided that suitable reductions are made in the value of the capacitors which determine response timings. The agc characteristics are excellent. The time constant can be changed by switching in different capacitors. It is also possible to change the gain manually by applying a control voltage to the agc time-constant capacitor.

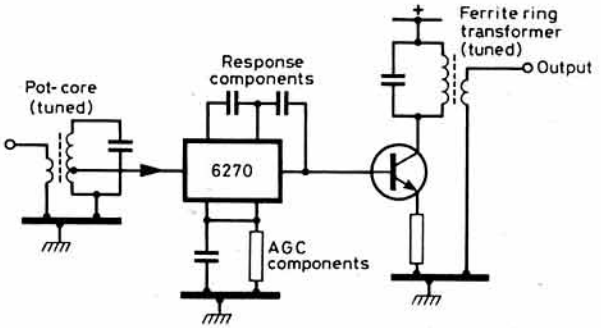


Fig 5. Use of an SL6270 vogad ic at a second i.f of 140kHz

Multi-band transmission line oscillator. Dave Parnell writes: "I use a transmission line oscillator with a quarter-wavelength of miniature coaxial cable (as previously described in *TT*) *but* I switch in binary lengths of cable to provide 32 frequency bands with the aid of five miniature toggle switches: Fig 6. This covers 14 to 36MHz in 32 overlapping bands. The highest band is 2·3MHz wide, the lowest 580kHz. I follow this with a buffer amplifier and a switchable divide-by-two flip-flop which gives me another 32 bands from 7 to 18MHz. Used in a receiver with an 8MHz i.f, this form of local oscillator provides a frequency range of 10kHz to 28MHz (with a small gap at the i.f)."

Ring mixer drive: The advantages of using a near square-wave drive to a ring mixer, in order to achieve optimum dynamic range, are well documented. Dave Parnell uses bus-driver chips, of the type normally used to drive microcomputer data buses, in order to provide square-wave drive to a Schottky-ring front-end mixer. He uses 8T26 chips which are high-current Schottky-clamped bus drivers. This gives fast edges and plenty of drive power. Other types may be suitable. A terminating resistor must be used: Fig 7.

Re-forming electrolytic capacitors

In the item "Refurbishing valve receivers" (*TT* March 1987, page 181) mention was made of the need to "re-form" any high-voltage electrolytic capacitor, as used in valve equipments, when it has been out of use for more than about a year, or even less in tropical climates. Otherwise the initial leakage current may be high enough to damage other psu components, or even result in an exploding capacitor. It was pointed out that the usual technique is to run the electrolytic capacitor for about half-an-hour or more through a high-wattage series resistor of the order of about 8,000 to 10,000Ω. Two useful comments have been made on this topic.

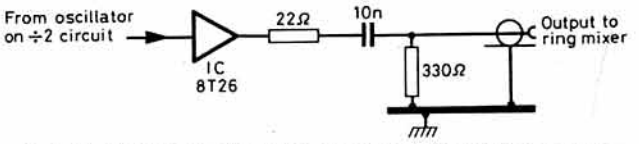


Fig 7. Method of providing near square-wave drive to a ring mixer

Douglas Byrne, G3KPO, writes: "While agreeing that high-voltage electrolytic capacitors should be 're-formed' in any valve receiver which has not been used for some months, this is easier said than done! Removing the chassis and feeding voltage through a resistor to each capacitor is a time-consuming task. It is much easier simply to apply the mains supply through a Variac variable-voltage transformer which is 'wound up' slowly over several hours, albeit keeping an eye on the colour of the rectifier anodes and watchful for any undue heating of the transformer. For those without a Variac, the receiver can be operated with a small light bulb in series with the mains lead, or even using a small board constructed especially for the purpose. This can have a couple of bulb-holders and two switches plus an output socket and a lead to the input plug: see Fig 8.

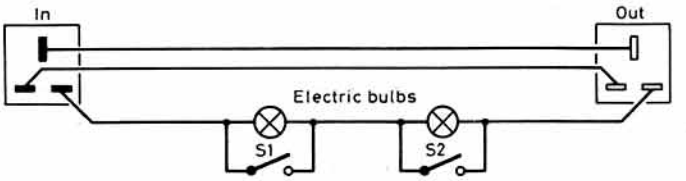


Fig 8. Use of electric lamp bulbs to reform electrolytic capacitors in situ

Mike Shepperd, G8YZW, also develops this theme by sending along the circuit diagram (Fig 9) of a variable voltage dc psu, originally published in *Radio Constructor* November 1953, intended specifically for the purpose of re-forming electrolytic capacitors. He writes:

"This unit covers the range 40 to 400V when a 200 – 0 – 200V transformer is used. Valves such as the 807, 1625, 6Y6 etc, will stand the piv applied to the electrodes and can often be recovered from the junk box or obtained at reasonable cost. R4 controls the voltage, with R3 connected

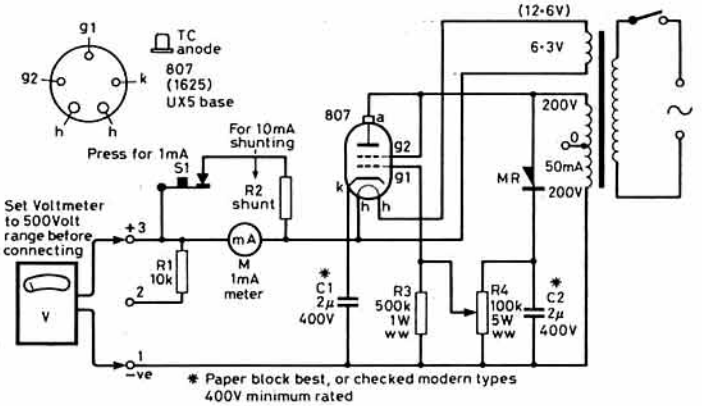


Fig 9. Variable voltage power supply unit for re-forming electrolytic capacitors as originally described in *Radio Constructor* November 1953. R1 reduces unwanted heating of the capacitor. Use a series external resistor to suit capacitance rating. R4 varies the output voltage over the range of about 40 to 400V

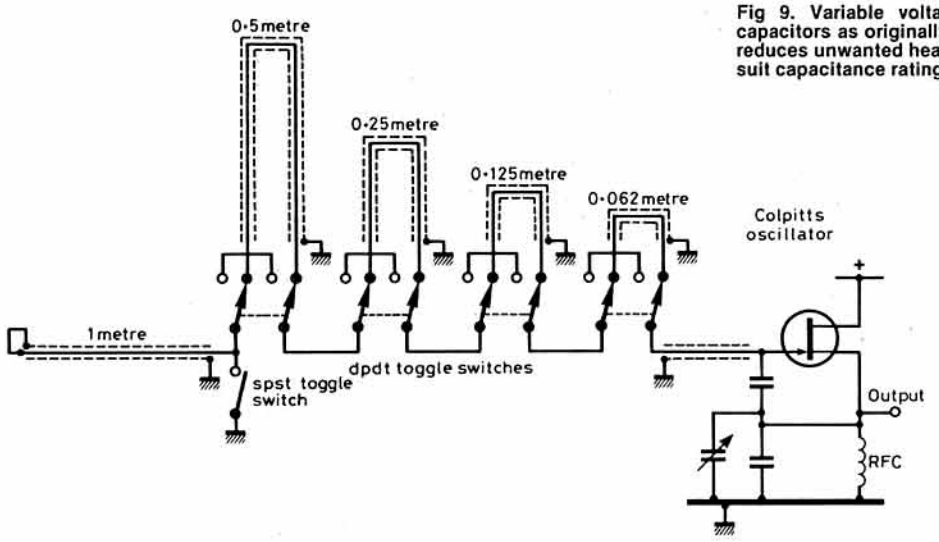


Fig 6. Multi-band transmission-line oscillator

to the slider to ensure that the voltage drops to zero if the slider of R4 fails to make contact for any reason. Ex-WD paper block capacitors used to be common, in 1, 2 and 4μF values at 400 – 600V ratings and ideal for C1 and C2, being usually reliable. Otherwise a good modern 500V or better capacitor should be used. Pressing S1 allows the basic 1mA meter to indicate low currents, otherwise the meter should be shunted with a suitable resistor to about 10mA fsd. The capacitor to be re-formed should be connected to terminals 1 and 2, with a voltmeter set to the 500V range to terminals 1 and 3.

"Set R4 to the lowest voltage position and switch on. Allow the 807 to warm up, then slowly advance the voltage control to the working voltage of the capacitor, watching for excessive current indication, and/or heating of the capacitor. Should this occur reduce the voltage and allow the capacitor time to cool down. Check again at low voltage to see if it begins to re-form, indicated by a gradually decreasing current; then gradually increasing voltage. If it again shows a tendency for the leakage to rise, throw it away! A couple of hours soaking at its rated working voltage will usually reduce the leakage current to an acceptable level, but an extended period will ensure that the component is as well re-formed as it can be. Make sure that R4 is *always* set for minimum voltage before switching on."

As noted in the March *TT*, a modest leakage current is always to be expected with a high-voltage electrolytic capacitor. The values suggested were, say, 0·5mA for an 8μF capacitor, about 2mA for 32μF etc. A variable voltage psu dedicated specifically to this purpose may be regarded as a bit of a luxury unless this is a regular task; however, the G3KPO external mains bulb series-resistor seems an easy makeshift substitute.

The pi-network and the variometer

The history and development of the pi-network (*TT* November 1986, January 1987) continues to attract interest and to turn up some new ideas. By coincidence two letters have come in from Canadian amateurs on this topic. L Herrington, VE4QL (one-time G5QL) of Winnipeg, recalls that the pi-network, as a universal matching network, was first brought to the notice of radio amateurs by Arthur Collins, W0CXX, founder of Collins Radio, about 1931, in *QST* or one of the other American amateur radio magazines of that period.

He recalls ruefully that he used one with an end-fed wire, forming a half-wave or aog (Act of God) antenna. But since, in those days, few amateurs had any appreciation of using swr meters for matching adjustments, he found the pi-network a little puzzling since it appeared to tune at numerous settings of *L* and *C*. Eventually he found that an rf ammeter in the antenna wire enabled him to adjust for optimum results. This, as I mentioned in the March *TT*, is still an entirely valid technique even when a small torch bulb is substituted for the rf ammeter. VE4QL comments: "Today, the pi-network appears to have become an exercise in mathematics. We've come a long way in radio knowledge of antennas, what with atus, swr, noise bridges etc, yet I still have more confidence in rf ammeters and/or neon bulbs!"

Kurt Grey, VE2UG, of Sept Iles, Quebec, also has memories of the 'thirties that deserve consideration. He remembers that German marine transmitters (both commercial and naval) of the early 'thirties used pi-networks extensively, often with a "variometer" as a continuously adjustable inductance: Fig 10(b). For instance, the Lorentz LO4OK39 two-stage transmitter used three variometers, one each in the master-oscillator, power-amplifier (two valves in parallel) and antenna matching network. VE2UG also points out that the Collins ART13 aircraft transmitter (813 pa) similarly used a variometer in a pi-network arrangement: Fig 10(a).

VE2UG writes: "The basic difference between the American and German versions was the coupling used between the power amplifier and the antenna tuning. The German version provides a higher degree of attenuation of unwanted harmonics. The value of each *C* is in the range 10 to 50nF. Such capacitors were made in one large block of mica capacitors with terminals sticking out on one side, so eliminating any wiring between the individual capacitors. The block formed, so to speak, a mica capacitor with taps.

"This brings me to an interesting point. But first a word about 'variometers'. These comprised two series-connected coils arranged so that one section can be turned through 180° rotation, changing from the series-aiding to the series-opposing condition. They could thus provide a continuously-variable inductance without incurring the well-known problems of the rubbing contacts (or the unused turns) of the roller-coaster form of variable inductance.

"The book *Radio operating questions and answers* by Hornung and McKenzie, a standard manual for marine and aeronautic radiomen for many years, stated:

'*Question:* Why do many marine transmitters employ variometers rather than variable capacitors as the tuning adjustments?'

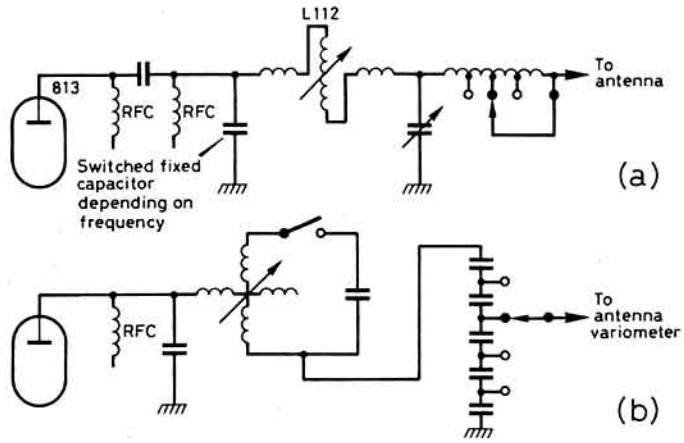


Fig 10. (a) How a variometer was used in the pi-network of the Collins ART13 aircraft transmitter. (b) Arrangement used in German Lorentz marine transmitter in which three variometers were used

'*Answer:* Because, in order to maintain a proper *Q* for various frequencies, the inductance rather than the capacitance of the oscillatory circuit must be varied. The use of variometers also permits constant *LC* ratio.' "

VE2UG adds: "It is a pity that the variometer has lost it's place in amateur radio equipment, Admittedly, they are rather expensive to fabricate. Some time ago, in correspondence with an hf engineer working for a well-known amateur radio organization, he maintained that the variometer was an historic oddity used for receiving purposes only in the early years of this century. He was clearly unaware of the fact that a very large variometer is currently used in a 2MW vlf transmitter in Massachusetts!

"Finally, I would like to mention that in contrast to the American-made ART13 variometer, fabricated from silver-plated copper wire unsupported by any former, the German-made variometers utilized silver windings plated on to a ceramic former and had a temperature coefficient of only a few parts per million. Thus, with a selected capacitor network of appropriate temperature coefficients, the stability of the master oscillators was very close to that of a non-ovened crystal oscillator."

A further recollection of how a pi-network was used in the Collins 18M-5 transmitter-receiver, developed originally for one of Admiral Byrd's Antarctic expeditions, comes from Colonel Jerry Parker whose recent callsign, G1SML, belies a long and distinguished career as a professional radio communications engineer with the Post Office and also wartime involvement with clandestine radio links in the Middle East and Western Europe.

He recalls that in Cairo in 1941 or 1942 he bought from special funds a number of the 18M-5 equipments which had a 6V6G as a crystal oscillator or vfo, an 807 pa, a pair of 6V6G as high-level audio modulator (a.m) and a five-valve superhet receiver with a tuned rf stage (12SK7, 12SA7, 12SK7, 12SQ7, 6G6G). This was, for its time, a well-designed, compact, transportable radio station (14·25in high 9·6in wide, 9·75in deep, weight 25lb 10oz plus psu). It provided (provides) an rf output of 15W cw between 2 and 8MHz, 12W cw between 8 and 16MHz, 5W carrier for a.m speech. The pi-network used as an unbalanced output tank circuit of the transmitter permitted operation into a wide range of load impedances on all frequencies.

The uses to which the 18M-5 equipments were put by the British included supplying a number to General Mihailovic's Cetniks before British support swung behind the partisans of Marshal Tito (Josef Broz). Jerry, G1SML, and his son Micky, G1SMM, still have an 18M-5 in working order.

A modern paraset

QRP enthusiasts are fond of telling those of us who like to have a little power in hand, if only to cope with fade margins, that they can make plenty of hf cw contacts with rf power outputs measured in milliwatts. This is true, though on most bands it does call for the use of reasonably-efficient antennas; it is also likely to be found that a fair percentage of minipower contacts on 7 and 10MHz fail to be completed either due to interference or to the signals fading out. Milliwatts work best along near-muf paths, which implies that any change in ionospheric conditions can have a dramatic effect on signal strength; such signals show an alarming tendency to drop from around S7-8 one minute down to noise level the next as the skip distance changes.

I hope I do not sound unduly prejudiced against milliwatt exhalers, but

in excuse I recall having to struggle to copy cipher traffic from dry-battery valve transmitters using crude antennas during the second world war. On the other hand, transmitters providing around 3 to 5W rf output, even with an aog throw-out antenna, usually had enough in hand to cope with normal fading as experienced on signals near the optimum working frequency (ie about 15 per cent lower than the muf for the specific path).

One of the simplest transmitter-receivers used for clandestine radio from 1939 to 1944 was the so-called Mark 7 or Mark 7/B made by Special Communications but also used for a short period by SOE as the "paraset". A circuit diagram and panel layout of the Mark 7/B was given in *TT* (November 1982, p961) showing that the 0-v-1 receiver used two metal 6SK7 valves, and the crystal-controlled transmitter a single 6V6.

A letter from S Pauwe of Mijdrecht, Holland (callsign not given), describes how he has drawn upon the basic Mark 7 arrangement, although he has never seen an actual model (I recall seeing many of them stacked up in a room in Paris in October 1944 after they were recovered from the French Resistance operators, but I fear they must all have been destroyed later). He writes:

"I have never seen a Mk7 except on a slide at a lecture by John Brown, G3EUR, and the diagram you gave in *Wireless World* (January/February 1982). But having gained some experience by constructing breadboard models, I set out to construct an improved version, having a suitable box on hand and digging out parts from my junkbox. Basically, my receiver follows the original circuit arrangement except that it is arranged to tune just the cw segments of the 3·5 and 7MHz bands and uses 6SH7 valves rather than 6SK7 variable-mu valves, since I consider a regenerative detector should use a sharp rather than a remote-cut-off valve.

"The transmitter uses a 6V6 or 6L6, but with pi-network output switchable for 3·5 and 7MHz. My first addition was a side-tone oscillator, but to avoid using transistors I adopted an old favourite microphone/speaker howl-round oscillator with a carbon microphone. However, I did experience trouble where least expected: due to stray hf, the particles in the microphone stuck together, with the resistance dropping to a very low value. It could be restored by tapping the microphone (shades of the coherer) but would again fail after a few symbols. A little rf suppression has cured this problem.

"The next step was to provide automatic changeover from transmit to receive. My first intention was to use the cathode current of the 6V6 to operate a relay, but I found that this could be eliminated thus making possible full break-in. To achieve this I had to depart from my original intention of not using any parts that were not available 45 years ago. In practice I use a zener diode permitting the receiver to operate between symbols. There are some clicks (reduced by back-to-back diodes across the af output) but the receiver stays on frequency well enough to make break-in a most useful facility.

"Tuning is very simple. The transmitter is adjusted using a dummy load. After switching to the antenna, the atu is adjusted to provide the same

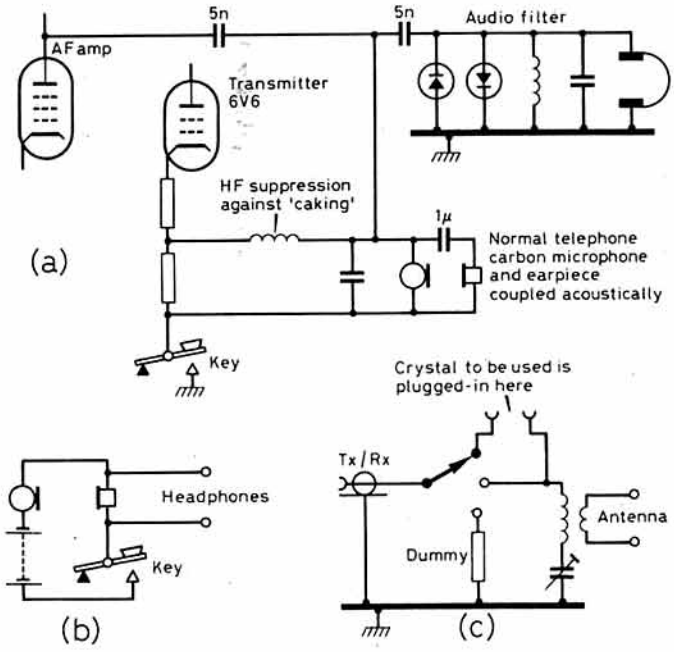


Fig 11. Circuit arrangements used to improve the basic Mark 7/Paraset transmitter receiver to provide sidetone, audio limiting, audio filtering etc

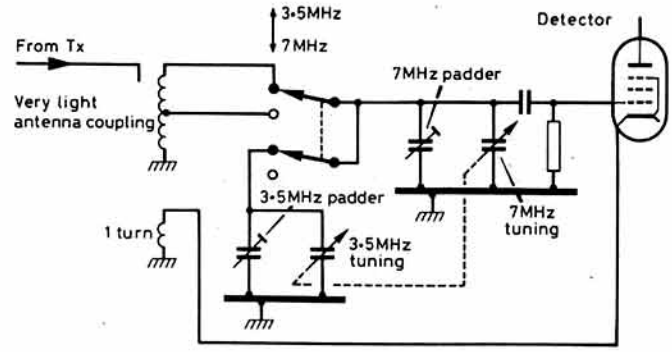


Fig 12. Improved tuning arrangement for bandspread on 3·5 and 7MHz (range 140kHz)

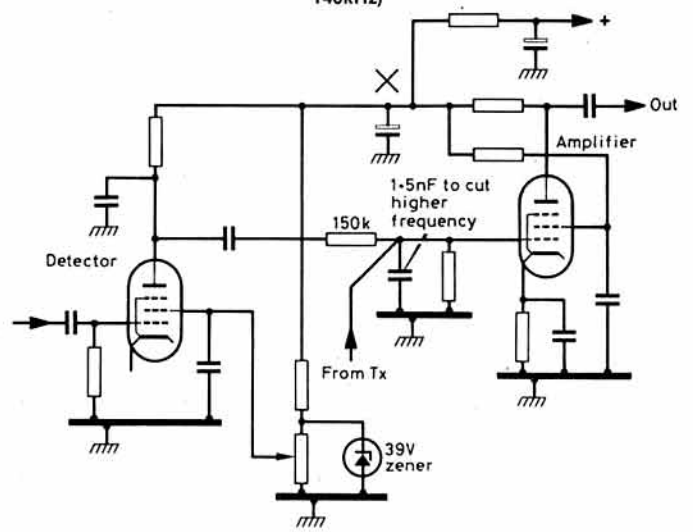


Fig 13. Circuit used to maintain more constant ht on regenerative detector while transmitter is being keyed

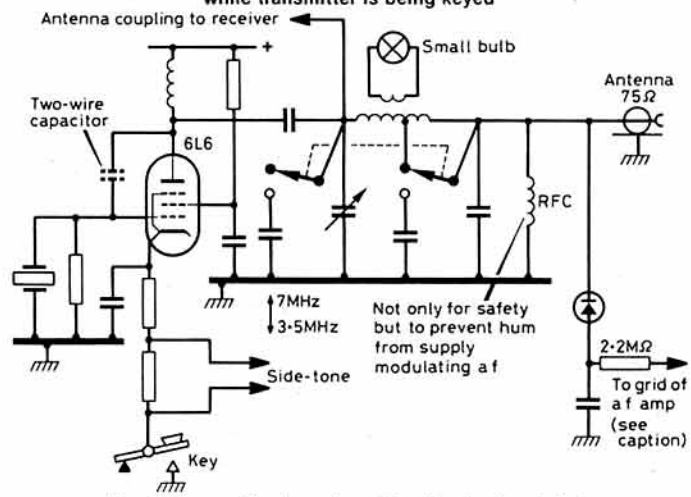


Fig 14. Transmitter based on 6L6 with pi-network tank

brilliance of the bulb. The receiver is adjusted to the crystal frequency by simply putting the crystal to be used in the transmitter in series with the lead between the transmitter and atu. Passing the crystal frequency on the receiver tuning gives an audible plop in the headphones, permitting near zero-beat netting." Figs 11, 12, 13 and 14 show some of his ideas.

"Operation with this simple rig is limited at the moment by lack of suitable crystals as I have only one that I can use, but in due course more will turn up in the flea markets."

None of the original suitcase sets was intended to be used on the same frequency as the base station, since this would have made interception and detection of the clandestine station easier. But with the modifications suggested there is little doubt that this type of compact, attache-case, rig could still prove effective and provide a stronger signal than many of the solidstate miniwatt rigs when used with a mains psu or a dc-dc inverter with a car battery capable of providing both heater and ht power.

Audio and solidstate

In the April *TT* a brief reference was made to the way in which some hi-fi enthusiasts are being persuaded to buy expensive "super-quality" audio cables, and the belief generated by some writers that KT88 valve amplifiers have some inherently better "sound" than even well-engineered solidstate amplifiers. My purpose in raising these topics was to underline the fact that we all need to be on our guard against the creation of technical myths as a sales technique. Fortunately, the advertising of amateur radio equipment and accessories has, with some usually minor exceptions, been rather more restrained in advancing technical hype, although the old advice of *caveat emptor* (let the buyer beware) remains valid.

Maurice Whatton, G8FUR, who, until he retired, was responsible for the production-design of high-quality BBC monitoring loudspeakers, has been provoked to comment in rather more detail on the question of audio mythology. He writes:

"Some years ago, I helped to organize and take part in a listening test, under carefully-controlled conditions. None of a panel of very experienced listeners, recognized possessors of 'golden ears', was able to detect any difference between ordinary heavy duty cable and the so-called 'special loudspeaker cable' when this was used in a reasonably long length as a connection cable for loudspeakers.

"Similarly, the definitive test between valve and solidstate amplifiers was that carried out by Peter Walker of Quad using amplifiers manufactured by that firm. Again the tests were conducted under carefully controlled conditions with an experienced listening panel. The results were analyzed statistically and then published in *Wireless World*. This showed that the panel could not distinguish between valve and solidstate amplifiers.

"It is, of course, the case that some early transistor audio amplifiers suffered from three defects:

(1) Crossover distortion, a particularly objectional form of audio distortion now virtually eliminated by improved design.

(2) Frequency limitations of early transistors meant that at higher audio frequencies the harmonic distortion increased. New types of transistors solved that problem.

(3) Overloaded stabilized power supplies. The hard clip produced when amplifiers with stabilized power supplies are overloaded is very much more objectionable than the soft clip of unstabilized units. It is often not appreciated that while the average power of speech and music may be quite small, the peak output may be very high and the amplifier must deliver this peak output without distortion. (This is particularly the case with high-fidelity reproduction, though not unimportant even for processed speech on ssb transmitters—*G3VA*).

"Finally the current trend to audio power amplifiers using power mosfets means that designs can now be produced that are as good, or in some cases better than, the preceeding amplifiers in the recording or broadcast chain. The main limitations are still in the input and output transducers such as microphones, disc reproducers and the loudspeakers. Even the highest-quality loudspeaker available produces many times the distortion of any reasonable amplifier."

More views on lightning protection

Recent references to the difficulty of providing adequate protection of amateur radio equipment—particularly solidstate equipment—against the effects of electromagnetic pulses (emp) from lightning and potentially from the even more devastating emp that would result from high-altitude nuclear explosions (*TT* November 1986, p781, January 1987, p31, March 1987, p183) have brought in a number of additional comments.

First and foremost, it should again be stressed that few if any of the usual precautions taken by radio amateurs are capable of providing protection against direct strikes, or even strikes in very close proximity to the shack or mast/tower. The November 1986 *TT* showed that for professional broadcast installations designed to sustain direct strikes on high masts, it is recognized that it is *essential* to have extremely good earthing systems, even to the extent of undertaking blasting operations at rocky sites to facilitate the injection of highly-conductive solutions in pursuit of "earthing improvement". But it was also noted that isokeraunic charts indicate that, at least in those northern areas beyond the Watford Gap, the number of thunderstorms experienced in any year is relatively small.

E McFarland, G3GMM, recognizes that many UK amateurs tend to be almost indifferent to the question of lightning protection "but, come a long, hot summer, we all have second thoughts about our protection and feel apprehension at the first rumble of thunder breaking out in the middle of the night.

"Even the operator with a modest wire or vertical antenna at not more than about 30ft lays in bed and vows to do something better than a crocodile clip to a simple earth stake.

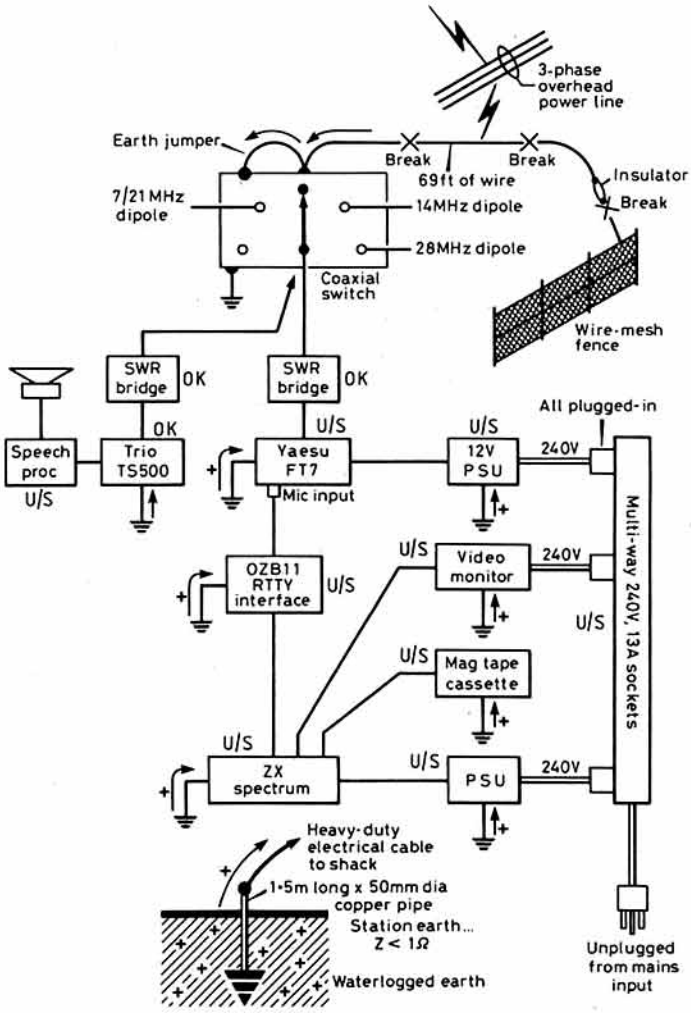


Fig 15. Z21AB's installation showing the results of the lightning strike that "took out" virtually all the solidstate equipment although the valved Trio TS500 remained in good trim. The culprit was probably the earth connection

"The first-class article by George Jessop, G6JP (*Rad Com* December 1982, pp1042-46) gave positive advice but there is still a need for more information on the choice, practical installation and sources of devices such as gas discharge tubes.

"In the old days, in the RAF, we used the old-style knife switches but these are no longer readily available and not well-suited for use with coaxial feeders. I must admit to seeing unmarked boxes of gdts at a mobile rally priced about 60p each but at the time none of us recognized what they were. Later, re-reading G6JP's article, I fell to gnashing of teeth at the missed opportunity!"

Many of us share G3GMM's midnight qualms, but come the dawn and lightning hazards tend to vanish from our minds. On the other hand, radio amateurs in regions where lightning is much more prevalent cannot afford to overlook this problem, as may be evident from a story of extensive equipment damage suffered by A E Skipper (Z21AB/G4JUO/ZS6AES). His experiences in Zimbabwe lead him to challenge the view (*TT*, January) that it is sufficient to disconnect the antenna and mains lead from equipment during thunderstorms unless this also includes disconnecting *all* wires, *including earth wires*. He writes:

"Last year during a heavy storm my house sustained a direct multiple strike. Transient energy was present through the mains leads and antennas. The radio shack had been unplugged from the mains and the antennas earthed as shown in Fig 15. Theoretically it might seem that there was no way my equipment could be damaged with all items duly taken to the shack earth.

"In practice, apart from serious damage to house wiring appliances, my entire radio shack, except the valved Trio TS500 transceiver, was 'taken out' and rendered unusable. As far as I was concerned this incident has led me to discount established theories about earthing antennas and removing wall plugs to make a shack safe. My theory is that a lightning discharge of this nature causes the earth potential to be raised at the point of discharge, taking time to discharge or dissipate. The result is a high static charge

sufficient to break down most semiconductor junctions, causing irreversible damage to solidstate electronic equipment.

"Examination of the wiring and burnt-out components shows beyond doubt that the equipment was damaged through the earth connection. In addition, on my 69ft of antenna wire, it shattered two egg insulators, welded a multistrand copper wire into a single strand and caused the supporting wire at the fence end to disappear. I no longer believe that you can prevent lightning damage by earthing! Zimbabwe is a country in which violent thunderstorms occur every season. I would suggest to those who operate in similar circumstances that they should disconnect everything, *including the earth*. This is the best form of lightning protection. Incidentally my insurance claim was Z$5,500 but fortunately there was no problem with the payment."

While one can understand his feeling that he was let down by the traditional advice, I must, in fairness, emphasize that the advice given in *TT* and *Radio Communication* has indicated quite clearly that there is no simple way of protecting equipment against direct or even near strikes, particularly where the earth conductivity is less than near perfect. As noted above and last November, protection of solidstate broadcast transmitters requires extremely good earthing, far better than found in most amateur installations. Even so, it is known for lightning to "take out" mf solidstate amplifiers. Valve equipment is far less vulnerable to emp.

Fortunately the chances of a direct strike or a near miss on the average UK amateur radio installation is little or no greater than on the house of a non-amateur. On the other hand if you are thinking of duplicating WD8RXP's *180ft* tower (see "Mid-Michigan Skyhook" *QST*, January 1987, pp15-17) then I suggest you give careful consideration to lightning hazards. But then I seriously question whether amateurs *should* be thinking of such monstrous installations, even if they have a local authority prepared to approve one. Envy? Not entirely.

The transmitting gramophones

In 1936, the Abwehr and the later Amtsgruppe Abwehr (German military intelligence) as an organization within the high command of the German armed forces (OKW)—not to be confused with the notorious Nazi police organizations that became grouped together as the RSHA and which in 1944 succeeded in taking over control of the Abwehr—began building up a "Geheimen Funkmeldedienst" (secret radio reporting service). A pre-war German radio amateur and professional radio engineer, Technical Superintendent Black, was appointed to form a centralized unit for the development and production of portable hf radio equipment for intelligence radio networks, including those for communicating with secret agents. This was established at Berlin-Stannsdorf where a design centre, workshops and assembly line were located together with the main Berlin base station, under the cover name of "Heeresneubauamt" (Office of new building for the armed forces).

Detailed information on the large number of hf receivers and transmitters built at Berlin-Stannsdorf, where many pre-war German amateurs came to be employed, and also "suitcase" equipment built in the UK, USSR, USA, Finland etc has been diligently compiled and collated by Dipl-Ing Rudi Staritz, DL3CS with the assistance of many amateur collectors and others interested in a type of equipment that was largely based on amateur radio concepts. These have included Gerhard Stroessner, DJ2VN, a member of RSGB, who has kindly passed to me booklets and photographs compiled and collated by DL3CS. Virtually all of the Stannsdorf receivers were "straight" regenerative-detector designs although the main intelligence offices were often equipped with communications receivers, such as the Siemens R4, closely patterned on the HRO. In the first year of the war, Stannsdorf continued to acquire HRO "PW" tuning drives (and also British Hivac miniature valves) through neutral countries.

One of the "Agentenfunkgerate" (agents radio equipment) developed in the early days comprised a plug-in "adapter" transmitter for use with an existing receiver such as the popular "all-wave" broadcast sets. The transmitter obtained its heater and ht power when the adapter was plugged into the output stage of the receiver. Adapter transmitters using various valve types (AL4, AL5, 6V6, 6L6) were produced. Fig 16 and the photograph show a 6V6 version of the "Senderanfertigung Grammo" for use with large, old-style cabinet gramophones. This particular version had an associated 350Vdc/180Vdc/6·3Vac psu and a four-valve receiver (1-v-2) using two miniature 4695 pentodes (untuned rf stage) and two 4671 af triodes. Other versions were simply plug-in transmitter units, for use with broadcast or communication receivers.

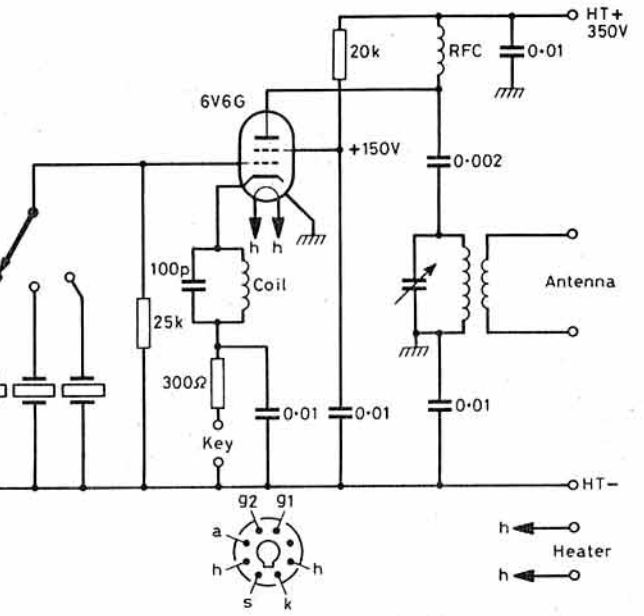
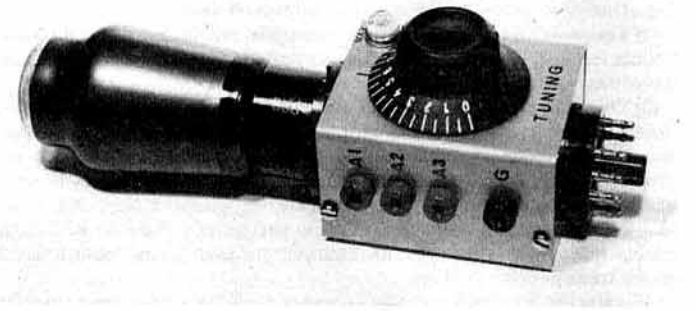


Fig 16. Circuit diagram of one version of the Abwehr "Senderanfertigung Grammo" adapter-transmitter produced at Berlin-Stannsdorf from about 1937 onwards. This version, apparently for concealment in large cabinet gramophones, was used with its own receiver and psu



An Abwehr adapter-transmitter suitable for use with a broadcast receiver fitted with an EL12 audio output valve (*Photo from DL3CS collection*)

Tips and topics

Alan Williams, G3KSU, felt sure that he had seen the nomograph for two resistors in parallel (*TT* January). Sure enough he traced a similar idea in *Wireless World*. The issue was that of 3 October *1928*. Ah, well, there's nothing new under the sun, even in electronics.

More hints and kinks from *QST*:

WA0KKC: "If you use a typical self-supported tower without the top section, the structural pipes are open-ended at the top. Corks in the top of each pipe will prevent moisture building up and wind whistle."

W4FXE: "When erecting dipoles, a bit of pruning is usually necessary and it is not easy to correct if in the process the antenna is cut too short, I cut the antenna short of the calculated length and then solder on an additional length of rigid no 12 copper wire at each end. It is then a simple matter to prune a little at a time, and I usually finish up with the desired resonance and a trimming wire between 1 and 5in long that is self-supporting and can be left in place (Fig 17)."

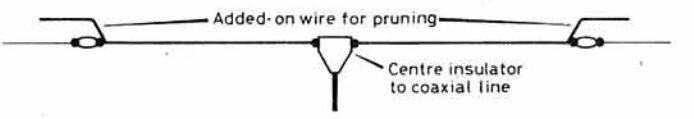


Fig 17. W4FXE's suggestion on how to prune a dipole without the tears of cutting it too short

WD9DID "I was worried about the guy lines in my yard: difficult to see and could injure someone walking into them. I went to the local hardware store, bought three foam-rubber insulating sleeves intended for lagging 0·5in water pipes. Each sleeve is 4ft long and silver in colour. They slip easily onto the guys. To make them even more visible in the dark they can be sprayed with fluorescent yellow paint, applied very lightly since paint solvents can melt the foam." □

NEWS BULLETIN

50 AND 70 MHz BANDS AVAILABLE TO CLASS B LICENSEES FROM 1 JUNE 1987

See our special 7-page feature for the full story — plus bandplans, propagation, getting going and much more

The Gazette Notice

Here's the precise wording of the notices which will appear in the London, Belfast and Edinburgh Gazettes any day now:

"The Secretary of State gives notice, pursuant to Section 1(4) of the Wireless Telegraphy Act 1949, to those licensed under either an Amateur Radio Licence (A) ("Licence A") or an Amateur Radio Licence (B) ("Licence B") which have been issued and remain in force, of the following variations to both the above named licences:

1) In clause 1(2) of Licence B, the following words should be substituted for sub-clause (b):

"The Station shall be used only within those frequency bands which appear between frequencies 50.00 MHz and 250 000 MHz in the first column of the Schedule, subject to the limitations relating to such frequencies which are contained in the second column of the Schedule, and shall be used only with a power not exceeding that specified in the fourth column of the Schedule relating to such limitations and such frequencies and shall use only those types of transmission relating to such frequencies, limitations and maximum powers as are named in the fifth column of the Schedule."

2) From 1 June 1987 the Schedule to both Licence A and Licence B shall be varied so as to delete all entries contained in each portion of columns 1, 2, 3, 4 and 5 which relate to those frequencies between 50.00 and 50.50 MHz and between 70.025 and 70.50 MHz and to insert by way of substitution entries in respect of frequency band 50.00 MHz to 52.00 MHz and frequency band 70.00 to 70.50 MHz in the first column. This means that both Class A and Class B licensees may transmit within these frequency bands in accordance with the amended Schedule entries shown below.

3) Clause 2 shall have effect accordingly.

M V Coolican

on behalf of the Secretary of State for Trade and Industry.

50 70 MHz THE FULL STORY

Background and schedule for the 50 and 70 MHz bands

Hands up those Class B licensees who'd like two new bands to do their thing on?

Fine - well, as of midnight on 1 June 1987 (actually, from the point of view of your logbook it's really 2300 GMT on 31 May 1987, which is the same as midnight local time on 1 June just to confuse the issue) you've got 'em!

What bands? 50 MHz and 70 MHz. Not only that, both bands are being expanded and we're to become primary users of part of one of them. In this special edition of the RSGB Bulletin we'll be looking at the changes in detail. We'll examine a little of the historical background and look at how and why the UK is the first country in Europe to make a formal allocation at 50 MHz to all of its radio amateurs. We'll also be suggesting some ways to get going on both bands, with a look at propagation and a quick checklist of some of the equipment that's available. All this and lots more, so start here and read until you reach the end.....

We probably ought to apologise for giving you such short notice of this extremely pleasing new development. The fact is, events moved very quickly indeed following the Minister's speech at the RSGB National Convention; it was more or less a matter of the DTI ringing us up a few days before press time asking us how quickly we'd like to go ahead! As you'll no doubt know, we've been making a case for fewer restrictions at 50 MHz and requesting Class B access to 50 MHz and 70 MHz for a very long time but even so we didn't quite expect our arguments to be accepted so thoroughly and so quickly. In fact, we reached agreement on the final terms and conditions only a few days before this edition of the Bulletin went to press - so you'll have to forgive us for any little misprints, etc, which might have crept in as a result of us burning the midnight oil to get the 50/70 MHz special together in time for the June issue. We thought you'd rather have two new bands a month early than an immaculate Bulletin telling you that you could have them on 1 July....

Let's first of all have a look at the new provisions in full. All these will come into effect on 1 June 1987 at midnight, in accordance with the terms of the Gazette notice we've reproduced on the first page of this feature.

*The 50 MHz band available to UK radio amateurs will become 50-52 MHz

*UK radio amateurs will have primary status at 50-51 MHz: we'll have secondary status between 51 and 52 MHz

*There's now no restriction on the location of a 50 MHz station - in other words, /A and /P operation is now permissible.

*The DTI still can't permit mobile operation on 50 MHz at present.

*The 70 MHz band will be expanded, and it will now be 70.0-70.5 MHz. UK radio amateurs will have secondary status.

*Class B licensees will be permitted to operate on both 50 and 70 MHz

Here's the small print.

Antennas for the 50 MHz band must not be at a height greater than 20 metres above ground level. Only other condition is that 50 MHz antennas must remain horizontally polarised, for reasons of protection to television broadcast transmitters still operational in Europe. End of small print.

One immediate question you might feel like asking is "what about the power limits - have they been changed?"

At present the permitted power on 50 MHz will remain at the 14 dBW carrier and 20 dBW ERP levels established last year when the band was released to Class A licensees. The DTI fully accepted the Society's case for an increase in these levels and initially felt that it might be possible. However, the Department has reluctantly concluded that at present the requirements of protection to TV broadcast transmitters on the Continent don't permit any change in our effective radiated power limit at 50 MHz just yet. The DTI has said that it will review the question of 50 MHz power levels in six months from now. The implication is that we MUST be very careful to keep an eye on what power we're running on this band and where we are beaming. Remember that at 50 MHz the limit relates to EFFECTIVE RADIATED POWER - i.e. not the power generated by your transmitter, the power which gets radiated from your antenna taking into account its gain (if any) and any loss in the feeder. On page 419 we've reprinted our "Erpogram", which is a quick way to find your ERP. It really is VITAL not to overdo it on the 50 MHz band - remember that it's still a part of the spectrum allocated to the broadcasting service elsewhere in Europe and we could lose our very precious allocation overnight if we blow it.

So - we've achieved something we've wanted for many years, which is a proper UK amateur band at 50 MHz open to all licensees. It's certainly been worth the long wait and all the hard work we've put into obtaining it, and it's now up to all of us to enjoy it, get the best out of it and demonstrate to the licensing authority that the investment they've made in the future of amateur radio in the UK will be repaid.

Footnote - one VHF columnist in the amateur radio press is going to have to find some new "informed sources", or get a crystal ball with a better noise figure. His predictions of what we would and wouldn't get on 50 MHz were pretty well completely out of phase with what we actually have got.....

THE SCHEDULE

On the following page we've given the wording of the new Schedule to the UK amateur licence insofar as the 50 and 70 MHz bands are concerned. It isn't actually a reproduction of the DTI's written schedule, simply because we hadn't seen a copy as we went to press. However, we've checked the wording and it's precisely that of the official Schedule. You might like to cut it out of the magazine and put it with your licence.

50 70 MHz ACTIVITY

Who you are likely to hear and where

This rather naturally brings us on to the matter of who you can expect to work. Before we get into that, however, no apologies for reminding you again that the 50 MHz band is still allocated to broadcasting in Region 1 and we simply must not cause interference. DO use the minimum power necessary to maintain contact and DO get into the habit of winding the wick down wherever possible. If you're getting reports of 40 over 9 you're running too much power.

50 MHz

Taking 50 MHz first, the band 50-54 MHz is allocated to the amateur service in most of Regions 2 and 3 - that's basically to say that part of the world outside Europe, Africa and the USSR - and when there's a bit more sunspot activity you'll be able to work all sorts of exotic places. There were several 50 MHz openings to the USA and Canada last year, although the propagation mechanism involved still isn't quite clear, and there may well have been others by the time you read this. In Europe, however, the following countries have either a 50 MHz band allocated to amateurs or, as in the majority of cases, permit a limited number of amateurs to operate at 50 MHz:

Norway
Portugal
Gibraltar
Eire
Greenland
Iceland
and Spain

A number of other countries have expressed an interest in the band namely, Malta, Cyprus, West Germany and Yugoslavia. We hope that some limited operation might be permitted in the future.

70 MHz

As far as 70 MHz goes, the UK, Gibraltar and Eire have an amateur allocation in this part of the spectrum; there's also been operation from Cyprus in the past and some limited operation is apparently possible this year.

THE NEW AMATEUR LICENCE SCHEDULE RELATING TO THE 50 AND 70 MHz BANDS

Frequency band MHz	Amateur service status	Amateur satellite service status	Maximum power carrier	PEP	Permitted modes
50.00 - 51.00	Primary, subject to not causing interference to other administrations. Antenna height limited to 20 metres above ground level with horizontal polarisation only. No mobile operation in the band.	No allocation	14 dBW erp	20 dBW erp	Morse, RTTY, telephony, data, SSTV, facsimile
51.00 - 52.00	Secondary, subject to not causing interference to other administrations. Antenna height limited to 20 metres above ground level with horizontal polarisation only. No mobile operation in the band.	No allocation	14 dBW erp	20 dBW erp	Morse, RTTY, telephony, data, SSTV, facsimile
70.00 - 70.50	Secondary, subject to not causing interference to other services.	No allocation	16 dBW	22 dBW	Morse, RTTY, telephony, data, SSTV, facsimile

50 70 MHz

BEACONS AND BANDPLANS

A full list of active and proposed beacons plus the new bandplans

At the IARU Region 1 meeting in the Netherlands in April, a revised Region 1 band plan was agreed. This is reproduced here together with the special features that refer to the UK. The revised 70 MHz plan is also reproduced.

We've also reproduced the list of beacons on 50 and 70 MHz which were known to be operational or at the proposal stage as of 1 May 1987. In case you're wondering why we've given every 50 MHz beacon in the world, the answer is that you never know quite what you might hear on 50 MHz and we felt we'd give you the full list so that you can identify anything you come across. Probably the most consistent 50 MHz beacon audible in the UK at this time of the year is ZB2VHF on 50.035 MHz, the signals from which are propagated via Sporadic E. It'll certainly come as a surprise to those who haven't listened before to hear a) how consistent and b) how strong this beacon can be. 5B4CY in Cyprus has also been heard a couple of times already this year - there's also a 70 MHz beacon operational from the same site, and it's well worth taking a listen for this. Of course, if you're hearing 50 and 70 MHz beacons it's well worth switching on the 144 MHz rig as well in case propagation is good enough to reach that frequency.

As far as the bandplans are concerned, note that there are no SSB and/or CW "calling frequencies" in the 50 MHz plan. There are instead designated "centres of activity" and you don't necessarily need to move off them if you've called CQ and received a reply.

50 MHz & 70 MHz BEACONS

Freq	Callsign	Location	ERPW	Mode
50.005	H44HIR	Solomon Islands	10	-
50.005	ZS2SIX	Cape Province	10	A1A
50.010	JA2IGY	Mie	-	-
50.010	ZS1STB	Still Bay	50	F1A
50.010	ZS6STB	Vereeniging	-	-
50.015	SZ2DH	Athens	-	-
50.020	GB3SIX	IO73TJ	100	F1A
50.025	ZS6SIX	Kempton Park	-	-
50.025	6Y5RC	Kingston, Jamaica	40	F1A
50.030	ZS6PW		-	A1A
50.030	CT***	*PROPOSED*	-	-
50.035	ZB2VHF	IM76HE	100	A1A
50.039	FY7THF	French Guiana	-	-
50.041	WA8KGG	NE Ohio	-	-
50.045	OX3VHF	GP60QQ	20	A1A
50.050	GB3NHQ	IO91VQ	15	F1A
50.055	LA***	Oslo *PROPOSED*	-	-
50.060	GB3RMK	IO77UO	40	F1A
50.060	ZS6DN/B	Pretoria	100	-
50.062	PY2AA	San Paulo	25	A1A
50.062	W3VD	Laurel, MD	-	-
50.065	GB3CTC	*PROPOSED*	-	-
50.070	W2CAP/B	Cape Cod, Mass	15	-
50.070	4U1ITU	Geneva	-	-
50.075	VS6SIX	Hong Kong	30	-
50.080	9H1SIX	JM65FV *PROPOSED*	-	-
50.088	VE1SIX	New Brunswick	-	-
50.099	KH6EQI	Pearl Harbor	-	-
50.110	ZS6LN		100	A1A
50.500	5B4CY	Zyyi KM54PS	15	F1A
50.925	ZS5VHF	25km W of Durban	200	A1A
50.945	ZS1SIX	Cape Province	8	F1A
52.200	VK8VF	Darwin, Australia	15	-
52.250	ZL2VHM	Pahiatua Track	-	-
52.300	VK6RPH	Perth, W.Australia	-	-
52.320	VK6RTT	Carnarvon, W.Aus	-	-
52.330	VK3RGG	Geelong, Australia	4	F1A
52.350	VK6RTU	Kalgoorlie, W.Aus	-	-
52.510	ZL2MHF	Mt.Climie	5	F1A
70.030	GB3CTC	IO70OJ	40	F1A
70.040	GB3REB	*NOT OPERATIONAL*	-	-
70.050	GB3BUX	IO93BF	20	A1A
70.060	GB3ANG	IO86MN	100	F1A
70.112	5B4CY	Zyyi KM64PR	15	F1A
70.120	ZB2VHF	IM76HE	50	F1A
70.130	EI4RF	IO63SN	25	A1A

50 MHz band plan — Region 1

	Usage	
50.000		
CW only	50.020 to 50.80	*Beacons*
	50.090	*Centre of CW activity*
50.100		
All narrow band modes	50.200	*Centre of SSB activity*
	50.300	*CW MS*
	50.350	*SSB MS*
50.500		
All modes		
51.000		
Pacific DX window		
51.100		
All modes		
52.000		

70 MHz band plan — UK

	Usage	
70.000		
CW only	70.025 to 70.075	*Beacons*
70.150		
CW and SSB	70.200	*SSB calling*
70.260		
All modes	70.260	*National Mobile calling frequency*
	70.300	*RTTY calling*
	70.350 to 70.400	*Raynet*
70.400		
FM simplex	70.450	*FM calling*
70.500		

50 70 MHz

PROPAGATION

What you can expect from the two bands

A great many clever articles have been written about propagation at 50 and 70 MHz and we're not about to write another one here, even assuming we were Great Brains as far as propagation was concerned and understood all the esoteric bits about FOF2 and tephigrams and whatnot. As a matter of fact, there's still rather a lot which isn't known about propagation at 50 MHz! One thing is obvious though - 50 MHz and 70 MHz are much more different than you might think as far as "normal" conditions are concerned. Here's a plain man's guide to where your signals go and why.

50 MHz

In some ways 50 MHz behaves more like a high-frequency HF band (excuse the tautology) than a VHF band; one tends to think that because of where it is in the radio frequency spectrum it should be extremely good for, say, inter-G or inter-EU work on normal tropo but in actual fact it's quite a bit worse than either 70 MHz or 144 MHz for this. You'll certainly find that, with the ERP that we're presently allowed, your range under normal conditions will be rather less than on 144 MHz and considerably less than on 70 MHz for similar ERPs (it's an interesting exercise to do comparative tests on 50 MHz and 144 MHz with a distant station running the same power) and the fading pattern for local-ish 50 MHz contacts seems to be quite different from the other VHF bands as well. You'll find that signals can disappear for minutes at a time and then emerge gracefully out of the noise as if nothing had happened. Also, ducting- type "lifts" caused by temperature inversions at height, which make for super openings on 144 MHz and even better ones on 430 MHz, don't work terribly well at 50 MHz because the refraction effects increase as a direct function of frequency and 50 MHz is a bit low. So "extended tropo" isn't a primary DX mode on 50 MHz.

We might as well admit at this stage that 50 MHz is also a rather noisy part of the RF spectrum. It may be Potters Bar paranoia setting in but we sometimes wonder whether there isn't a conspiracy amongst the manufacturers of devices such as thermostats, RF heaters, computers and other domestic and industrial electrical gubbins to ensure that the hash radiated by their products peaks at 50 MHz! In other words, unless you live in the depths of the country with no sign of civilised activity for miles you can safely expect much more racket in the receiver than you're used to on 144 MHz, for instance. This doesn't help in copying weak signals.

It's when you consider modes such as sporadic E and aurora that 50 MHz comes into its own. Just after the 50 MHz band became available to Class A licensees last year, there was a monumental auroral opening: for a while it sounded as though every 50 MHz station in the UK was working every other one and all signals were S9. There's nothing like as much Doppler shift at 50 MHz, so SSB off the aurora is infinitely easier than it is on 144 MHz, and even stations with 3W to a dipole were making tremendous contacts during that particular event. Class B licensees in particular ought to enjoy auroras enormously from now on.

Sporadic E is, quite simply, superb. The band opens for hours at a time, in contrast to the seconds or minutes of 144 MHz, and S9+ contacts with countries in our list (p.415) are dead easy with Dobbs power (sorry, Reverend) to an indoor dipole. The 50 MHz sporadic E season seems to start in mid- or late April most years and peak in the summer months, and parking the receiver on the frequency of a distant beacon seems a good move; an even better one is to build or buy a simple scanning receiver and load some 50 MHz beacon frequencies into it. It appears that "multiple-hop" sporadic E operates at 50 MHz and this may well be the mechanism behind the openings to the USA and Canada which took place last year, although no-one could put hand on heart and say that this was definitely the mechanism involved.

True ionospheric propagation (i.e. off the F-layer) is also possible at 50 MHz, although - we hasten to add - probably not in 1987! At present we're still very close to sunspot minimum and daytime MUFs are nowhere near 50 MHz: you need a smoothed sunspot number of something like 100 to support ionospheric propagation at 50 MHz and that doesn't happen until somewhere near the peak of the sunspot cycle. This implies that world-wide contacts on 50 MHz won't be available until 1990 or 1991, but on good days in those years they certainly will. As with F-layer propagation in the HF bands, the best 50 MHz days are likely to be in winter, although the spring and autumn will be best for trans-equatorial signals. It'll be extremely interesting to see what can be worked in a few years' time.

50 MHz is also a good band for meteor scatter, as you'll know from reading in Ken Willis' column about how some 50 MHz operators have been doing. The low ERP limit doesn't seem to have been a big handicap and some very tasty crossband DX has been worked.

Final thought - don't even THINK about trying EME on 50 MHz! By our calculations you'd need something like 600W into a 17 dB antenna, assuming 100 Hz receiver bandwidth and the same power and antenna at the other end. Wait for the sunspot cycle to wake up a bit and work the guy off the F-layer instead.....

70 MHz

70 MHz is a wonderful band which we've always loved dearly and it's frustrating that there are so few countries with access to it. From a tropo point of view it's quite different from 50 MHz: for a start it's nothing like as noisy and signals seem to be able to trundle up and down the UK at good strengths even with modest power and simple antennas. For consistent natters to your friends 100 or 150 miles away when conditions are normal, it's superb - very little fading and what there is is usually shallow and slow. 70 MHz signals also seem to have a knack of ignoring minor obstacles like Ben Nevis and Snowdonia and suchlike - what this means is that those whose sites always cause them to come something like 95th in 144 MHz fixed-station contests will find that 70 MHz gives them much better and longer-distance contacts. 70 MHz also works well in auroras and would no doubt work like a charm on sporadic E if there was anyone 1500 or so miles away to work....sigh.

50 70 MHz GETTING GOING

What's available to start you off

Having got these new bands, how are we going to get set up for them?

50 MHz

Taking 50 MHz first, it's definitely going to be a matter of building or buying; we can't off-hand think of much in the way of ex-professional gear which could be modified to work on 50 MHz, although one or two bits of ex-military hardware cover 47-68 MHz and might at least get you going. We're not yet at the stage of needing to design and build big linears for the band, so it's probably just a matter of home-brewing a transverter for use with an existing rig; there might even be some scope for "dual-banding" an existing 70 MHz transverter with some movable taps on strategic inductors and a switchable crystal. From the commercial point of view, Microwave Modules make transverters from both 28 and 144 MHz to 50 MHz and you might find one of the excellent muTek 50 MHz transverters second-hand. If you've a Yaesu FT726 or 767 you can buy a 50 MHz module and get going that way, or there are various other commercial 50 MHz multimode rigs available - take a look at our "Buyer's Guide to Amateur Radio" for some suggestions in this line (price incl. p&p, £7.22 for members and £8.49 for non-members from Headquarters, heavy hint, nudge nudge).

70 MHz

Coming now to 70 MHz, we can't off the top of our heads think of any commercial equipment for this band apart from Microwave Modules transverters (28 MHz and 144 MHz). Having said that, of course, 449 companies will now write and complain that we didn't include their particular product - great, let us know and we'll tell the world about it, or them. We hear that Yaesu may do a 70 MHz module for the FT767, and of course we'd be delighted to print articles about converting other commercial equipment for the band. Probably the best candidates for the home-brew treatment are ex-PMR transceivers. For instance, we saw an immaculate Wessie which was set up for several channels around 77 MHz for £25 at this year's NEC, and we're currently kicking ourselves for not having snapped it up. Hint to prospective authors - we'd love to see some good articles on converting this sort of tasty item for 70 MHz use....

Putting together an add-on amplifier for 70 MHz is no problem - there are plenty of designs in the VHF Manual and elsewhere. The power limits at 70 MHz are 16 dBW and 22 dBW. They relate to power supplied to the antenna, not to ERP. and for SSB the figure corresponds to just over 150W PEP. If you're not into transistor amplifiers, probably the easiest way to achieve that at 70 MHz is to use a single 4CX250B: you wouldn't need more than about 1.5 kV on the anode and it could be a very good linear indeed at the permitted power level. For once with these valves you wouldn't even need a massive blower. We've got away with some very weird and wonderful bases for 4CX250Bs on 70 MHz in the past, so you wouldn't necessarily need to use one of the precious SK600s or 620s you were keeping for a big amplifier for the higher bands provided that there's some screening between pin 1 (the screen connection) and the grid spigot on the base you have in mind.

ANTENNAS

Antennas are the next items to think about. We've tried Jaybeam, Tonna and MET antennas for 50 MHz and they all seem to work well; we've only tried a Jaybeam 4-ele antenna on 70 MHz, which worked fine, although MET make a 3-ele and a 5-ele. It's quite easy to homebrew Yagis for either band, though, and it might be worth trying to work out how to make one antenna operate on both bands. Worth a special mention in that context is a new Jaybeam antenna, the DB4-4/6 Duobander. This is a four-element trapped device for 50 and 70 MHz, with a claimed gain of 7 dBd on 70 MHz and 6 dBd on 50 MHz. Being very new we haven't seen one yet and almost no dealer we checked with seemed to have any, but South Midlands Communications told us just before we went to press that they did indeed have some in stock. Sounds like a good way to get going on both bands at once without killing the rotator as a result of too much headload!

SAFETY

Seriously, that is a point. It's wonderful to have two new bands but don't just add 50 and/or 70 MHz antennas to your existing array without carefully considering whether the mast or tower and rotator installation will cope with the extra stresses which will inevitably be induced in them. If it all falls down in the next wind it might a) kill you b) fall through the roof or, worse still, your neighbour's and do an immense amount of damage c) cause various other nasty forms of consequential damage or d) write off an expensive amount of hardware in the shape of mast, rotator, antennas, etc. We want to hear YOU on the new bands, and preferably both, but NOT at the price of someone's safety.

FILTERS

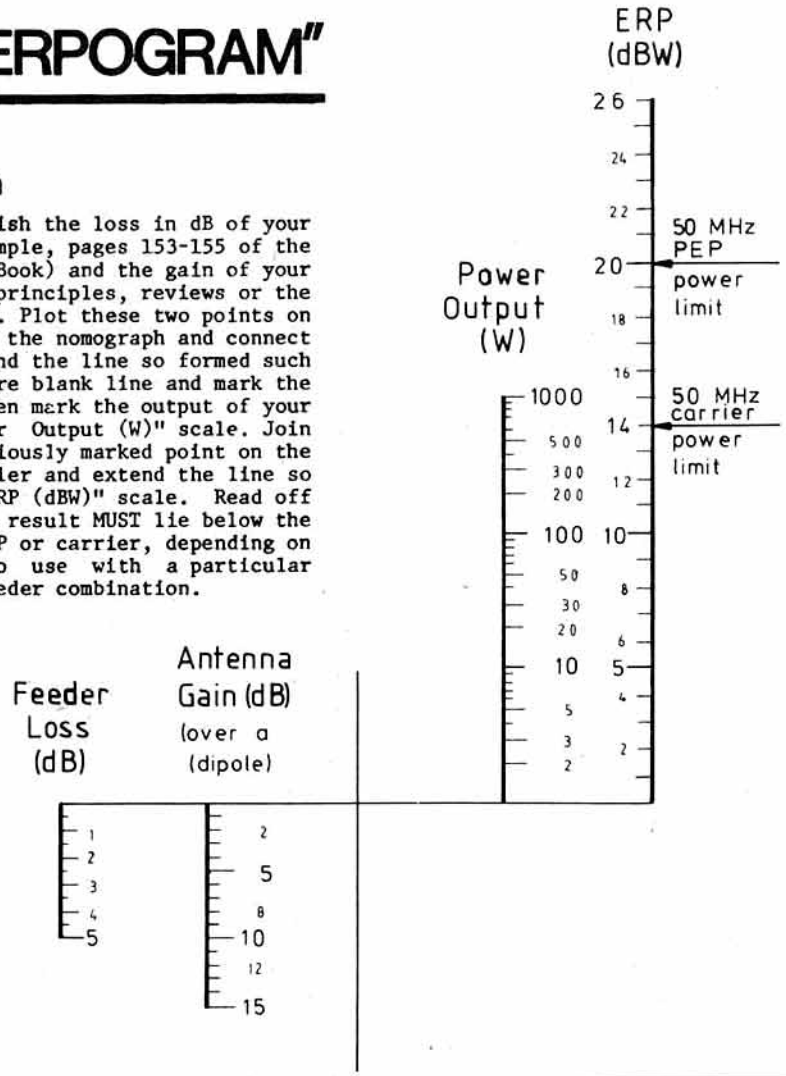
Final thought for both 50 MHz and 70 MHz is harmonics. The second harmonic of 50 MHz falls at the top end of broadcast Band II, which has to be bad news for the neighbours if your transmitter has too much harmonic output, and both the second and third harmonics of 70 MHz fall in nasty places. Low-pass filters at the output of a 50 MHz or 70 MHz rig are a Good Idea (actually they're a Good Idea at the output of any VHF/UHF transmitter, bearing in mind the very high occupancy of all this part of the RF spectrum by commercial and military users) and here again there are several designs in the literature as well as some good commercially available ones. Do think about spending some time and/or money on providing output filtering at the transmitter before you fire up a new 50 MHz or 70 MHz rig for the first time. We've found this to be especially true for simple 50 MHz transmitters made from published designs - far too many of them have second and/or third harmonics only -25 or -30 dB down on the fundamental and that simply isn't good enough.

So - good luck and let's hear YOU on soon! If you can think of any other good ways of getting on 50 MHz or 70 MHz quickly and cheaply, don't keep them to yourselves - let us know and we'll pass them on.

RSGB "ERPOGRAM"

Using the ERPogram

The first step is to establish the loss in dB of your chosen feeder (see, for example, pages 153-155 of the RSGB Radio Data Reference Book) and the gain of your antenna in dBd (from first principles, reviews or the manufacturer's literature). Plot these two points on the left-hand scales of the nomograph and connect them with a ruler; extend the line so formed such that it intersects the centre blank line and mark the point of intersection. Then mark the output of your transmitter on the "Power Output (W)" scale. Join this point and the previously marked point on the centre line with the ruler and extend the line so that it intersects the "ERP (dBW)" scale. Read off the ERP on that scale. The result MUST lie below the power limit arrows for PEP or carrier, depending on which mode you intend to use with a particular transmitter, antenna and feeder combination.



Because 50 MHz is still allocated to broadcasting in Region 1, and indeed there are still many television transmitters in Europe and Africa using 50 MHz for just that, we're given a limit on effective radiated power from the antenna when we use the 50 MHz band so that calculations which make use of field strength figures can be used to guarantee protection from interference to reception from broadcast transmitters within their defined service area. You have to calculate how much transmitter power you can use into a particular antenna, allowing for your feeder loss, without exceeding the ERP limit. To help you do that easily, use our "Erpogram". This little nomograph is the same as the one we published when 50 MHz first became available to Class A licensees on a general basis last year (and indeed which we reproduced in the latest Callbook). The instructions for using it are adjacent to the nomograph itself.

Just to make life easier, we've dug up some figures for approximate feeder loss at 50 MHz from various sources. These all relate to a 25 metre length, so you'll need to break out the calculator and work out the loss for your particular length;

UR(M) 95	- 4 dB
UR(M) 43	- 2 dB
UR(M) 67	- 1 dB
H100	- 0.8 dB

We can't see anyone using Heliax or whatever at 50 MHz so we haven't given any figures for anything better than H100. In practice, most of us will be using UR67 or a variant of it and allowing 1 dB per 25 metres is about right for calculating ERP.

Don't forget, by the way, that the abbreviation ERP means something different from the abbreviation EIRP, which you'll sometimes see in the literature. ERP stands for Effective Radiated Power, and the figure used for antenna gain when you calculate it must be its gain over a dipole. EIRP, on the other hand, stands for Effective Isotropic(ally) Radiated Power, and to calculate that you use the antenna's gain over a hypothetical isotropic source. In manufacturer's literature and advertisments the abbreviation "dBd" stands for gain over a dipole and "dBi" implies gain over isotropic. Obviously you need to use the "dBd" figure when you calculate your ERP at 50 MHz. To convert "dBi" to "dBd" all you need to do is subtract 2.15.

Whatever you do, DON'T run more ERP than you should on 50 MHz, because if you do we'll lose the band in short order when the European broadcasters start complaining bitterly about interference. DO use the Erpogram and use it every time you change any bit of the station which will affect your ERP.

Helplines

OPERATION RALEIGH:

Operation Raleigh is looking for more volunteers; this time to assist the expeditions in the field rather than on the flagship SES Sir Walter Raleigh, which is returning to the UK. They need able bodied radio amateurs who can give up to three months to join the expeditions a) to help with maintenance b) to communicate with projects c) to communicate with the UK and d) to act as ambassadors to Operation Raleigh and amateur radio in the host countries.

The volunteers are needed immediately in Malaysia, Indonesia and North Queensland, Australia. Anyone who is interested should contact:-

David Hopkins, G1TFT
Operation Raleigh Support Centre
47-49 Queens Dock Avenue
Hull HU1 3DR
tel: 0482-28217 (office) or
0482-210763 (home)

QTI-TNA NEEDS VOLUNTEER:

QTI-TNA "Talking Newspaper" for blind radio amateurs needs a volunteer skilled in physics and maths to 'read' those articles involving complex formulae and Greek letters! Anyone interested in lending a hand is asked to contact QTI-TNA at:-

2 Cartmel Walk
North Anston
Sheffield S31 7TU
or telephone 0909-566301.

HOME CONSTRUCTION HELP LINE:

The Society is always keen to promote home-brew construction, and we know the benefits that home-brew projects can bring in terms of understanding how radio and electronic circuits work. Many people who would like to build their own equipment, either from a kit or from the junk-box, find themselves at a disadvantage when it comes to the actual contruction. The elderly may have failing eyesight; a handicapped person may have restricted or no limb movement.

To help with these kind of problems, Cirkit Distribution Ltd is hoping to use its IBM 36 computer to create a 'constructors' data-base of competent builders and testers of electronic and radio equipment who are willing to give some assistance with home-brew projects. Hopefully, the listing will be sorted geographically and it will be available free of charge to anyone who requests it.

If you can help please write giving your name, address, telephone number and area of expertise (computer, RF, general etc) to:-

Cirkit Distribution Ltd,
Home Constructors Help Line
Park Lane
Broxbourne
Herts EN10 7NQ
Tel: 0992-444111
Telex: 22478

PLEASE NOTE - This is not a commercial venture.

MORSE TESTS

The following list shows the dates and locations of all the available test centres from the end of June to the beginning of August 1987, as we went to press. Because of space limitations, we cannot print a complete list of all the test centres notified to us, but these can be found on the application form itself. If you want to take a test and any of the centres shown is within striking distance, send for an application form immediately. Completed applications will be dealt with strictly on a first-come first-served basis.

Morse tests will be carried out in groups of three and will be of half an hour's duration. Details of the test, the venue and how to get there will be sent to you as soon as your application has been processed and your place confirmed.

COUNTY	TOWN OR LOCATION		DATE
Devon	Plymouth CFE		30/06/87
Dyfed	Carmarthen		02/07/87
Lancashire	Fleetwood	*CHANGE OF DATE*	04/07/87
West Yorkshire	White Rose ARS		07/07/87
Dorset	Dorchester		11/07/87
Isle of Wight	Binstead, Ryde		11/07/87
Mid-Glamorgan	Rhydyfelin, Pontypridd		12/07/87
South Glamorgan	Penarth		14/07/87
Central	Stirling		14/07/87
Cornwall	Liskeard		14/07/87
Bedfordshire	Luton		16/07/87
South Yorkshire	Stocksbridge, Sheffield		16/07/87
Essex	Colchester Rally		19/07/87
Shropshire	Telford		20/07/87
Merseyside	Huyton, Liverpool		21/07/87
Lincolnshire	Lincoln		22/07/87
West Midlands	Sandwell		25/07/87
North Yorkshire	Scarborough Rally		26/07/87
Gwent	Newport		27/07/87
Hertfordshire	North Watford		31/07/87
Derbyshire	Clay Cross, Chesterfield		03/08/87
Guernsey	Guernsey ARS, St.Martins		06/08/87
Dumfries & Galloway	Stranraer		08/08/87
Hampshire	Winchester		08/08/87
Derbyshire	near to Derby Rally		09/08/87
Staffordshire	Uttoxeter		09/08/87

We receive notification of new centres almost daily and the application form gives a full list of these as far ahead as January 1988, as we went to press. Currently there are around 100 centres taking advance bookings for Morse tests.

ALL DRIED UP?:

David Shirley, BRS30365, is looking for a supply of silica gel - you know the sort of thing, the little packs of crystals that come with cameras and radio equipment. All he wants is about a dozen of these little packs, so if you've just thrown one away fish it out of the bin and send it off to David - and he'll refund your postage too! He can be contacted at:-

"Lorcosta"
19 Clifton Street
Barnstaple
North Devon
EX31 3AZ

(over)

Around the Groups

GOING DUTCH?:

The Scarborough Amateur Radio Society is looking to twin with an amateur radio club in Holland. If any of our Dutch readers are interested would they please contact:-

Mr D E Mapin, G4EDR
12 Willow Close
Grove Hill Meadows
Filey
North Yorkshire
YO14 9NY.

NEWS FROM REGION 1:

OE NEWS:

Austria has now adopted the Region 1 band plan for Top Band, which is as follows:

1810 - 1840 kHz CW only
1840 - 1850 kHz CW and SSB
1850 - 1950 kHz CW only

The allocation in Austria is on a secondary basis.

Packet radio is now allowed on all bands in Austria. AX 25 protocol is obligatory. Also, ATV experiments at 1296 MHz and higher are now to be permited for an experimental period of one year.

Finally, it's expected that the Austrian PTT will be granting permission for amateurs to receive between 50 and 54 MHz to allow cross-band operation. This may be a prelude to some 50 MHz operation.

ON NEWS:

The new regulations for the amateur service in Belgium, which we mentioned a couple of Bulletins ago, have now been published. A copy of the full text is available from HQ on request, but basically there are now three classes of Belgian licence.

Class A is a beginner's licence, permitting a maximum power of 10W on 144 MHz only. Prefix probably ON2.

Class B is a VHF-only licence, involving the normal examination but no Morse test.

Class C is for all bands and modes.

The obligation to keep a mobile logbook has been abolished and the minimum age for the holding of a licence reduced from 16 to 13 years.

Packet radio and "....all modern systems of transmission" are now permitted and ATV is allowed on 430 MHz and above.

GM TROPHIES:

Two trophies are awarded annually in Scotland:-

The "Jack Wyllie Trophy" is awarded to the Scottish RSGB member, society, club or group which is deemed to have contributed the most for amateur radio in Scotland.

The "Jock Kyle Trophy" is awarded to the Scottish RSGB member, society, club or group deemed to have contributed the most in the VHF field in Scotland.

In 1986, the Jack Wyllie Trophy was awarded to Drew Givens, GM3YOR. No nominations were received for the Jock Kyle Trophy and no award was made last year.

Nominations for 1987, along with citations, from at least five RSGB members resident in Scotland, should be sent to the respective Regional Representatives by 15 August.

To be eligible for the awards, the member, or group of members, shall have been resident in Scotland for the period for which the award is made. In the event of no nominations being received, the trophies will be passed to the Zonal Council Member for safe keeping until nominations are called for 1988.

RUSSIAN TO SPEAK AT COLLOQUIUM?:

AMSAT-UK hopes to pull off a coup by inviting Leonid Labutin, UA3CR to give a talk on Russian satellites at its forthcoming colloquium. Leonid is the designer of the Russian series of amateur orbiting satellites and, if all goes well, this will be the first time he has given a talk to an amateur radio organisation outside the USSR.

In a long telephone call to Ron Broadbent, AMSAT-UK Hon. Secretary, Leonid expressed his pleasure in accepting the invitation and asked that permission be requested of the USSR authorities. This has been done and Ron is awaiting a reply.

Other guest speakers will be:-

* Geoff Perry - of The Kettering Group
* Graham Ratcliffe, VK5AGR - OSCAR 10 Control Station
* Dr Martin Sweeting - UoSAT Director
* Dr Arthur Gee, G2UK - Chairman AMSAT-UK
* Dr Karl Meinzer, DJ4ZC - OSCAR 10 designer and President of AMSAT-DL
* Phil Bridges - AMRAC Secretary
* Craig Underwood - Satellite in Education Projects
* Jeff Ward, K8KA - Packet radio/DCE project
* Plus others yet to be confirmed

Last year's event was both educational and entertaining with many of the delegates swopping experiences and ideas during the social evening and between lectures. In addition to this year's lecture programme, there will be a trade show on two floors with exhibits by special interest groups. Some of the major UK electronics companies will be sending engineers along with test and demonstration equipment. Throughout the week-end there will be guided tours of the new UoSAT Command Station.

Mrs Joan Heathershaw, G4CHH, the President of the RSGB, will give the opening address at 10.15am on the Saturday.

Further details from Ron Broadbent on tel: 01 989 6741 (sociable hours please!)

EXPEDITIONS:

ST.PATRICK'S ISLE & CALF OF MAN:

The Isle of Man ARS will be running two special stations in rare locations over the next two months. The first will be located in Peel Castle on St.Patricks Isle using the club callsign GD4IOM. The station will be active on Saturday 13 and Sunday 14 June.

The second station, on the Calf of Man (the small island to the south of the IOM) will be active from 14.00 local time on Saturday 4 July to 13.00 local on Monday 6 July. The callsigns to look out for will be GD4IOM and GD4FLH. Operation will be on the HF, 144 MHz and, possibly, 59 MHz bands.

WAB enthusiasts should note that both of these islands qualify separately from the Isle of Man for the WAB Islands Award. QSLs for both expeditions via the bureau or direct to GD4GWQ, QTHR.

AMRAC NEWS:

Membership of AMRAC, the national Amateur Radio And Computing club has increased by 10 fold in the last 12 months standing at just over 800.

The club produces a bi-monthly newsletter, "AMRAC-User", which covers all forms of computer

communications with heavy emphasis currently being given to packet radio.

Membership of AMRAC is £8.00 per year and further details can be obtained by sending a stamped addressed envelope to the secretary:-

Phil Bridges, G6DLJ
AMRAC
PO Box 39
Hythe
Hants SO4 6WY

WAB NEWS:

Worked All Britain nets take place on various bands. The HF nets run for most of the day on or around the following frequencies:-

1,930 kHz	14.280 MHz
3,760 kHz	21.320 MHz
7,060 kHz	28.660 MHz

The VHF/UHF nets tend to be at set times of the day and are controlled from different parts of the country. The details are as follows:-

Monday:
8.00pm : 144.440 MHz : Midlands
8.30pm : 432.270 MHz : London
Wednesday:
8.00pm : 144.440 MHz : N.England
8.30pm : 144.430 MHz : S.Coast
Thursday:
8.00pm : 144.460 MHz : E.Anglia
8.30pm : 144.430 MHz : S.Wales
Friday:
8.00pm : 144.440 MHz : N.England
8.30pm : 144.430 MHz : London
Saturday:
11.00am: 144.260 MHz : NW.Engl'd
Sunday:
10.30am: 144.430 MHz : London

Nets may be heard at other times when there is mobile or portable activity and all are welcome to join in.

Further information:-

Brian Morris, G4KSQ
22 Burdell Road
Sandhills Estate
Headington
Oxford OX3 8ED

DON'T FORGET

RSGB

75th ANNIVERSARY

13 - 16 JULY, 1988

Watch this space for more details

AMATEUR ANSWERS "MAYDAY" CALL

Two yachtsmen rescued off Ascension Island

RSGB member Brian Tutt, G4ZZK, found himself the centre of media attention over Easter after he answered a Mayday call on 21 MHz from a sinking yacht off Ascension Island. At 1630 GMT on 18 April he was waiting to call ZS1JD on 21.326 MHz when he heard a weak and broken Mayday signal; Brian called the South African station to see whether he had any more information and then rang the local coastguard. Nothing more was heard from the sinking vessel, but next morning the coastguard rang back to say that Brian's action in telephoning them had probably saved the lives of the two yachtsmen, who were now safe and well on Ascension. It seems that the coastguard alerted the Royal Air Force, who had a Hercules inbound from RAF Stanley on the Falkland Islands to Ascension at the time: another Herc out of RAF Lyneham in Wiltshire apparently dropped supplies and a dinghy to the yachtsmen. Pic shows Brian Tutt in his shack, and we also couldn't resist publishing the gorgeous shot of a Hercules given to us by MoD (the pic, not the aeroplane, regrettably).

Brian was featured in an interview in Radio 4's "World at One" on the following Sunday and there was some nice publicity in the national dailies during the following week, apart from a rather snide comparison in the Daily Wapping between Brian's exploits and the infamous Tony Hancock sketch!

PICTURES AT AN EXHIBITION:

Terry Linacre, G4VKV and Frank Cassidy, G4HBI returned recently from a trip to PO Box 88, Moscow.

As you may well know, PO Box 88 - or The E T Krenkel Central Radio Club of the USSR, to give it its full title - is the place where all your QSL cards are sent for contacts with Russian stations. Terry and Frank were shown around the bureau, the club station (UK3F) and museum. They were given a full account of Radiosport and the activities of the club and Terry gave details of RSGB, its many functions and the help it gives to its members with antenna planning, setting-up of local clubs and groups and TVI which, in particular prompted some laughter from their hosts. TVI is apparently unkown in Russia! An RSGB pennant was presented to the club and both Terry & Frank were asked to sign the DX Map on the club wall. Photographs were taken and the many exhibits were shown including models of the RS satellites (or should we say 'sputniks'?) and the original radio transmitter used by Ernst Krenkel.

Terry & Frank were overwhelmed by the warmth and hospitality shown to them by the UK3 chaps and were staggered that two of their hosts had travelled 15 hrs by train from the Ukraine (UB5) and Latvia (UQ1). They would like us to extend their thanks via RadCom to all at CRC and their families for the gifts, excursions and visits to their homes and for the very many vodka toasts to "Amateur Radio".

Dos Vadanya.....!

(Photo shows staff of PO.Box 88 with the club station, UK3F. The QSL card is inset)

Lynne Higgins, one of the youngest of the 2nd Middleton West Brownies who took part in the special event station GB4LPB (Langley Primary Brownies), would like to thank all the stations who spoke to the Brownies on Guides' Thinking Day, 22 February. Her father, G4ZQL was the operator of the station.

CHANGES OF ADDRESS:

The labels for each month's Radio Communication are printed on the 2nd Thursday of the preceeding month - for example, the labels for this issue were printed on Thursday 14 May. If you have a change of address, please try to let us know in good time, otherwise your RadCom will go to the old address.

CSP INTERNATIONAL REPORT PUBLISHED:

As mentioned briefly in the 'PS' column last month, the report from CSP International on deregulation and pricing in the radio spectrum has now been published. In a Commons statement on 2 April, Geofrey Pattie, Minister of State for Industry and Information Technology, said that there had been considerable changes in radio usage and spectrum management in recent years. New services such as cellular radio had been introduced, many radio services had been de-regulated and the demand for radio-based services was continuing to expand all the time. He said that the DTI was still considering the full implications of the report insofar as its proposals were concerned and he solicited comments on it from users.

We've so far only had a quick glance at the contents of the report, which is available from HMSO at £9.50 (the ISBN is 0 1151 39796). As far as amateur radio is concerned, the authors of the report seem to see it as a national asset but add that it has a large proportion of spectrum space allocated to it and should not have any more. We'll give a full analysis and comment in a subsequent Bulletin, probably next month's.

EMC ADVICE-LINES:

Members experiencing breakthrough problems with BT telephones should, in the first instance, contact "Customer Service" department via the operator and explain the problem. If this action does not prove effective within a few days or an unhelpful reply is received contact Les Hawkyard, G5HD, EMC Committee Chairman who is QTHR in the current callbook.

If TVI or BCI-type problems are experienced with 'rented' equipment, write to Les with the name and address of the complainant and details of the local branch of the rental company.

Advice on EMC matters can be obtained by telephoning any of the following EMC Committee members:

Les Hawkyard, G5HD	- 0409 28 342
Les Rowbotham, G8KLH	- 01 907 4219
Nick Edwards, G3XZB	- 0983 293244
Bert Hammett, G3VWK	- 0762 882758
Jim Martin, GU3YIZ	- 0481 57868
C A Webb, G4FWM	- 0391 75404
Jack Swayne, G3BLE	- 0665 720601

RSGB POLICY ON HF CONTESTS:

In response to several requests, we're publishing in full the RSGB HF Contests Committee's policy statement relating to HF contests:

"From time to time the Society receives complaints from members concerning the high levels of interference caused to non-contest operators by international contests. Frequently the Society is blamed for organising such events, or a member thinks that the RSGB can and should stop other bodies from running their own contests.

"RSGB is a member of IARU Region 1 and is represented on the HF Working Group, which lays down guidelines on contests for the many societies within the region. These guidelines cover contest periods, contest-preferred frequency segments, the number of contests and the type and other factors directly related to the reduction of interference to non-contesters. IARU Region 1 cannot control or regulate contests organised by magazine publishers, non-IARU bodies or societies located in other parts of the world. The majority of complaints to RSGB concerning contests stem from the 48-hour all-band or multi-mode contests organised outside Region 1, over which the RSGB has absolutely no jurisdiction or influence.

"It is necessary to strike a balance between those who support contests (a much larger percentage than some members think) and those who detest them. The RSGB attempts to take a very responsible attitude towards minimising any interference from contests organised by the Society. Recognising that these events can cause annoyance to non-contest operators, it has long been the policy of Council and the HF Contests Committee to adopt strict rules to limit and control the HF contests organised by the Society.

"These limitations are much more severe than those recommended by IARU Region 1. They are;

1. RSGB does not organise any multi-mode HF contests. All HF events are limited to a single mode (CW or SSB)

2. RSGB restricts the number of bands used in a contest. Only the Commonwealth Contest is a 5-band event; all the others are single- or dual-band affairs. RSGB does not organise any international DX contests - note that NFD and SSB FD are IARU-coordinated events.

3. The majority of RSGB HF contests are of very limited duration, and some are only 2 or 3 hours long. Only the Commonwealth contest is a 24-hour event.

4. RSGB pioneered the use of limited contest frequencies in its HF contests, and the frequencies permitted for contest operation are specified in the rules for the majority of these events

5. RSGB supports the view that, whenever possible, inter-UK contests should take place on weekday evenings, with a view to the further reduction of contest interference at weekends. This concept has been introduced for the 1.8 and 28 MHz Cumulative events. Whilst these weekday activity periods have proved popular with some members, many have indicated that they are unable to participate and prefer a limited-period contest during a Saturday or Sunday".

Members of the Harrogate College (for Girls) Radio Club in their shack. The club is thought to be only one of its kind at a girls' school with eight of the girls and two members of staff being licensed. The shack comprises a TS430S, KW1000 linear and TH3 Mk3 plus an inverted 'V' at 50' for HF, and an FT208R, 25W linear and a colinear antenna for VHF. The club station has the callsign GOHCA (Harrogate College Amateurs) but during the annual open day in June, the special event call GB2HC will be used. The station will be active from 1600 GMT on Thursday 25 June to 1600 GMT on Friday 26 June and will be operational in the 80, 40, 20, 15, 10 and 2 metre bands. (L to R in the photo: David, G4CWB, Director of Music; Jane, G1WUC; Ingrid, G1WUD; Julie, G1VRY; Michelle, G1VSA; Emma, G1RMO; Lynne, G1KNN; Ruth, G1VRZ; Kate, G1WUE; and Richard, G3XWH, Head of Physics and Computing)

Dear John...

Last month, in the first of these new columns, we looked at mobile/portable operation. However, we made a silly error when refering to alternative address operation. In the column we said that if you are at an alternative address for longer than four weeks you should notify your local RIS office and sign -/A. Not totally true! After you have notified the RIS office you DO NOT need a suffix. We're still wiping the egg off our faces.

With that out of the way, this month we take a look at class B operation on the HF bands.

CLASS B - WHERE, WHEN & HOW:

Alf from Swansea asks, "Can a class B operator in the same household operate my HF rig? What callsign does he/she use? What goes in the logbook and what is the strict meaning of 'operating under supervision'?".

A class B licensee may use the station of a class A licensee and operate in the HF bands under direct supervision. (clause 1 (2) (c) (ii) of the amateur licence).

The callsign used must be that of the class A licensee and all contacts should be entered in the class A's logbook.

When the period of operation is ended, the class B licensee should sign the class A's logbook giving his full name, callsign and signature: this should be countersigned by the class A. (clause 6 (2) of the licence).

'Operating under supervision' means just that: the class A should be present during all transmissions and be available to 'take control' at any time and for any reason. (clause 5 of the licence)

If the station comprises HF and VHF/UHF equipment (which is common to both licensees) the class B operator may use only the bands he/she is licensed for whilst operating alone under his/her own callsign. In this case, the class B op. uses his/her own logbook. (clause 2 (b) of the licence). The class B may not operate HF (even when using the class A callsign and under supervision) whilst the class A is operating on another band. Simultaneous operation of a callsign on more than band is not permitted, except in the case of "GB Special Event Callsigns" but that's another story.

GB2CDD was active for the Girl Guides "Thinking Day On the Air" from the Castle Donnington Church Hall on 22 February. The photograph shows G4YOX and members of the Castle Donnington District Girl Guides. The Guides and Brownies had an opportunity to pass greetings messages to stations in USA and Canada and a splendid day was had by all. Special thanks go to those who climbed the belfry to put up the 80m half-wave!

ST JOHN AMBULANCE 100 YRS

SPECIAL EVENT STATION IN HYDE PARK, LONDON.

This year is the centenary year of the St John Ambulance Brigade. The highlight will be a large party in Hyde Park, London on Saturday 20 June at which more than 100,000 people are expected to attend. It will be a memorable day for the Brigade as Her Majesty The Queen, the Sovereign Head of the Order, and His Royal Highness The Prince Philip, Duke of Edinburgh have graciously agreed to be present.

It was suggested by members of St John Ambulance Brigade that radio enthusiasts might wish to participate in the centenary event. The RSGB was approached about the possibility of setting up a special event station in Hyde Park so that overseas countries could be contacted during the celebrations. The Grafton Radio Society kindly offered to set up and operate the station at Hyde Park from 1600 GMT on 18 June to 1600 GMT on 20 June. The station will use the callsign GB4SJA and will be active in the 40, 20, 15 and 10 metre bands.

It is anticipated that Brigade members who are also licensed radio amateurs will participate in this world wide link-up, the focal point being London. As with all special event 'GB' stations, non-licensed members of the public will be able to pass a two minute greetings message to amateurs in the USA, Canada and the Falkland Islands. Special QSL cards will be provided by the St John Ambulance Brigade and will be sent out via the RSGB Bureau. If you can't get to the party try making contact over the air.

CROSSWORDS

Since we published the Christmas Crossword and invited members to send their own ideas in for possible publication, we've been deluged with them - we're currently seeing crossword grids everywhere we look and the Membership Services Department is overflowing with them! Seriously, we've received over 100 and many of them are excellent - some are real snorters and we'll save them for Christmas and other festive seasons. We'll probably start publishing a bi-monthly crossword in the Bulletin next month. Many thanks for sending them all in - we've got more than we can possibly use for a while yet, though, so please hang on to your crossword brainchild until we ask for some more.

GERMAN RECIPROCAL - ABOUT TURN:

You remember that in previous Bulletins we mentioned that a unilateral arrangement whereby UK amateurs visiting West Germany could operate without the tedium of having to obtain a reciprocal licence was in force for a time; it then lapsed. Well, as we went to press the situation finally was resolved.

UK radio amateurs who wish to operate in West Germany may now do so by obtaining the necessry letter of authority from the DTI. There is now no fee for operation in West Germany as the letter of authority confirms the class of licence. The letter can be obtained by writing to:-

Radiocommunications Division
Amateur Radio Section
Room 613
Dept of Trade & Industry
Waterloo Bridge House
Waterloo Road
London SE1 8UA

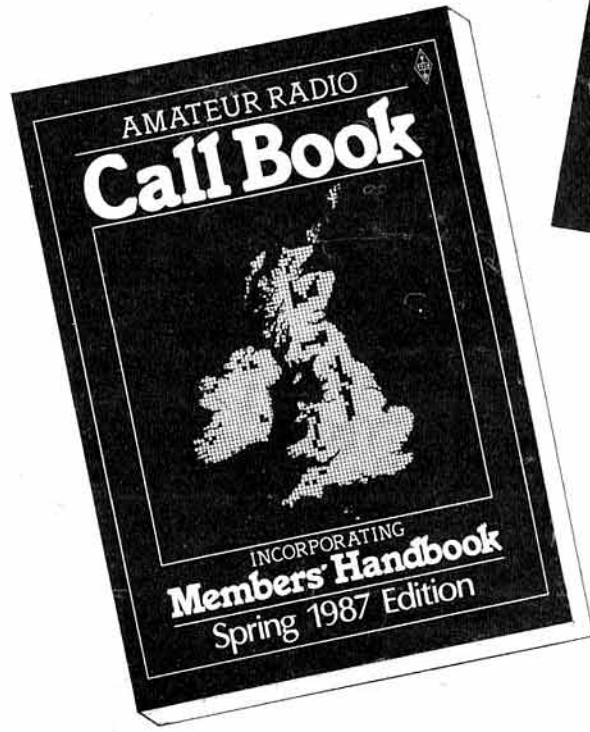
..... and please mark the envelope "West German Licence".

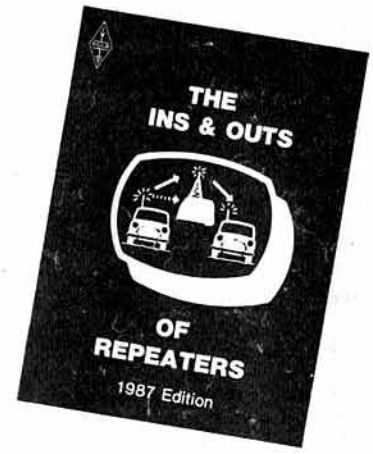
WOULD YOU CREDIT IT .....?

As of 1 July, we can take credit card orders over the telephone for books and all the other things we sell. We can take any of the Big Four - i.e. American Express, Diners Club, Access or Visa - and all we need is your card type, card number and name. This facility is available to both members and non-members.

Why not give this new facility a whirl by ordering one of the books we've mentioned elsewhere in this Bulletin? You really ought to have a current Call Book, you know.....that's right, the one with the light blue cover. That way you can send a QSL card direct to the Bulletin staff when you work them on the air, find out where that new beacon or repeater is, have a full amateur radio calendar for 1987 at your fingertips and have piles of other useful information available in the shack.

BOOK NEWS





As we mentioned last month, both these magnificent new books are now available from RSGB HQ. The Callbook costs £5.49 for members and £6.46 for non-members by post. As we mentioned previously, you can order your copy simply by picking up the telephone and quoting the number of your flexible friend at us.

The Ins and Outs of Repeaters costs £1.89 for members and £2.22 for non-members, again by post.

BULLETIN NEWS

Last month we mentioned in the context of a couple of stories that we'd have more information on some points - such as the full text of the Minister's speech at the NEC, for example. Because of the special 50/70 MHz feature and the consequent pressure on space (and in the case of the Minister's speech, the fact that the contents of it have now been overtaken by events to some extent) we've had to hold over some news until next month. Bear with us and apologies if something you were looking forward to isn't in this month's Bulletin.

Incidentally, whilst we're on the subject of Bulletin news, any items for inclusion in the Bulletin should be sent directly to RSGB Headquarters - please don't send them to the editorial residence in Wales because we might want to use them for other news outlets such as GB2RS or the DataBox and it runs up our phone bill no end when we have to read out quite long items and transcribe them. Please mark any

Please mark any items for the attention of David Gough at RSGB Headquarters.

Events Diary

Mobile Rallies

This is a list of all rallies, exhibitions and conventions notified to HQ **(as at press date)**. Items are given in detail for the next three months inclusive and in brief thereafter. Please send detailed information, including contact callsign and telephone numbers direct to HQ and marked 'Bulletin'.

6/7 JUNE
West Middlesex Radio Group Rally - Twickenham Rugby Football Club. Details G1DDR.
7 JUNE
Spalding Mobile Rally - Springfields Gardens, Spalding, Lincs. Opens 10am, usual traders. Details D Hoult G4OO, tel: 077 586 382.
14 JUNE
Elvaston Castle Mobile Rally - Elvaston Castle Country Pk, near Derby. Usual traders, talk-in on 2m & 70cm by GB2ECR. Details G4PZY, tel: 0332 767994 or G4CTZ, tel: 0332 799452.
RNARS Mobile Rally - HMS Mercury near Petersfield, Hants. Opens 10am. Talk-in on 2m and 70cm. Details G4UJR, tel: 0703 557469.
Mid-Lanark ARS Open Day - Wrangholm Hall Community Centre, Jerviston Street, New Stevenson, Motherwell. Satellite operation, RTTY, HF/DX demo, QRP. Traders, junk sale, car-boot sale. Talk-in on 2m. Details GM1SSA, tel: Holytown 732403.
19/21 JUNE
Ham Radio '87 - Friedrichshafen, Germany. 100+ international exhibitors at largest amateur radio exhibition in Germany. Exhibition Centre Friedrichshafen on Lake Constance.
21 JUNE
Denby Dale Mobile Rally - Shelley High School, near Huddersfield. Opens 11am. Usual traders, refreshments. Talk-in on S8, SU22 and 10m FM. Details G3SDY, tel: 0484-602905.
28 JUNE
30th Longleat Rally - Longleat Park, near Warminster. Usual traders and displays. Gardens and other attractions for the whole family. Details G4FRG, tel: Portishead 848140.
12 JULY
Sussex Mobile Rally - Brighton Racecourse. Usual trade and club stands. Free mini-bus to the Brighton sea-front for children and families. Refreshments and bar. Talk-in on S22. Details G4HUJ, tel: 0903-200572 evening.
Widnes & Runcorn ARC Radio Rally - Queens Hall, Victoria Road, Widnes. Rally opens at 10.30am (10am for disabled). Trade stands, bring & buy stall, licensed bar & refreshments, ample car-parking. Details from G1AWW tel: 051-424 8116.
Worcester & DARC Droitwich "Strawberry" Rally - High School, Droitwich. Opens 11am. Usual trade stands, family entertainment, free transport to local strawberry fields (weather permitting). Free parking, free entrance, talk-in on S22. Morse tests bookable via RSGB. Details Steve, G0AOC.
17/18/19 JULY
AMSAT UK Colloquium - University of Surrey, Guildford. All-in weekend cost of approx £45 (includes accomodation and all meals). Places booking fast, very few left! Series of lectures and demonstrations by leading lights in the amateur satellite field. Social events, Delegates Dinner and tours of UoSAT control station. Remote Imageing Group, BARTG, AMRAC and many other groups will be present. Details Ron, G3AAJ, tel: 01-989 6741. NOT UNIVERSITY OF SURREY.
19 JULY
Cornish Mobile Rally - Camborne College of FE. Opens 10am, usual traders. Talk-in available. Details G1AJB.
McMichael '87 Rally - Haymill Youth & Community Centre, 112 Burnham Lane, Slough. Opens 10.30am (10.15am for disabled visitors). Usual traders, real ale bar, something for the whole family. Car-boot sale, ATV demo, HF Special Event Stn GB4MR. Talk-in on S22 and SU8 by G6WIR - Burnham Beeches RC. Details G0BTY, tel: High Wycombe 29868.
Anglian Mobile Rally - High Woods Sports & Leisure Centre, Severalls Lane, Colchester. Opens 10am, all usual traders, bookstall, raffle, bring & buy, home catering. Talk-in on S22 by G4CRA. Details G6HQI tel: Colchester 862403.
26 JULY
Scarborough ARS Rally - The Spa, Scarborough. Open 11am, usual traders, right on the beach so ideal for the family. Talk-in on S22, SU8 and via GB3NY. Details Ian G4UQP, tel: 0723-376847.
2 AUGUST
Rolls-Royce ARC Mobile Rally - Rolls-Royce Sports & Social Club, Barnoldwick. Details, G4ILG, tel: 0282 812288 or 0282 813271 (day).
RSGB MOBILE RALLY - Woburn Abbey, Woburn, Bedfordshire.
9 AUGUST
30th Derby Mobile Rally - Lower Bemrose School, St Albans Road, Derby. Details Martin G3SZJ, tel: 0332 556875.
Hamfest '87 & Craft Fair - Wimbourne, Dorset. Details G0CDY, tel: 0202 872503.
16 AUGUST
Red Rose Rally - Bolton Sports & Exhibition Centre. *RSGB Stand* Details G1IOO, tel: 0204-24104.
23 AUGUST
Newbury & Dist ARS Radio Car Boot Sale - Acland Hall & Recreation Ground, Cold Ash, Newbury. Details G3VOW.
30 AUGUST
Torbay ARS Mobile Rally - STC Social Club, Brixham Road, Paignton. Details G3KZJ, tel: 0803 51995.
31 AUGUST
Doncaster & Dist Raynet Rally - Bircotes Sports Centre, Waterslack Lane, Bircotes, Doncaster. Opens 11am (10.30am for disabled visitors). Usual traders, bring & buy, refreshments. Talk-in on S21 by G4YRD.

IN BRIEF - More details later.

6 SEPTEMBER
Preston ARS 20th Annual Rally - Lancaster University. Details G3DWQ, tel: 0772 53810.
Bristol Radio Rally - Hareclive Youth & Harecliffe Community Centres, Hareclive Road, Harecliffe, Bristol. Details Len G4RZY, tel: 0272 834282.
West Kent Amateur Radio Rally - Angel Centre, Tonbridge, Kent. Details G4KIU, tel: 0892 515678.
12 SEPTEMBER
Ballymena Mobile Rally - Ballee High School, Ballymena. Details GI4HCN.
13 SEPTEMBER
Lincoln Hamfest - Lincolnshire Showground, Lincoln. Details G8VGF, tel: 0522 25760
Scottish AR Convention - The Magnum Sports & Leisure Centre, Irvine, Ayrshire.
National Amateur Radio Car Boot Sale - Old Warden Aerodrome, Beds. Details G6EES, tel: 0582 607623.
SMC Open Day - Chandlers Ford Industrial Est, Eastleigh, Hants. Colin Ward (SMC), tel: 042 15-55111.
Telford Mobile Rally - Telford Racquet & Fitness Centre. Details G3UKV.
20 SEPTEMBER
Peterborough R & ES Rally - Wirrina Sports Stadium, Peterborough. Details G4PNW.
Trafford Rally & Components Fair - Lancs CCC (Old Trafford), Talbot Road, Stretford, Manchester. Details G1IJK, tel: 061-748 9804.
Vange ARS Rally - Nicholas School, Leinster Road, Laindon. Details G4OJN, tel: 02774-4386.
27 SEPTEMBER
Harlow Mobile Rally - Harlow Sports Centre. Details G4KVR, tel: 0279 22365, daytime or G3UEG, tel: 0279 27788, evenings.
4 OCTOBER
Welsh Amateur Radio Convention - Oakdale Community Centre, Blackwood, Gwent. Details Brian GW3KYA, tel: 0495 225825.
Wakefield Mobile Rally - Details G4RCH, tel: 0532 536633.
Great Lumley AR & ES Rally - The Comunity Centre, Great Lumley, Chester-le-Street, County Durham. Details G4MSF, tel: 091 469 3955.
10 OCTOBER
RSGB Midlands VHF Convention - Madeley Court Centre, Telford, Shropshire. Details Peter G3UBX.
23/24 OCTOBER
Leicester Amateur Radio Exhibition - Granby Halls, Leicester. Details Frank G4PDZ, tel: 0533 553293.
1 NOVEMBER
Carmarthen ARS Exhibition & Rally - Leisure Centre, Johnstown, Carmarthen. Details GW3GUE, tel: 026 783 460.
7/8 NOVEMBER
North Wales Radio Rally - Aberconwy Conference Centre, Llandudno, Gwynedd. Details Derrick Watts, tel: Colwyn Bay 530041.
15 NOVEMBER
Bridgend Rally - Bridgend Recreation Centre, Angel Street, Bridgend. Details GW1OUP, tel: 0656 723508.
22 NOVEMBER
West Manchester RC Winter Rally - Pembroke Halls, Walkden. Details G1IOO, tel: 0204-24104.
6 DECEMBER
Verulam Christmas Rally - St Albans City Hall. Details Hilary G4JKS, tel: 0727 59318. Trade: Watford 52959.

OTHER EVENTS

19 JULY
Microwave Bands Assembly and Dinner - The Dunstall Suite, Dunstall Racecourse, Wolverhampton. Details F T Smith G6FK, tel: 0902-343746.

GB Calls

The list below shows **ALL** the special event stations licensed for operation during May and early June - **(as at press date)**
It is taken direct from the GB Calls file on the HQ computer. These callsigns are valid for use from the date given but the period of operation may vary from 1 to 28 days. There's now no need to send details direct to the editorial office.

1 JUNE:
GB0PCD - PLESSEY GALA DAY: Plessey RC, Beeston, Notts. Details G4VFK.
GB0SJA - ST. JOHN'S AMBULANCE: St.John's HQ., West Bromwich. Details G4ZAD.
GB2CF - GREENWICH FESTIVAL: Plumstead Common, SE London. Details G4DFI.
GB2PPC - PRIOR PARK COLLEGE: Bath. Details G3LYW.
GB2ALD - ALDERSHOT & DIST (SCOUTS): Army Camping Grounds, near Church Crookham. Details G4UEL.
GB2REG - REGIMENTAL: Regimantal HQ, Claro Barracks, Ripon. Details G4ZAT.
GB4HGJ/GB8HGJ - HOLMFIELD GOLDEN JUBILEE: Holmfield County Primary School, Leicester. Details G4UUG/G8ATE.
2 JUNE:
GB4CFB - CHESHIRE FIRE BRIGADE: Fire Station, Wilmslow, Cheshire. Details G4WKD.
3 JUNE:
GB2FHM - FOR HUMANITY AND MANKIND: St.John Ambulance Beach Hut, Sea Front, Lower Prom, Fleetwood. Details G0AJW.
5 JUNE:
GB2NTS - NATIONAL TRUST FOR SCOTLAND: Kirkcoswald, Ayrshire. Details GM3MTH.
GB2OTR - OLD TIME RALLY: The Showground, Aldham, Colchester. Details G3FIJ.
GB6BSW - BRISTOL SOUTH WEST: Woodhouse Park, Almondsbury, Bristol, Details G6ETL.
GB2LRS - LOUGHTON RADIO SOCIETY: Aylmers Farm, Old Harlow, Essex. Details G4FKI.
GB4DF - DELTA FIRE: Twickenham Rugby Ground. Details G0DIW.
6 JUNE:
GB2SAR - SOUTHDOWN AMATEUR RADIO: Hailsham Leisure Centre, Hailsham, E.Sussex. Details G4KAR.
GB2TCR - THREE COUNTIES RADIO: Lurgashall Village Green, W.Sussex. Details G4UWJ.
GB4DRC - DUDLEY ROAD CORRIDOR: Dudley Road Hospital, Winson Green, Birmingham. Details G4ZAD.
GB4FMC - FORD MOTOR COMPANY: Dagenham, Essex. Details G0BQF.
GB2EGS - EAST GOSCOTE SCOUTS: Jubilee Playing Fields, Leicester. Details G4UBD.
GB4IPA - INTERNATIONAL POLICE ASSOC: Police HQ, Leek Wootton, Warks. Details G4PIP.
7 JUNE:
GB0DCT/GB1DCT - DERBY CITY TRANSPORT: Ascot Drive, Derby. Details G0GHD/G1SFR.
GB4SPF/GB8SPF - SURREY POLICE FORCE: Guildford, Surrey. Details G0GFP.
GB6ABF - AMBULANCE BUS FUND: Wigston, Leicester. Details G6PFN.
8 JUNE:
GB6NVC - NICOLSON VICTORIA CROSS: Southampton. Details G6LOB.
9 JUNE:
GB6BH - BARLBOROUGH HALL: Barlborough, Chesterfield. Details G0DAG.
10 JUNE:
GB4SSP - SCHOOLS SATELLITE PROJECT: Bilton High School, Rugby, Warks. Details G4IZM.
11 JUNE:
GB2HVF - HAWARDEN VICTORIAN FESTIVAL: Hawarden, Deeside, Clwyd. Details GW4FLZ.
GB2MMR - MERCURY MOBILE RALLY: HMS Mercury, Petersfield, Hants. Details G4RLE.
12 JUNE:
GB0BRA - BANBURY RADIO AMATEURS: Spiceball Park, Banbury, Oxon. Details G4DLB.
GB0CXC - CLAY CROSS CHURCH: St.Bartholomews Church, Clay Cross, Derbys. Details G3ZY.
GB0WSS - WILSON STUART SCHOOL: Perry Common Rd, Birmingham 23. Details G0DJA.
GB4CDD - CLUB DENBY DALE: Shelley High School, nr Huddersfield. Details G3SDY.
GB4OH - OSBORNE HOUSE: East Cowes, Isle of Wight. Details G3FWE.

(over)

Events Diary

GB4SBF - ST BARNABAS FETE: Bromborough Village Centre, Wirral. Details G4YWD.
GB6AC - AIR CADETS: Cadet Centre, Holmfirth, W.Yorks. Details G4MTO.

13 JUNE:
GB2ISS - ISLINGTON SCOUTS SHOW: Highbury Fields, Islington, London. Details G0DCP.
GB2NTS - NATIONAL TRUST FOR SCOTLAND: Greenbank Garden, Clarkston, Glasgow. Details GM3MTH.
GB2YRS - YORK RADIO SOCIETY: "The Hamlet", Tollerton, York. Details G3TMN.
GB4SP - STAFFORDSHIRE POLICE: Police HQ, Cannock Road, Staffs. Details G4GKZ.
GB4SS - SHIPLEY SCHOOL: Shipley, nr Horsham, W.Sussex. Details G3PVH.
GB4WF - WESTFIELD FETE: Westfield Jnr School, St.Ives, Huntingdon. Details G4KJJ.

14 JUNE:
GB2TFS - THORN FARMERS SHOW: Thorne Showground, junc of A18/M180. Details G4NSM.
GB4DPC - DEWSBURY POLICE CELEBRATION: Police Station, Dewsbury, W.Yorks. Details G4IEJ.
GB4RPS - RUGELEY POWER STATION: Rugeley, Staffs. Details G4XCW.

15 JUNE:
GB0TPR - THREE PEAKS RACE: Meirionydd Yacht Club, Barmouth, Gwynedd. Details GW3GKZ.
GB2FC - FLEET CARNIVAL: Fleet, Hants. Details G0GJR.
GB4MSA/GB8MSA - MIDLAND SPASTIC ASSOCIATION: Harbourne, Birmingham. Details G0EJL/G8VBE.
GB4SJW - SIR JOSEPH WHITWORTH: Middleton by Wirksworth, Derbys. Details G0FQB.

17 JUNE:
G1HCG - HUNSINGORE CHURCH GALA: Cowthorpe Hall Farm, Cowthorpe, W.Yorks. Details G1UOQ.

18 JUNE:
GB2GG - GEORGE GREEN: Greens Mill & Science Centre, Sneinton, Nottingham. Details G4NZU.
GB2OH - ORMESBY HALL: Ormesby, Middlesbrough. Details G0BIA.
GB2RER - ROYAL ENFIELD RALLY: Lilliardsedge Caravan & Camp Site, Jedburgh. Details GM0DYD.
GB2SIN - SIR ISAAC NEWTON: Wyndom Park, Grantham, Lincs. Details G4VUA.
GB4SJA - ST JOHN AMBULANCE (100 year Celebration): Hyde Park, London. Details G4NYD.

19 JUNE:
GB0CRR - CENTRAL REGIONAL RAYNET: Stirling, Scotland. Details GM0FSV.
GB2DPS - DITCHAM PARK SCHOOL: Ditcham Park, nr Petersfield, Hants. Details G0DAE.
GB2RCC - RADIO CARAVAN CAMPING (CLUB): Londham, Notts. Details G4EPN.
GB2RNX - ROYAL NAVAL AUXILIARY: Port HQ, Scapa, Kirkwall, Orkney. Details GM4LNN.
GB4HAD - HOLYHEAD AND DUNLAOGHAIRE: Newry Beach, Holyhead, Anglesey. Details GW4ZWN.

20 JUNE:
GB2AGF - ANNUAL GARDEN FETE: The Shrubbery, The Crescent, Walsall, West Mids. Details G4VML.
GB2CS - CARNIVAL SLEAFORD: Boston Road Recreation Ground, Sleaford, Lincs. Details G2HHK.
GB2INB - INCE "B": CEGB Ince "B" Power Station, Elton, Chester. Details G4XQA.
GB2RAM - RAMSEY: Queens Pier, Ramsey, Isle of Man. Details GD4MNS.
GB2WFH - WHITCHURCH FOLK HOUSE: Whitchurch, Bristol. Details G4RZY.

22 JUNE:
GB2HC - HARROGATE COLLEGE: Harrogate, N.Yorks. Details G3XWH.

24 JUNE:
GB4LMR - LONGLEAT MOBILE RALLY: Longleat Park, nr Warminster, Wilts. Details G4FRG.

26 JUNE:
GB0CDT - COASTAL DEFENCE "T" (FORT NELSON): Grid: SU 628 069. Details G0GIA.

27 JUNE:
GB0KCF - KINGSTON BAGPUIZE CHURCH FETE: Recreation Ground, Kingston Bagpuize-with-Southmoor, nr Abingdon, Oxon. Details G0AOZ.
GB0SGF - SHAMLEY GREEN FETE: Village Hall, Shamley Green, Surrey. Details G4WYJ.
GB2BYN - BRYN 'Y' NEUADD: Bryn Y Neuadd Hospital, Llanfairfechan, Gwynedd. Details GW4UWI.
GB2CF - CONGRESBURY FAIR: Village Hall Grounds, Congresbury, Somerset. Details G4SIY.
GB2CFD - CUBS FUN DAY: Moor House Scout Centre, West Rainton, Co.Durham. Details G4OHZ.
GB2DW - DICKENS WEEK: Victoria Bandstand, Broadstairs, Kent. Details G0CHN.
GB2RAF - ROYAL AIR FORCE: RAF Locking, Weston-super-Mare. Details G3FVC.
GB4BPM - BROMLEY PEAGENT OF MOTORING: Norman Romley Park, Bromley, Kent, Details G0CRI.
GB6EMC - EYRES MONSELL CARNIVAL: Eyres Monsell Park, Leicester. Details G6PFN.
GB8SRG - SURREY RAYNET GROUP: Netherne Hospital, Chipstead, Surrey. Details G1LKJ.

28 JUNE:
GB0DFS - DERBYSHIRE FIRE SERVICE: Fire Service HQ, Littleover, Derby. Details G4LPZ.
GB2MRS - MANX RADIO SCOUTING: Ballawillyn Farm, Peel, Isle of Man. Details GD4OEL.
GB4ISC - ISLAND SCOUT CAMP: Ballawilyn Farm, Peel, Isle of Man. Details GD4OEL.
GB4YTG - ESSEX KITE GROUP (HOLDER CALLSGN): The Playing Field, Gt.Waltham, Essex. Details G4YTG.

1 JULY:
GB2DJ - DIAMOND JUBILEE: Elvaston Castle Country Park, nr Derby. Details G4XPE.
GB2ERD - GB CLUB CALL (Derby & DARS): Elvaston Castle Country Park, nr Derby. Details G4HDP.
GB2ICD - INTERNATIONAL CO-OP DAY: Recreation Ground, Old Heath Rd, Colchester. Details G3FIJ.
GB2RF - ROSE FAIR: Wisbech, Cambridgeshire. Details G0FHM.
GB2USA - UNITED STATES OF AMERICA: RAF Chicksands, nr Shefford, Beds. Details G0ABW.
GB2WRF - WISBECH ROSE FAIR: St.Peters carpark, Church Terrace, Wisbech, Cambs. Details G4ODH.
GB4BGG - BEECHGROVE GARDENS: BBC House, Beechgrove Terr., Aberdeen. Details GM4GXD.
GB4JLY - 4TH JULY: Sharrow, Ripon, N.Yorks. Details G0CLY.
GB4JUL - 4TH OF JULY: Darley, Harrogate, N.Yorks. Details G0FWG.
GB4RRA - RED ROSE AWARD: Bolton, Gtr.Manchester. Details G0FRL.

2 JULY:
GB2RCC - RADIO CARAVAN CAMPING (CLUB): Weedon, Grid: SP 675 591. Details G4EPN.

3 JULY:
GB2ALD - ALDERSHOT & DIST SCOUTS: Tweseldown Racecourse, Church Crookham. Details G4UEL.
GB2NTS - NATIONAL TRUST FOR SCOTLAND: Brodick Castle, Brodick, Isle of Arran. Details GM3MTH.

4 JULY:
GB2RAM - RAMSEY: Ramsey, Isle of Man. Details GD4BEG.
GB4SJW - SIR JOSEPH WHITWORTH: Whitworth Inst., Darley Dale, nr Matlock. Details G0FQB.
GB4WRT - WEDNESBURY ROUND TABLE: Brunswick Pk., Wednesbury, W.Mids. Details G4ZAD.

6 JULY:
GB2IAT - INTERNATIONAL AIR TATTOO: Fairford Airfield, Glos. Details G4ZAZ.
GB6NVC - NICOLSON VICTORIA CROSS: Millbrook, Southampton. Details G6LOB.

10 JULY:
GB0ARR - AMATEUR RADIO ROCHFORD: Hawkwell, Essex. Details G4TUO.ESSEX. G4TUO
GB0DAN - DANSON PARK SHOW: Danson Pk., Bexley Heath, Kent. Details G3TAA.
GB4SPC - SANDWELL PHAB CAMP: Dartmouth Pk., West Bromwich. Details G0BZP.
GB8SI - SHAINT ISLANDS: Eilean An Tighe Island, South island of Shaint Island Group. 49deg 58'N, 6deg 3'W. Details GM3MTH.

11 JULY:
GB1SWC - SOUTH WINGFIELD CARNIVAL: South Wingfield, Derby. Details G1SFR.

Mobile Rallies

Listed below are the VHF and HF contests for the next quarter. The full list of RSGB's VHF and HF contests for 1987 was given in the December 1986 issue.

VHF CONTESTS 1987

14 JUN:	432 MHz FM (rules April 87)
21 JUN:	10 GHz Cumulative
4/5 JUL:	VHF NFD (rules April 87)
12 JUL:	10 GHz Cumulative
8 AUG:	144 MHz Low Power & SWL
9 AUG:	432 MHz Low Power & SWL
	10 GHz Cumulative
23 AUG:	1296/2320 MHz
5/6 SEPT:	144 MHz Trophy
	IARU VHF & SWL

HF CONTESTS 1987

6/7 JUN:	HF NFD CW IARU
11/12 JUN:	SWL Contest (rules May 87)
14 JUN:	DF Qualifying - Northampton
27/28 JUN:	Summer 1.8MHz
	DF Qualifying - Dartford Heath
12 JUL:	DF Qualifying - S.Manchester
19 JUL:	QRP Field Day
AUG (tba):	Hopscotch
2 AUG:	DF Qualifying - Salisbury
17 AUG:	DF Qualifying - Colchester/ Chelmsford
30 AUG:	ROPOCO 2
5/6 SEPT:	SSB NFD

INTERNATIONAL CONTESTS

6/7 JUNE:	Field Day CW (DARC)
20/21 JUNE:	All Asian DX Phone (JARL)
4/5 JULY:	YV DX Phone (RCV)
11/12 JULY:	HF World Championship CW/Phone (IARU)
18/19 JULY:	HK DX CW/Phone (LCRA)
	SEA Net CW (MARTS)
25/26 JULY:	YV DX CW (RCV)
1/2 AUGUST:	YO DX Phone (RCV)
8/9 AUGUST:	European DX CW (DARC)
15/16 AUGUST:	Remembrance Day CW/Phone (WIA)
	SEA Net Phone (MARTS)
22/23 AUGUST:	All Asian DX (JARL)
5/6 SEPTEMBER:	Field Day Phone (IARU Reg 1)

CLUB CONTESTS

Worked All Britain Contests:

28 JUN	VHF QRP	0900-1200 GMT
	VHF QRO	1400-2100 GMT

ATV Contests:

20/21 JUN Summer Fun (all bands)

PS

A last thought - watch that second harmonic on 50 MHz. We're coming up to the Proms season: just think of all those hi-fi addicts with high-tech Band 2 tuners and ears to match glued to their rigs listening for a pin to drop in the Albert Hall. Is the output of YOUR 50 MHz rig filtered?

HQ station GB3RS hopes to be operational on 50 and 70 MHz soon - watch this space for details.

Not much response yet to our offer of personalised Call Book entries last month - take a look at page 344 again....

NEWS & VIEWS

HF

*John Allaway, G3FKM**

Top band

The latest list from IARU dated 4 March 1987 shows the position in Region 1. However, some countries have not sent in reports and may not be included in the following data.

As a result of WARC 1979 the Table of Frequency Allocations allocates the segment 1,810–1,850kHz to the amateur service, with certain exceptions (which are listed in Footnotes 490, 491 and 493). However, six countries allocate the whole segment 1,800–2,000kHz; Cyprus (phone allowed only between 1,900 and 2,000kHz), Gibraltar, Ireland, Lesotho (only 10W), Nigeria (10W), and Oman (up to 10W of cw only). All or some of the 200kHz is shared with other services. Amateurs in the following have access to more than 40kHz: Andorra (1,810–1,875kHz with phone permitted only in the upper 50kHz); Austria (1,810–1,950kHz, phone 1,840–1,850kHz 100W); Botswana (1,810–2,000kHz up to 32W p.e.p.), Czechoslovakia (1,750–1,850kHz, phone between 1,820 and 1,950kHz 10W), Finland (1,820–1,845kHz and 1,915–1,955kHz 10W), German Dem Rep (1,810–1,950kHz, phone in upper 50kHz 10W) German Fed Rep (1,815–1,835kHz and 1,850–1,890kHz, phone 1,832–1,835kHz only), Malta (1,810–2,000kHz 10W), Mauritius (1,810–2,000kHz 10W), Norway (1,820–1,850kHz 15W), Poland (1,705–1,800 and 1,810–1,930kHz 10W except 1,830–1,850kHz), USSR (1,830–1,930kHz low power, phone allowed in upper 70kHz), and the UK (1,810–2,000kHz 10W).

The following have 1,810–1,850kHz: Bahrain, Djibouti, Gabon, Kuwait, Luxembourg, San Marino, Senegal, Switzerland, S Africa, Turkey (up to 30W erp), Yugoslavia (ssb 1,830–1,850kHz), and Zambia (10W).

The segment 1,830–1,850kHz is available to Belgium (10W), Denmark (cw only, 10W), Faroe Is (cw, 10W), France and Reunion Is (1,810–1,830kHz), Hungary (cw, 10W), Italy, Kenya, Monaco, Portugal (cw and rtty, 60W), Spain and Syria.

Amateurs in the Netherlands are allowed 10W of cw and ssb in 1,825–1,835kHz, and cw only in 1,835–1,850kHz. In Sweden 10W of cw only is allowed in 1,830–1,845kHz. No access is allowed in Lebanon, Liberia, Morocco and Romania.

DX news

The *Long Island DX Bulletin* reports that 4K0E and 4K1A will be trying to be active on all bands using both cw and ssb. I wonder if in fact some of the QSLs for apparently bogus VK1 stations mentioned in the March column could have been from people who missed one dit from the "4"?

At the time of writing VK9LM, on **Lord Howe Is**, was reported to be near 14,010kHz most days from 2130, and on 7,002kHz from 1000. ZK3PM is said to be on both cw and ssb on 7 and 14MHz. Joe, KH6GDR, is believed to be on **Christmas Is** (the one in the Pacific) and on the air as /T32 with the possibility of a prolonged stay.

The French island of **St Barthelemy** now uses its own prefix which is FJ. *DXNS* lists the new calls as follows: FG5AU = FJ5CB, FG5CB = FJ5AB, FG5BU = FJ5BC, FG5EB = FJ5CD, FG5EK = FJ5AD, FG5BQ = FJ5CQ, and FG5BW = FJ5AH.

Iris and Lloyd Colvin finished their African trip on 27 March when they left Nairobi to return to the USA. It is not known what further plans they may have. The rumoured visit by George, VE3FXT, to **Marion Is**, is said to have been postponed until next January. QSLs sent for the unlicensed August 1986 operation are being returned together with a letter from SARL which explains the circumstances. *DX-NL* reports that two Israeli amateurs are at present on the island as members of the crew which is building the airport.

1987 is the centenary of the city of Muskoka, Ontario. To publicise the event VE3DFA is presenting an attractive certificate to all those who work him during the year.

*10 Knightlow Road, Birmingham B17 8QB

9G2MR was very active during March and appearing on 14,197kHz or thereabouts at 1900 quite often. He was hoping to come on 7 and 21MHz. Nothing is known about the validity of his licence but generally speaking amateur radio is not allowed in **Ghana** at the present time.

The *Lynx DX Bulletin* gives details of a planned expedition to the **Saharan Arab Democratic Republic**. This is the former Spanish territory of Rio de Oro. It is intended that this takes place in August and that activity will be on all bands on cw and ssb using the callsign S0RASD. EA2s ANC, OP, IA and JG are mentioned as participants, and they hope to leave a permanent station there when they leave. Documentation will be provided for ARRL and hopefully DXCC status may be granted.

Martin Haasen, better known as OY7ML, has written to say that his callsign is being pirated and that he is receiving many cards for QSOs he hasn't made. Most of these seem to have taken place between 1500 and 1800 on 14 and 21MHz cw and the pirate uses what sounds like a Vibroplex key.

In the rumour department are some stations allegedly claiming to be in the **PDR Korea**. The most recent of these was P9AF who perhaps significantly asked for QSLs via the P9 bureau—which at the time of writing had not been heard of. However, beam headings and times seem to have been right so we will have to wait and see.

Stations in the **Federal Republic of Germany** are now using the /60 suffix. This marks the 60th anniversary of amateur radio in their country.

Turkey is no longer on the list of countries which officially forbids its amateurs to talk to those in other countries. For the first time ever representatives from Turkey attended the IARU Region 1 conference this year and it seems that amateur radio is now being seen in a good light by the government.

More piracy—this time a report that 7Q7LW's callsign has been used by a pirate on 3·5MHz.

New activity from **Franz Josef Land**—in addition to regular activity by UV1OO, UV1OT and RZ1OWA, UA1ODX is now on the air and has been working into the UK on 7MHz cw in the early evenings.

The special callsign TV7GLC will be on the air from Rouen between 1 May and 30 June to celebrate the 900th anniversary of the death of William the Conqueror. Special QSLs will be sent out via F6DLM.

Superb QSLs from the **Peter 1 Is** expedition have now been received. The total number of QSOs made was 15,841:10,090 on ssb, 5,703 on cw and 48 on rtty. Twenty-nine QSOs were made on 1·8MHz, 587 on 3·5MHz, 1,189 on 7MHz, 9,307 on 14MHz, 4,570 on 21MHz and 159 on 28MHz. There were 2,736 QSOs with Europe. A most creditable performance.

DX News Sheet

No apologies for mentioning this hf "weekly" again, as it is now much enlarged and consists of four A4-size sides crammed with information of value to almost anyone who is interested in hf band activities. To mention a few features: it summarizes the previous week's dx, gives details of forthcoming dxpeditions and contests, and information on awards, QSLing and many other items. In my opinion it is now equal to, or better than, any other similar hf news sheet. Full details of subscription rates are available from RSGB HQ.

Philips International Amateur Radio Group

There is in existence a Philips amateur radio group the purposes of which are the normal amateur objectives of friendship and technical information exchange, but in the narrower field of present and retired employees of Philips and associated companies. With about 2,000 radio amateurs working for Philips worldwide, an on-the-air get-together is held once a year—but where are those 380 stations who work for Philips in the UK? To become a member all you have to do is to send your name, callsign, address, company affiliation and site to your local co-ordinator. Retired members receive mail direct and working members via local co-ordinators. More information from Ian Swan, GM8BSE,QTHR, or c/o Philips TMC Ltd, Victoria Place, Airdrie ML6 9BL.

OK/G QRP tests

Angus Taylor, G8PG, of the G-QRP Club, reports that last year these tests were run on an experimental basis with selected teams operating from both countries. This proved so successful that this year the tests were thrown open to all QRP operators. They took place on 31 January/1 February and the results were very satisfactory. The participation by Czech QRP stations doubled, showing the very steady increase in QRP activity in that country, and the number of QSOs with the UK also doubled, no less than 43 different QRP stations in G, GM, GJ and GW being worked. As was the case last year, 10MHz proved to be the star band, followed by 14MHz, but there was also a healthy increase in 3·5 and 7MHz contacts. Top band was disappointing, with only one contact made. Much of the trouble with the two lower frequency bands was tv timebase noise in the UK. Next year,

times will be picked for the two bands that will minimize the problem. On 14MHz a very interesting skip was present, contacts with OK3—and for part of the time with OK2 being possible—but with OK1, which is nearer, lying in the silent zone.

Solomon Island

The Solomon Is RS reports that its QSL bureau has been resurrected and is now operating. It has over 2,000 QSL and listener cards for former H44/VR4 stations. Most of these were expatriates who were only on the islands for a couple of years at most, and SIRS has no forwarding addresses. Any former H44/VR4 station or anyone who has information is asked to write to SIRS QSL Bureau at PO Box 418, Honiara, Solomon Is, with the information. Photocopies of QSL cards received from former H44/VR4 stations are also helpful as they often give the name of the operator, his or her home callsign and home address or alternate QSL addresses. SIRS is looking particularly for Anthony Bryan Sturm, ex-H44IA/P29IA/ZL2IA, as over 1,000 QSL cards are held for him! DXers are urged to send cards direct to H44 stations or to the H44 QSL bureau, as QSL bureaux in some areas have been known to delay H44 cards for years due to small numbers received, and by this time many operators have left the country.

News from overseas

Reb Jones, G0CJM, has written from Singapore to say that he hoped that his 9V licence would be issued during April. He intends to operate around 3,002, 7,002 or 10,102kHz between 0615 and 0730, and again on 14,002, 14,065, 14,182 and 14,320kHz from 2000 to 2315. When he wrote, Reb was hearing very few UK signals, but he suggests that it might be a good idea to call "CQ RSARS 9V1" near his published frequencies and if he hears you he will send a listener card!

DXNS DXCC Countries Guide

This shows DXCC countries listed alphabetically, with present and past prefixes back to 1945, plus a reference list of previous names of countries and other useful notes, also a list of deleted countries with full information. Most useful to dxers now retired and taking up radio after a long period of inactivity and thinking of applying for the DXCC Award! Those on the Honour Roll may wish to begin working islands instead of countries. The list gives the IOTA reference number of all the islands on the DXCC list —well over the 100 necessary to claim the basic IOTA CC-100 Award and to get on the IOTA Honour Roll. Included also is a comprehensive Oblast listing for those interested in obtaining the USSR R-100-O Oblast Award. The 11 page guide costs £1 (UK) or will be sent overseas by airmail for US $2 (or six ircs). Apply to Geoff Watts, 62 Belmore Road, Norwich, NR7 0PU.

Geoff still produces his *Radio Amateur Prefix-Country-Zone List*. This gives (for each country) normal prefix, special prefixes, continent, ITU callsign block allocation, DXCC status, ITU zone, and *CQ* zone. It also contains full information on Antarctic stations, USSR club stations, and obsolete prefixes used during the past 10 years. It covers 15 pages and is the same price as the *Countries Guide*. Both are well worth buying.

Welcome . . .

. . . to the following who joined the Society during March: DA4CA, DJ3AK, EI9FK, FD1HPK, OE3FPW, OH1AF, S79DW, SM5IXH, VE5LY, VK6CP, WC6U, 9H5BY, and W Wangombe (5Z) and F Olte (C3).

Awards

Filipinas Award

A two-in-one award available to all licensed amateurs and listeners. Applicants must have worked or heard and confirmed each of the nine Philippine districts. Any missed district may be substituted with a club station (recognized by its DX prefix) but not more than two may be claimed in this way. A five band Filipinas Award is available to those who have worked or heard the Philippines on five bands. Send log details (certified by two other licensed amateurs or a national society awards manager) plus US $10 to Robin U Go, Award Custodian, PO Box 125, Cotabato City, Philippines. It is recommended by the sponsors that applications be made by registered airmail.

Field Day Diploma

This is intended to increase interest in the EDR national field-day which this year takes place from 1500 5 September to 1500 6 September on both cw and ssb. It covers 3·5 to 28MHz. As in the UK, participants will use /P after their callsigns. The award is in two classes—Class A for working 15 stations on one band in the same year, and Class B for working 30 in the same year spread over at least four bands. Send log extract plus five ircs to Allis Andersen, OZ1ACB, Kagsaavej 34, DK-2730 Herlev, Denmark.

DL 60 Award

A special award is being sponsored by DARC to celebrate 60 years of amateur radio in Germany. The award is available to all radio amateurs and listeners. To qualify applicants must obtain 60 points by working club stations and special anniversary stations located in the Federal Republic of Germany.

ALL-TIME BAND TABLE CURRENT COUNTRIES No 6

Callsign	1.8MHz	3.5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3KMA	124	236	298	317	315	300	1,590
G3MCS	64	211	259	314	314	294	1,456
G3GIQ	70	205	257	314	313	294	1,453
G3XTT	151	197	237	286	278	244	1,393
G4DYO	66	184	233	309	302	283	1,377
G3UML	30	212	225	314	284	243	1,308
G4GIR	88	198	229	280	255	244	1,294
G4BWP	92	205	226	274	227	238	1,262
G4FAM	64	180	238	268	265	240	1,255
G3ALI	2	213	221	302	271	231	1,240
G2DMR	52	164	173	299	291	257	1,236
VK9NS	80	184	226	290	243	192	1,215
G3XQU	44	161	184	287	270	242	1,188
GW4BLE	24	166	180	271	268	240	1,149
G3VIE	43	117	169	285	284	246	1,144
G3TXF	59	161	180	252	245	205	1,102
G3IGW	99	150	234	225	197	182	1,087
G3NOF	4	84	82	313	310	264	1,057
G3YMC	78	106	171	239	240	184	1,018
GM3YOR	74	137	181	213	196	179	980 (cw)
GW4OFQ	50	200	182	210	191	135	968
G4OBK	115	103	127	190	161	124	820
G4JBR	62	142	124	142	156	172	798
Average	67	170	202	269	255	228	1,191

Next deadline—scores for All-Time (with deletions) **to reach G3GIQ** no later than **8 July** please.

10MHz COUNTRIES TABLE

	All-time	1987
G3PJT	90	40
G4OBK	56	35
G4YWG	60	31
G4VDX	67	29

1987 28MHz COUNTRIES TABLE

G4JBR-36	G4NXG/M-2
G4XAH-22	G4OBK-1
G4MUW-6	G0FYD-1
G3XQU-4	

Contacts with club stations (prefixes DB0, DF0, DK0, DL0, or DP0) are worth one point. Club stations may be worked once on each band. Contacts with the special anniversary stations DB0HQ/60, DF0AFP/60, DF0BUS/60, DK0DX/60, DL0AND/60, DL0DBP/60, DL0DL/60, DL0FUB/60, DL0HFG/60, DL0SWL/60, and DL0UKW/60 count five points but may only be counted once ie not once per band. Only contacts during 1987 are valid. Special endorsements are available on request for single-band or single-mode entry. Send log details, plus DM10, US $5, or 12 ircs to DARC Traffic Manager, Hans-Peter Gunther, DL9XW, Am Strampel 22, D-4460 Nordhorn, F R Germany.

Diplome du Gabon

This is available in three classes—DDG1 for confirmed contact with eight Gabon stations, DDG2 with 12, and DDG Special which is awarded for proof of contact with one TR station on each of five different bands, at least two of which must have been If. The fee is 10 ircs, and applications should be sent to AGRA Diploma Manager, BP 1826, Libreville, Gabon.

SP5NOW took over as **PZK Awards** manager in October 1986 and has written to say that all PZK awards now cost 10 ircs and not five as published in many magazines.

Contests

All Asia DX Contest

0000 20 June—2400 21 June (Phone section)

1·8 to 28MHz. Single-operator single- or multi-band, and multi-operator multi-band sections. Stations send RS followed by their age (ladies send "00"). Non-Asian stations work only Asians and QSOs count three points on 1·8MHz, two on 3·5MHz, and one on the other bands. The multiplier is the number of different Asian prefixes worked on each band. Please note that contacts with USA military stations do not count and that those in the Minamitorishima part of JD do not count either. At the time of writing no 1987 contest stationery has been received but photocopies of 1986 rules are available from me in exchange for an sase. Should 1987 forms arrive these will be sent of course!

Results of the **1986 CQ WW WPX SSB Contest** were published in March *CQ*. UK scores were as follows:

SINGLE-OPERATOR

Callsign		Points	Callsign		Points
G3FXB	(All bands)	2,487,550	G4KHF	(All bands)	18,289
GM4GPN	(All bands)	397,518	**G4OBK**	(28MHz)	42
GM4WEW	(All bands)	173,885	**G4TNB**	(21MHz)	88,230
G4TXM	(All bands)	139,152	**G4ZFE**	(14MHz)	39,624
G4YEK	(All bands)	62,250	G3NT	(14MHz)	26,712
G0CLY	(All bands)	23,944	G6NK	(14MHz)	5,376

In the **Multi-Operator Single-Transmitter** category **GW0WAS** came European eighth with 4,504,500 points. G3UOA scored 793,152 and G4XOM 157,617 points.

WW S America CW Contest

1500 13 June-1500 14 June

CW only. 1·8 to 28MHz. Exchange RST and serial number (from 001). QSO with all countries. Multiplier is different DXCC countries and S American prefixes worked on each band added together. Single-operator single- and multi-band, multi-operator single-transmitter and listener sections. QSOs in own country zero points (multiplier only), in same continent two points, other

QTH CORNER

C56/G3OLU	via G3OLU, 2 The Ruskins, Rayne, Braintree, Essex, CM7 8TP.
ON71P/ST2	St Piedfort, Kloosterstr. 49, B-2465 Gierle, Belgium.
TE2Y	Luis A Retana J, Box 197, Paseo de los Estudiantes 1002, Costa Rica.
TI5MRC	Martin Rosenthal, PO Box 73, Unionville, Ont, L3R 2L8, Canada.
TZ0MAR	DJ5RT, W Ruppert, Riesenkopfweg 7, D-8209 Schloberg Stefanskirschen 1, FR Germany.
VK9LM	via OE1ZL, P Kratzl, Ruppweg 4, A-1210 Vienna, Austria.
VP8BGX	J D Flegg, G4OYY, Oaklea, Ham, Axminster, Devon, EX13 7HL.
VP8BKQ	A Walker, G4ORO, 4a Winton Drive, Eston Lanbaurgh, Cleveland, TS6 9LY.
YS0YS	PO Box 517, San Salvador, El Salvador.
ZC4AK	via G3VHE, R A Evans, Officers Mess (111), RAF Cuterslott, BFPO 47.
ZC4IT	Ian Tough, 16 Javelin Way, RAF Benson, Nr Wallingford, Oxon.
3G87PAX	PO Box 72, Valparaiso, Chile.
4M0ARV	PO Box 3636, Caracas 101-A, Venezuela.
5A0A	W Ziolkowski, SP6BZ, Box 253, 50-950 Wroclaw 2, Poland.
5Z4KG	Yasme Foundation, PO Box 2025, Castro Valley, Calif, 94546, USA.
DJ6QT/9L	W Skudlarek, an der Klostermauer 10, D-6476 Hirzheim, FR Germany.

continents four points, with S America eight points. Send separate log for each band, and post before 31 August to WWSA Contest Committee, PO Box 18003, 20772 Rio de Janeiro, RJ Brazil. In the 1986 contest G3VZT scored 17,138 points on 7MHz, and G3ESF 53,460 in the multi-band section.

Second IARU HF World Championship
1200 11 July–1200 12 July
The object is to contact as many other amateurs as possible—especially IARU member society headquarters stations. 1·8 to 28MHz (excluding WARC bands). Single-operator, phone only, cw only, and mixed classes, as well as single-transmitter multi-operator mixed mode. HQ stations may operate simultaneously on more than one band. Exchange RS/T and ITU zone. A station may be worked once per band per mode by mixed-mode entrants. QSOs with own ITU zone and with all society HQ stations count one point, with own continent but in another ITU zone three points, and with other continents five points. The multiplier is the total of ITU zones and HQ stations worked on each band. Official entry forms are available from IARU HQ, 225 Main St, Newington, Conn, 06111 USA. Copies of the rules are available from G3FKM (sase please).

In the **17th ARRL 160M** Contest the only UK entrant was **G3ZFC** who scored 4,620 points.

Around the bands

Rather short measure this month, due to the very early deadline brought about by my absence at the IARU Region 1 Conference. However, I am very grateful to the following who did manage to get their reports to me in time: G1XEO, G2HKU, G3YY GM3CSM, G3GVV, G3PXT, G4QK, G4BYG, G4EHQ, G4JBR, GW4KGR, G4s LRS, NXG/M, OBK, UZN, XAH, and RS52868.

As always stations listed in italics were using A1A.

1·8MHz 0000 *G6ZY/EA6, OY9JD, K1ST/6W1, DJ6QT/9L.* **0700** *ZL3GQ.* **1800** *W7AWA/OY, ZL3GQ.* **2000** ON7BW. **2200** *LX1GQ/50, W1-W3, 9H1CG.* **2300** *TU4A, VK9XS, VS6DO, 9M2AX.* **3·5MHz 0000** *C56/DK7PE, UJ8AH, 4M0ARV, K1ST/6W1.* **0300** ZF2KT. **2100** C30BBE, TK5EA. **2200** 4U1ITU. **2300** *TA4A.*

7MHz 0000 D44BC, *PZ1AV, VP2MDY, ZD8CW, K1ST/6W1,* **0100** *VP2EC, K1TN/VP2M, 4K1H, 9L1GG.* **0600** *NW6N, WL7E, 4M0ARV.* **0700** FM0A. **0800** *OH2KI/CT3.* **2000** *VK3, VK6, VS6DO.* **2300** *8P9HG.*

10MHz 0000 *W1FZY.* **0800** *VK6ZE.* **1100** *OY3H, W1, W4.* **1200** *W3.* **1900** *K5HK/KP2.* **2100** *PJ2/W1BIH.* **2200** *W0FVP.* **2300** *KJ9I.*

14MHz 0700 JY5CI, VK, YI1BGD, ZL. **0800** JA, KH4AC/KH2, VK9ND, 3C1MB, VE2PAB/4U. **0900** BV6IA, HL9YG, *TR8CR.* **1000** *UZ0LWC.* **1100** *JA.* **1200** BV2B, *K1TN/VP2M.* **1300** *TI1T, 6W1CK,* **1400** *HZ1AB, VU2LAM.* **1500** *S79WH.* **1600** HS0B. **1700** S79CW, TU4A, *VU4APR,* YE0X, *4S7GX,* 9M8GH. **1800** A25/VE3FXT. *TZ6FIC,* ZD9BV, *5A0A,* 5V7SA, 7X2LS. **1900** VP8QP, 4M0ARV, ZD8RP. **2000** *FS5IPA,* J6LPS, TZ0MAK, V44KQ. **2100** K7LXC, 3X0HSH/TY, 9Q5ML. **2200** *OA4BJU,* VP8MC, *3G87PAX, 4U1UN.*

18MHz 1100 *OK2BPM, YU3AN.*

21MHz 1000 3D6CW. **1100** *C56/DK7PE,* JY5ZM, TR8LD, VK6ADP, *VK8HA,* 3D6CW, 5H3RB, 9N1MC. **1200** YB, *5A0A.* **1300** H24SA, TR8JC, ZC4EE. **1400** A25/VE3FXT, AP2SQ, OD5AS, 3C1MB, 5A0A, *5Z4KG.* **1500** *CP8HD,* TJ1CH, *3B8CF* 7P8DB, *9Q5s DA, KI.* **1600** 5L2FT, *7Q7LW.*

28MHz 1200 CN2AQ, ZSs 1ABH, 3WPX. **1300** ON7VD/5N6, **1400** ZD7BJ, 6W6JX, **1800** TZ6VV, VP8BGX.

Once again, thanks to the authors of the following for information extracted: *Long Island DX Bulletin* (W2IYX), *DX News Sheet* (G4DYO), *The Ex-G Radio Club Bulletin* (GI3OEN/W6), *Long Skip* (VE3IPR), *Lynx Group Bulletin* (EA2JGO), the *DX Family Newsletter* (JH1KRC), *DX'press* (PA3CXC), *CQ Magazine* (W1WY), and *DXNL* (DL3RK).

Closing date for receipt of material for the **August** issue is **12 June.** □

HF F-layer propagation predictions for June 1987

The time is presented vertically at two-hour intervals 00(00)gmt to 22(00)gmt for each band, ie ♀ = 0000, ♀ = 0200, ♀ = 0400 etc.
The probability of signals being heard is given on a 0 (indicated by a dot) to a 9 scale; the higher the number the greater the probability, with 1 meaning 10 to 19 per cent of days, and so on. Additionally 50MHz F-layer and 1·8MHz openings are indicated by a plus (+) sign in the 28 and 3·5MHz columns respectively.

Time / / GMT	28MHz 000001111122 024680246802	24MHz 000001111122 024680246802	21MHz 000001111122 024680246802	18MHz 000001111122 024680246802	14MHz 000001111122 024680246802	10MHz 000001111122 024680246802	7MHz 000001111122 024680246802	3.5MHz 000001111122 024680246802
** EUROPE								
MOSCOW	.....	.....	....111..22.	...233212452	214566656887	766554445789	753222222468	42.....35
MALTA	.....	.....1.	....11...23.	...133222562	2.1666656897	856655556789	986422223578	++3.....24+
GIBRALTAR	.....	.....	.....2.	21111341	1..265444786	733665556789	986543333578	++42.....24+
ICELAND	.....	.....	.....	.....	1..124433365	744565555678	776543333456	4432.....23
** ASIA								
OSAKA	.....	.....	.....1.....	...112212.11	112243334354	1..121112463	231	.....
HONGKONG	.....	.....	....111.11..	..1233213311	112244335645	2...11112475	243	.....2.
BANGKOK	.....	.....	...1221.21..	..123422441.	112234335654	31...1112477	1.....255	22
SINGAPORE	.....	.....	...1221.....	..134422....	212234332..	41..1111222.	2.....244	23
NEW DELHI	.....	.....1..	...12211241.	..133432464.	213223335774	631...112478	41.....256	23
TEHERAN	.....	....11..122.	...22311355.	..2444325772	224333335787	7531..112578	63.....256	4.....23
COLOMBO	.....	....11..1...	...223113...	..2334335...	.1322333511.	431..1112455	51.....256	2.....23
BAHRAIN	.....1..	....11..132.	...223214651	..2444336773	324322335788	853...112578	73.....256	4.....24
CYPRUS	.....11.	...1121.133.	...344324662	1.2566546885	536666666899	976333334689	86311..11367	53.....34
ADEN	.....11..	.....11123..	...213335611	..1424446843	524322345787	8641...12478	751.....256	42.....24
** OCEANIA								
SUVA/S	.....	.....	.....	....11....21	1133331..253	.1342111.441	...1.....11.	.....
SUVA/L	.....	.....	11	1..1.....23	2114.....64	113411..1242	..11.....12.	.....
WELLINGTON/S	.....	.....	.....	...1.....21	2233.....64	224421111163	..11.....131	.....
WELLINGTON/L	.....	.....	1	2.....3	421.....5	3343.....43	.122.....131	.....
SYDNEY/S	.....	.....	...11.....	..132.....1	114541..1215	212421.12455	...1.....252	.....2.
SYDNEY/L	.....	.....	1.....1	3.....3	51.2.....6	32241.....44	...2.....142	.....
PERTH	.....	....1.....	...231.....	..2452.....	213453.....	521221..134.	2.....255	23
HONOLULU	.....	.....	.....	.....1..1111	1122331.3322	.1443111221.	..11.....	.....
** AFRICA								
SEYCHELLES	.....1...	....1.112...	...2213351..	..14424463..	..442234561.	2331..112463	741.....256	42.....24
MAURITIUS	.....	....11111...	...223334...	..14454452..	..443433511	4.42.1112456	732.....257	43.....24
NAIROBI	.....11..	.....1133..	...2223466..	...43345781.	..4522335751	5252...12477	763.....257	44.....24
HARARE	.....21..	.....11242..	...2234465..	...4445577..	2.1643335722	72531.112467	7641.....257	44.....24
CAPETOWN	.....1....	....1.12....	....32352...	...254554...	...5543352..	22.421.12422	6611.....246	54.....24
LAGOS	.....124..	....1.12462.	...13134685.	...35245788.	331652235783	88542...2478	7741.....256	54.....24
ASCENSION Is	.....131.	....1..1253.	....3213586.	54346881	54335785	2...21..2478	71.1.....146	44.....24
DAKAR	.....132.	....1..1255.	32235782	2..153345895	6315532336688	985431..1378	7742.....146	44.....3
LAS PALMAS	.....12.	....11..1241	43233573	2..265455796	731676666799	986654333589	886321111267	+53.....35
** S. AMERICA								
Sth SHETLAND	.....	.....11...	.....242..	.....1465..	.....123464.	223..1.12464	6641.....146	44.....3
FALKLAND Is	.....1..	.....1221.	.....23454.	.....35676.	..1..233578.	2352.1112464	7642.....146	44.....3
R DE JANEIRO	.....12.	11351	2233683	1....4345786	51...4333589	862.11111268	7741.....36	442.....3
BUENOS AIRES	.....12.	11341	1.....133674	3....1345787	731..3334579	9851.1111258	7742.....26	442.....3
LIMA	.....1.	21	1.....122254	4.....333367	82.2313333357	87443111..25	7742.....2	44.....
BOGOTA	.....	21	1.....111144	3....1333256	82.113332247	87442111..14	6642.....1	34.....
** N. AMERICA								
BARBADOS	.....1.	21	1....2121254	3....4333367	82.224332257	8744311...25	7742.....3	44.....
JAMAICA	.....	11	1.....111133	3....1232246	72...3332236	77421111...3	4642.....1	24.....
BERMUDA	.....	1	1....1111.33	3....3222246	72..14322247	7742211...24	5642.....1	24.....
NEW YORK	.....	.....	.....11.12	2....1222124	621..3332246	67422111..13	3642.....1	.3.....
MEXICO	.....	.....	12	2.....121134	521...232224	4742..11...1	1542.....	.2.....
MONTREAL	.....	.....	12	2....1122124	621..3332246	67422111..13	3642.....1	.3.....
DENVER	.....	.....	.....	1.....1111	421...122223	355311111..1	1342.....	.....
LOS ANGELES	.....	.....	.....	1.....1111	3211...23222	24531.112...	.242.....	.....
VANCOUVER	.....	.....	.....	111	322211112222	245421112111	.142.....	.....
FAIRBANKS	.....	.....	.....	.....	223232212222	123431112211	..11.....	.....

The provisional mean sunspot number for March 1987 issued by the Sunspot Index Data Centre, Brussels, was 14·8. The maximum daily sunspot number was 24 on 5 and 7 March, and the minimum was 0 on 12 and 13 March. The predicted smoothed sunspot numbers for June, July, August and September 1987, are respectively: (classical method), 19, 20, 21 and 22; (SIDC adjusted values) 27, 29, 30 and 32.

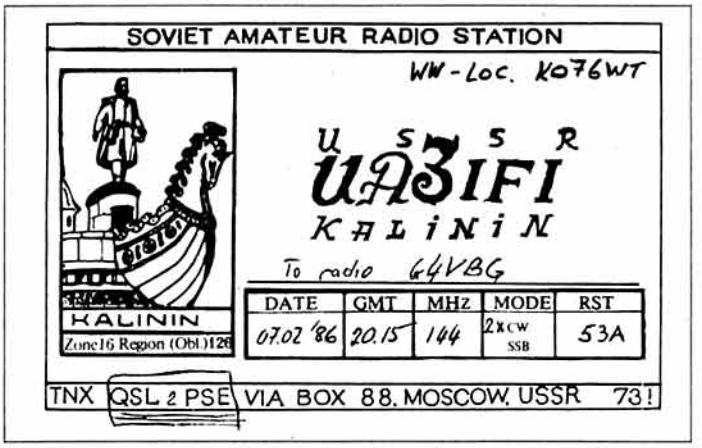
VHF/UHF

*Ken Willis, G8VR**

144MHz auroral record

The illustration shows a card confirming a 144MHz contact between David Farries, G4VBG (Gateshead) and Sergey, UA3IFI (Kalinin, KO76WT) which took place on 7 February 1986 during that major event. The distance between stations was of the order 2,316km, and this seems to be a new record by quite a large margin. Although this contact which took place some time ago has received a good deal of publicity elsewhere, no-one so far has come forward with a claim which beats it. If anyone can, or knows of a contact over a longer distance via this mode, will they please write giving details.

At the the time, David was using a FT290 with Mutek board and a Microwave Modules 100W amplifier. The antenna was a 20-element Yagi, but only 15ft above ground. In the same event which appeared in phases over a three-day period, he heard UA1 and worked UQ2, UR1, UP2 and several SP stations, which should encourage those who think that only the stations with high power and massive antenna can work the real dx. At the other end of the contact, UA3IFI was using a 17-element antenna and a "KT920 transmitter and KR 312A receiver" if anyone knows what these equipments are. It is likely that the transmitter power was also quite low.



2,316km via aurora on 144MHz, believed to be the current record (see text)

Class B morse and meteor scatter

Two readers have asked recently whether, as Class B licensees, they can operate high-speed cw meteor scatter under the terms of their current licence. One reader comments "The recommendations/regulations laid down are somewhat vague as to the use of morse by Class B operators. Some say meteor scatter is not permitted, some say it is, others say it could be, while others just don't know".

I must agree that the guidelines issued when morse was first permitted for these operators appeared to leave a lot unsaid. In some ways the situation resembles band plans in that they do not form part of the licence conditions but require a general acceptance and the co-operation of all operators for their success. Class B morse facilities were approved because several operators had complained that actual "on-the-air" morse operation was an essential to learning the code. Personally I never subscribed to this since, at least in the early stages of learning, I believe that one's fumbling attempts to send the code were best confined to the kitchen, heard by a sympathetic helper rather than transmitted over countless hundreds of square miles for all to hear. For all that I confess that as a dyed-in-the-wool vhf cw operator, I have not so far been in any way embarrassed by Class B operators doing their thing on 144MHz, and in fact some of them sound so good that one suspects that a micro is generating the stuff rather than a human fist! Which leads to another point raised in support of a more general use of morse by those who have not passed the test, for if data transmissions such as rtty and packet radio can be used, why not a memory keyer or micro generating morse with excellent characteristics albeit at high speed? The *News Bulletin* article on the subject (*Rad Com* June 1986) re-states the guidelines which are, briefly; to provide practice which will prepare an operator for the morse test; to allow operators to use morse under real operating conditions; and to demonstrate the value of morse in overcoming language barriers. To this end, the guidelines then gave four basic rules which were agreed by the RSGB and the DTI and which led to the use of morse by Class B operators becoming a permanent feature of the licence. The two which apply here are: operators must identify transmissions using voice; and avoid operating in those parts of the band reserved exclusively for cw operation.

The need to use voice identification specifically requires operators to keep clear of 144·000 to 144·150MHz, which is exclusively for cw operation. Meteor scatter cw seldom encroaches higher than 144·150MHz, and the random cw channel is centred on 144·100MHz. Let's face it, morse for Class B operators was intended to prepare them for passing the morse test. If anyone is proficient enough to copy a slowed-down cw reflection via a meteor trail with its attendant QSB and doppler frequency shift, they are probably equipped to take the morse test. Meteor scatter cw requires operator participation quite unlike rtty, packet, sstv etc. While accepting that there may be situations in which two Class B operators remain content to continue to communicate with each other using micro computers both to generate the cw and to translate the received code, I cannot imagine why an operator interested in the code would not wish to pass the morse test —not such a difficult undertaking—and by that means open up quite a lot more for himself including hf band communication which can be of great value to the vhf operator in working the vhf nets or operating crossband.

Sporadic-E

June is the month when we can expect sporadic-E openings on 144MHz, so if your receiver is not set on the calling channel while you read this, you might be missing some exotic dx! This month there is also the chance to make a first-ever contact between Cyprus and the UK on 144MHz since the West Sovereign Base Area ARS is sponsoring an expedition to the highest point in Cyprus to make the attempt. The site will be on Mount Olympus at 6,400 ft asl (locator probably KM64KW). The group plans to operate all day long during the month of June (see also *VHF/UHF* January 1987) using callsign ZC4VHF, possibly with a /5B4 suffix added. Dave Rycroft, ZC4DR, who is president of the club, says that the frequencies used will be 144·010MHz for cw and 144·200MHz for ssb, while contact with the outside world will be maintained through hf band links on 14·330 and 21·330MHz signing ZC4EPI. The link-man in the UK will be G3YAP, West Midlands.

Permission has been sought by the Cyprus group to operate on spot frequencies on both 50 and 70MHz, and to re-locate the 70MHz beacon at the mountain site for the duration of the expedition. If this is permitted, the beacon will also sign ZC4VHF on 70·114MHz, and the same frequency will be used for two-way contacts on that band. Cross-band operation will also be possible using the hf band frequencies. The Cyprus operators in making this determined attempt to work the UK on 144MHz ask for short snappy QSOs if they are heard here, with just callsigns, reports and locations being exchanged. We could be in for some of the biggest pile-ups ever heard on 144MHz if conditions are favourable!

See also beacon notes in this month's column for some further news from Dave Rycroft in Cyprus.

50MHz

In January this year, the RSGB VHF Committee established the 50MHz Reporting Club, with Ray Cracknell, G2AHU, as its co-ordinator. This is a band which offers exciting prospects for vhf communication, since it at times exhibits the characteristics of both hf and vhf waves, notably during periods of maximum sunspot activity. There is still much to be learned about propagation at these frequencies, and to this end, the Reporting Club was set up to provide a regular input of information from stations active on the band. It was decided to limit the "membership" of the club to 50 stations, 36 British and 14 from overseas. G2AHU has recently published his first report based on information received which covered the first year of operation following the general release of the band to Class A licence holders on 1 February 1986. The report is very detailed, and covers all known forms of propagation on the band. Ray hopes to publish in *Radio Communication* as soon as possible, and is also preparing an article for *IARU Region 1 Newsheet* under the title "50MHz—a great resource". Since there is far too much information to reproduce here, I will send photocopies of the first report to anyone wanting them on receipt of an sae and 40p in stamps.

At the time of writing, the RSGB was in discussion with the licensing authority, and it is hoped that some extension of the licence arrangements for this band will be the outcome of these talks. One of the most active operators on this band, Paul Turner, G4IJE, has regular meteor scatter

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contacts with LA6QBA which go through routinely, often in a matter of minutes and seldom take more than half-an-hour. During the first year of general release, G4IJE worked 12 countries and 40 squares two-way on 50MHz, and all-time on the band (that is, including the period when operation was restricted to non-tv hours). Paul has had over 660 complete contacts via meteor scatter, these including cross-band contacts. The ease with which such contacts can be made on this band should encourage others to use the mode. All that is required is to use the correct procedure, described in previous issues, not special equipment. In fact stations with 10W to a dipole are working successful meteor scatter on 50MHz, though anything better than this will improve one's chances considerably. This summer the potential for sporadic-E contacts (28/50MHz) with European stations will be even greater. DL7YS, who published a design for a 50MHz receiving converter reports that numerous stations throughout Europe wrote for details and are believed to be building to this design. Then in July will come the possibility of transatlantic dx, so simple 50MHz receiving equipment will be a good investment at this stage until a more general allocation of the band perhaps becomes available. As we have said before, such a receiver makes a good auroral indicator, too.

FAI propagation

This might be a good time to suggest that you look back to *VHF/UHF* June 1986, when some information on fai (field aligned irregularities) was provided by John Branegan, GM4IHJ. If there is a good sporadic-E opening, and during or immediately following it you hear some exotic dx on what appears to be a strange beam heading, don't swing the beam in an attempt to improve the signal but go ahead and call the station leaving things as they are. The propagation might be field-aligned (fai), a mode which is becoming much more recognized as a valuable one for dx working these days though its appearance is admittedly somewhat rare. *Dubus* January 1987 carries a very good article on the subject, and includes a map plus overlays showing (as did John Branegan) where the action is most likely to occur for a given set of conditions. So, if an HG is heard on a bearing normally reserved for Swedish stations, get in quickly and worry later about whether you might have gained a decibel or two by peaking up the antenna heading. Likely as not you'll lose the signal completely if you fiddle with the rotator.

Beacon notes

Jeff Holland, G3GHS, who is keeper of the Cornish beacons (signing GB3CTC), wrote to say that the beacon mast was to be changed in late spring for a taller one, due to the requirements of is owners. He went on to say that he felt that there was doubt in people's minds these days as to the usefulness of the CTC beacons which normally operate on 70, 144 and 432MHz, with one for 1,296MHz proposed. Added to this, the coastal beacon site with its salt-laden atmosphere has played havoc with the antenna and feeders, all of which will need to be replaced if they are to be accommodated on the new mast, so funding is urgently required. He commented: "It would be nice if users of these beacons could forward donations towards the cost of the necessary new equipment in order to keep them on the air. No cash means no beacons as far as the group which installs and maintains them is concerned". Jeff's address is "Tanglewood", Off Portheast Way, Gorran Haven, Cornwall PL26 6JA.

Writing from Cyprus, Dave Rycroft, ZC4DR, puts the record straight on the subject of 70MHz in Cyprus. He says that neither the 5B4 licence issued by the Republic of Cyprus nor the ZC4 licence issued by the British Sovereign Base Area Administration permits the use of 50 or 70MHz. The 5B4 beacons on 50 and 70MHz are special concessions granted by the Cyprus Ministry of Communications and Works, for the purpose of scientific propagation studies. The 70MHz beacon was donated by G4BPY and the licence holder was 5B4AZ, who was permitted to make a few two-way contacts using the beacon transmitter just after the beacon was installed and being tested. Thereafter, it resorted to beacon mode only, which accounts for the lack of two-way contacts on that band in recent years. At a recent council meeting of the Cyprus Amateur Radio Society, it was agreed that the responsibility for the beacon will in future pass to the Social Club Radio Group of the British East Mediterranean Relay Station (BEMRS) of the BBC World Service, since the beacon is located on their site at Zyghi, near Limassol. Dave recently attended a meeting with the authorities at which he requested facilities for both 50 and 70MHz for amateurs there, and has received a written reply stating that the matter is under consideration.

Paul, G4IJE, is rebuilding the beacon transmitter destined for Malta and at the time of writing was in the final stages of optimizing a filter to reduce harmonic radiation. The rig is capable of 10W output on a crystal frequency of 50·085MHz. Paul had no information on the likely date of its shipment to 9H1, though a site is said to be available and a licence already issued. It was understood that GW3LDH would take over arrangements for shipment once the transmitter was ready to go. Let's hope that it will be on the air for at least part of this year's Es season.

Jan, OH1ZAA, who has become a regular contributor, said that he copied strong bursts from beacon OX3VHF on 27 April in the period 2120 to 2138gmt. Have you listened for it yet on 50·045MHz? It runs 20W to an omnidirectional groundplane antenna.

70MHz

Since this band was described as being virtually dead recently, much correspondence has shown this to be far from the truth, and some possible activity from Cyprus mentioned elsewhere in the column this month can only be good news to those devotees of the band. One of these is G3VKM, Roger Basford of Norwich. He came on to the band only recently, initially on fm but now using cw and ssb generated by a SEM "C" transverter, modified as described by G3FDW in *Radio Communication* August 1984. He has worked EI, GW and GM and most days can hear beacon GB3ANG at rather better strength than GB3BUX. He appeals for more operators on this band to beam towards Norfolk, especially as interest in the band is growing in that area, where G4ULR, G4VXR, G4VCE, G4RRN, G3MPN and G4UVA are known to have multimode equipment, while G0GQQ, G0FEI, G4LEP and G3TOZ have fm only. Consideration is being given to a local "natter" channel on 70·450MHz to avoid tying up 70·260MHz unduly.

Rentacard

Do you need a QSL for a particularly difficult square or country, maybe ones which you may never work? The Russian publication *Radio* (November 1986) provides a novel solution, which, I hasten to add, it certainly does not condone. One of its contributors, in reporting his dx successes, added "If you need clean QSLs from LZ, or UA2 through 9, write to me. In exchange, I need cards from UA1 and others. Write to . . . etc."

The next issue of the same publication reported a contest during which tremendous signals with splatter covering everything from dc to light were traced to one of the best-known vhf operators in the area, a several-times winner of contests, who was caught red-handed using illegal power ("two GU43s cooled by ventilators") from a builder's trailer on the edge of a field. Typically (for we all know the type!) the culprit was well known for continually criticising the "system" for its faults, especially any delays in sending his prizes won in previous contests. In the end they cancelled his licence, so watch it, you lot who descend on Broadstairs every time there is a contest. I shall especially be on the lookout for builders' trailers fitted with some of those ventilators.

Aurora

Judging by the response to my offer of details for making a simple Jamjar Magnetometer as used by BAA observers, (*VHF/UHF* March 1987) there must surely be a shortage of such jars around the country, with quite a few radio amateurs watching for geomagnetic disturbances which might indicate auroral activity. Actually this is a poor period for such events, but that is not to say that one won't suddenly pop up and provide good propagation, especially on the lower bands of 50 and 70MHz. Ron Livesey's monthly report from the BAA Aurora Section confirmed low activity in the period ending 15 March, though for those living really far north the opportunities of short events are much greater of course.

Things should improve slowly, since it is believed that we are now past the minimum of the solar cycle and the gradual upwards climb has begun.

Repeater news

Some repeater information received recently was forwarded from my old QTH, vacated over two years ago, so if I appear to have neglected any particular group or publication, please accept my apologies and check that your records show my address as given at the foot of this column. To hand are newsletters from Kent RG (No 47), Central Scotland FM Group (Spring 1987), Leicester RG (1/87) and South Dorset, which I assume are the latest issues from those groups. South Dorset operates the packet switch repeater, GB3DP, located 6km north of Weymouth on a site 530ft asl which is shared by the group's other repeater, GB3SD (RB14). It uses simplex operation on 144·650MHz, and identifies in morse every 12min. It is intended to form part of a network of such stations in the south-west. Further information on this system can be obtained from G3VPF, QTHR, but for the initiated, tones are Bell 202 standard, 1,200/2,200Hz, fm modulated on to the carrier. Data rate is 1,200 baud and the system conforms with the AX.25 version 2 specification. G3VPF is also treasurer of the group, so he will no doubt welcome enquiries from potential members. The annual subscription is very modest.

Kent RG, which now shows a membership list approaching 250, reports that both GB3EK and KN have now been re-equipped. Unfortunately EK

is abused on occasions by those who can have no concept of the work which must go into the establishment of repeater facilities, and, as a member of the group pointed out in a letter to his editor, many unlicensed people listen to repeaters, especially during the day. What some of them make of amateur radio when they encounter "verbal vandalism" over the air can be imagined. Kent is quite a large county, and the group covers it all with its six repeater installations. A sheet giving a map of the county showing the location of the repeaters plus brief details of each installation I will gladly pass on to anyone sending me an sae plus an 18p stamp. If you prefer, write regarding membership etc to the treasurer, G6ZAA, QTHR. It would be useful if I knew the type of information repeater addicts prefer to see in these pages. Obviously the amount of space which can be devoted to any single aspect of this diverse hobby of ours must be limited, so at least we might try to restrict copy to those matters which are of interest to the majority, so let me know whether it is technical, operational or any other form of information which is preferred.

"There will be sporadic-E to Yugoslavia on the 9th, an aurora on the 11th, and on the 15th they'll close you down because of tvi"

From here and there

The RSGB QSL Bureau will be closed from 1 to 23 August inclusive this year, so get as many cards off as you possibly can now.

Philip, GI4OMK, apologises for the delay in sending out QSL cards for the big aurora of February 1986, plus those covering numerous tropo contacts when he was operating from a portable site. To give you some idea of the task, he recently wrote out nearly 400 cards, and hopes that he is now up to date. He says that half-way through any big opening these days he starts to think of the QSL problem which will confront him at the end of it all, and tends to go QRT, since he always tries to QSL 100 per cent. Philip has also been a bit "put off" vhf operation by noises-off from "semi-local tv sets, radios, electric organs and the odd kitchen sink or gas-cooker, all at S9!" Don't worry though, he'll be back.

If you haven't heard of the British Amateur Television club (BATC), then you could be missing quite a lot. The club's *CQ-TV Magazine*, No 138 is to hand and is an 88-page issue, superbly prepared and crammed with information about this aspect of vhf/uhf operation. These days they cover satellite tv broadcast and microwave equipments, and a lot of micro applications as well as the more obvious aspects of amateur television. The general secretary of the BATC is Trevor Brown, G8CJS, of 14 Stairfoot Close, Adel, Leeds 16. Drop him a line for membership details.

Colin Mister, G0DAZ (Worcester), is a recent convert to cw meteor scatter and has found it a useful way of increasing his squares and countries totals on 144MHz. He has a running mate in G0CUZ (West Midlands) who sometimes sits on frequency to compare results, and they often receive quite different reflections although situated only 25 miles apart. Some years ago G4IJE and I transmitted for five minutes simultaneously to SP2DX and YU3ES, and of several dozen reflections received at the far end, only a handful contained information from both stations. This is because the geometry of the path and the meteor trail is very important, so don't think your neighbour has a better receiver if sometimes he hears reflections which are inaudible at your location. G0DAZ listens on the random cw frequency, something not many operators tend to do except during major showers, and he has been rewarded by contacts with OE3JPC who seems to have the same idea. Colin uses full legal erp from 4 × 14 element m.e.t antennas on 144MHz, with a Mutek masthead preamplifier and heliax feeder, part of a three-band vhf antenna system supported by a 60ft Versatower, the sort of set-up most of us dream about but never accomplish. To illustrate the tremendous variations in the equipment used by vhf operators, Angie Sitton, G1EXO (Stevenage), says that her home-brew four element 144MHz Yagi is only 9ft above ground since her's is a "funny town for antennas". She was licensed in February after passing the RAE, self-taught, first go, and was aiming to become a Class A operator by April. In the meantime, she says that she doesn't fancy ssb meteor scatter since saying "Roger" for a whole minute would make her "giggle and feel silly". As a long-time swl before becoming licensed, Angie is only now finding out about the pleasures of vhf, and I suspect we shall be hearing quite a lot from her in future.

G0DUS (Bury St Edmunds) wonders whether anyone has knowledge of the Newbold Target Sports Centre, Rugby Award. This was announced in *Radio Communication* September 1985, when special event stations were set up with callsigns GB6NTS and GB8NTS. The award was offered to operators who worked both stations, as did G0DUS (then G1IPA) and his friend G1FXG. Though they sent the prescribed fee, and made several attempts to locate the organizers, nothing has ever been heard from them. One telephone number given turned out to be a factory in the Midlands. Anyone who can throw any light on this, please contact G0DUS, QTHR.

Newcomers to vhf may not know of the useful booklet *International VHF-FM Guide*, published privately by Julian Baldwin, G3UHK, and Kris Partridge, G8AUU. It provides a wealth of information on repeater installations in most European (and some other) countries, plus details of reciprocal licensing for those planning to operate while abroad. A new edition is being prepared, and I will bring it to the attention of readers when it becomes available. □

MICROWAVES

*Mike Dixon, G3PFR**

Microwave support

Last month I outlined the differences between the RSGB Microwave Committee and G8MWR's Microwave Society. Glen, G8MWR, in a letter to HQ (and to me personally) expressed surprise that confusion had arisen since (I quote) "I cannot stress too strongly the fact that we have always made it clear to our members (sic) that we have no connection with RSGB. We believe that we should leave the Microwave Committee to get on with the organizational side of the hobby while we get on with the job of helping newcomers to get on the bands"—my words: 10 and 24GHz. Notwithstanding Glen's clear statement of intent, I still had no less than four enquiries at NEC!

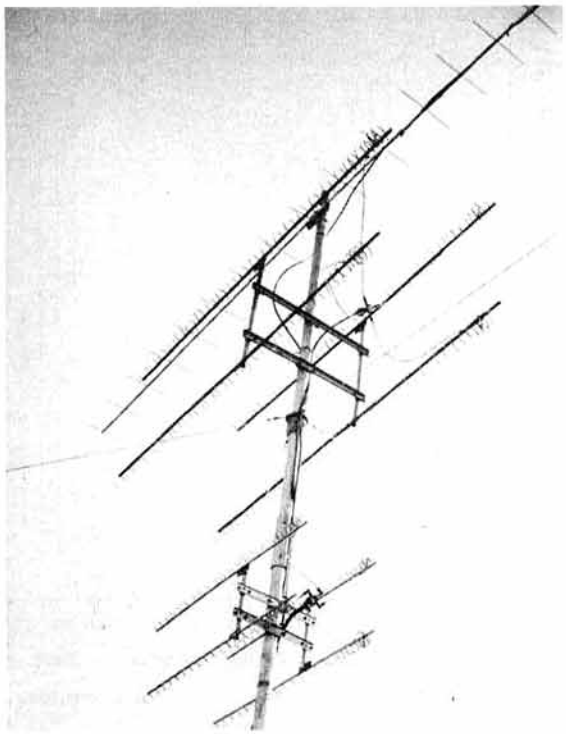
I stated that the Microwave Society could supply a limited range of components; I should have added "from stock", since Glen pointed out that he, on behalf of the Microwave Society, acts as an agent for "four major microwave companies and can supply virtually anything that the operator on the bands above 10GHz could require, although some of the prices are frightening!".

This latter remark underlines the major difference: the Microwave Committee's concern is **all** bands, not just those above 10GHz. For this reason, although the Microwave Committee has access to all the major suppliers mentioned in Glen's letter—and more besides—it was decided early in the development of the components service that the stocklist would be limited to hard-to-get components for proven designs or fairly "universal" appeal. The committee, through G4DDK and others, has extensive knowledge of most of the newer devices and their applications, from many suppliers, and is in a position to advise members of price, availability and use. Many of the technical items which appear both here, in the *Microwave Newsletter* and in the *Microwave Manual* (when it goes to press) result from this investigation and the developments carried out by committee members.

If there is sufficient interest expressed in a particular design or component which is not readily available from other sources, then the component service may, within the constraints of budget, be prepared to stock it. Otherwise we will certainly be prepared to advise sources for direct purchase. Incidentally, we now have a limited stock of RT Duroid board available: enquiries via HQ, please.

Following the information on the impressive results of the 2·3GHz contacts made by OK1AIY/P in the October IARU Contest published in this column in April, Dave, G4FRE, who made the longest contact with the OK station while himself operating /P in South Wales, received a number of photo-

*"Woodstock", Gaze Bank, Norley, Warrington, Cheshire WA6 8LL.



OK1AIY's antenna system: an F9FT Yagi for 432MHz (top), four 25-element quad-loop Yagis for 1·3GHz (middle) and four 25-element QLYs for 2·3GHz. A nice, neat and effective portable antenna "farm"

graphs of the setup at the OK end. A shot of the antenna system is shown here.

News has just come from OVSV (the Austrian national society) of a new international beacon on 1·3GHz, callsign 4U1VIC at the Vienna International Centre (UK "territory"). Its frequency is 1,296·825GHz with 2W output, mode F1B, beaming 45, 135, 225 and 315 degrees from four two-element antennas. □

SWL

*Bob Treacher, BRS32525**

FIRST THIS MONTH, a reminder that the Society's Listener Contest takes place over the weekend of 11 and 12 July. A transmitting contest takes place at the same time so there should be plenty of activity. Full rules of the contest appeared in "Contest News" last month. It is hoped that there will be a large entry. The HF Contests Committee hope for an even larger entry than in 1986 for proof that the swl contest movement is gaining momentum.

QSL manager list

How often do we wish we had a good QSL manager list in the shack to refer to so that we send our QSL card for that rare station or expedition to the correct person? I have come by a list prepared by DL8BL which has details of over 1,500 QSL routes for stations active in 1986. If you would like a copy, send £1, or 3 ircs to me at the address given at the foot of this page.

VPX Award

For those swls who are keen on award chasing, I have been advised of the VPX Award of Excellence. It is newly-sponsored by *CQ* magazine. It is the ultimate award for the prefix chaser. The requirements are 1,000 prefixes mixed, 600 prefixes SSB, or 600 prefixes cw. There are continental endorsements and a five-band endorsement for 28-3·5MHz. A special 1·8MHz endorsement is also available.

The award takes the form of a plaque, and at $50 the fee is rather high. The 1·8MHz bar is $4.50. Further details are available from, and all applications should be sent to: N V Koch, K6ZDL, Box 1351, Torrance, California 90505, USA.

*93 Elibank Road, Eltham, London SE9 1QJ.

Sporadic-E

Real vhf dx enthusiasts will not need reminding that now we are into June we are likely to experience sporadic-E propagation at 144MHz. June is traditionally the starting point for Es openings on the band. Over the last few years there have been some good openings as follows:

1982: 8 June.
1983: 6, 7, 10, 15, 16, 17, 20, 21, 22 June.
1984: 8, 17, 22, 10 June.
1985: 2, 5, 6, 30 June.
1986: 6, 7 June.

With these dates as a starting point, I wish everyone good luck, and leave you with the thought that it might be worth monitoring 144MHz around 6, 7 and 8 June.

HF news

The main talking point of March was the continuing expedition to the Laccadive and Nicobar Islands by a large group of Indian amateurs. However, reports of the stations have been extremely sparse. In view of the rarity of the islands it is disappointing that the expedition was not the success which the group hoped it would be. Conditions on 21 and 28MHz were poor, and I have only one report—by BRS8841—of their signals being heard on 21MHz. Miss Bharati, VU2RBI, was often on 14MHz ssb with a good signal during afternoon hours, and BRS8841 also heard them on cw and 3·5MHz ssb. The Nicobar Islands station—VU4NRO—is only mentioned once, again by BRS8841, on 14MHz ssb. All in all, it seems swls in Britain fared poorly in logging this rarity, and I will not dwell on the bad manners which accompanied the trip.

Elsewhere on the hf scene we had the WPX Contest at the end of March, which this year saw the first running of the UBA SWL Contest. Conditions were quite good, with much good dx audible and plenty of weird prefixes. 14MHz was quite good to the Far East on the Sunday—HS0A and YE0X (YB0) for example, and K4YT/4F (DU) was a strong signal on 7MHz from 1630 on the Sunday. 1·8MHz was poor, but CP8HD, PJ2FR, 5J4R and OH1RY/CT3 were noted.

Also worthy of note during March were several African expeditions, namely TU4A, K1ST/6W1, 5Z4KG, A25/VE3FXT, TZ0MAR and DJ6QT/9L, who as usual did his customary best on 1·8MHz.

While mentioning expeditions, a quick pat on the back to the crew who activated Aves Island (4M0ARV). Although I found them elusive, they did a fine job, especially on 3·5, 7, and 14MHz. David Whitaker also heard them on 1·8MHz for no 113 on ssb. Brad Bradbury, BRS1066, heard VS6DO on 1·8MHz cw for no 93.

Tony Blackburn, BRS87156, referred to QSLing techniques and the fact that all his direct QSLing is done with at least two ircs if the station is outside Europe. As a result, his return is very encouraging. Tony did mention, however, that he cannot get a QSL out of 5B4TI, even though he has sent him eight ircs. Readers might not be aware that this is the same station who was active as A71AD. Unfortunately, the operator **does not QSL swl reports** so do not waste your QSL card or ircs. There are plenty of other 5B4 operators who will willingly QSL listener reports. Robert Small mentioned receiving a QSL in a batch from the bureau from EP2DC in reply to a report sent to the EP bureau in October 1976—never give up hope!

Also on QSLs, I had an interesting letter from George Hook, BRS1914, (2CIL), who sent a photocopy of a QSL card he received in 1938 from VR6AY for an a.m transmission on 14MHz. VR6AY was Andrew Young, a descendent of the settlers.

Robert Small can boast a new rig thanks to his dad, G3ALI, who has a new TS830S. This means that Robert is able to listen on 10, 18 and 24MHz. At the time of writing, a few Europeans had been heard on 10MHz, but his best dx was FG5XC. We look forward to more reports through the year.

VHF news

Angela Sitton is now G1XEO and has taken her morse test. Her grounding as an swl has already had its benefits, and she has worked 25 counties and three countries under fairly flat conditions and had taken part in the March 144MHz contest.

Another who had passed the RAE was Phil Le Brun, BRS87677. He hoped to be QRV on 144MHz by now. He had a Spectrum converter and a six element quad and was building a transmitter and power amplifier.

A couple of QSL cards received have given more news of good openings last year. First, a card received from SM4GVF, heard during the 8 July sporadic-E gave details of the event from SM. It started at 1530 towards UB5 and UA6, moved over to LZ, YU and YO and then stopped. It reopened with SM4GVF working 11 Gs and an F at 1953, when the event ended.

F1ADT provided much information about the fine tropospheric opening on 21 September as it affected 432MHz during the annual F9NL Memorial

Contest. F1ADT was active from JN15JN. In the 7h of the contest, between 0500 and 1200gmt, he worked 283 stations, of which 218 were over 500km distance, and including 111 Gs, 13 GWs, 3 GJs and 1 GD. F1ADT is very active on both 144 and 432MHz and will gladly QSL any listener report on his signals, especially on 432MHz.

Andy Smith had purchased a 50MHz converter and had heard a GM via meteor scatter.

Other news

Welcome to Philip LeBrun, BRS87677, who has since passed the RAE. He uses a Triton tx/rx mainly, as the selectivity is better than his FRG7, and a delta loop. He has taken the RAE. Philip is a member of the International Listener's Association run by GW4OXB. He is also a member of the G-QRP Club and is starting a regular QRP swl column in *Sprat*. Philip's first column will be in the summer issue. I would imagine that it must be difficult for an swl to write much about QRP, so if any reader has items to help Philip he would be pleased to hear from you. If Philip lets me know the sort of things he wants to report on, I will pass his views on through this page. His address is 22 Russet Road, Cheltenham GL57 7LW.

Finale

That is all for this month. A real bumper mailbag. Please keep the news and views dropping through the letterbox. I'm afraid there is no room for tables this month. Copy for the August column should reach me no later than 2 June, with late copy by 10 June. □

SATELLITES

*Bob Phillips, G4IQQ**

CONTINUING on the theme of satellite terminology, I will discuss two straightforward terms this month—the period and the epoch. The period of a satellite is simply the time required to complete one complete orbit, and the value can be derived from the expression $T = 2\pi \times (R+h)\sqrt{R+h/GM}$, where R is the earth radius, h is the altitude of the orbit and GM is the gravitational mass of the earth (see *VHF/UHF Manual* chapter 10 for more details). It is essential when using this formula to ensure that all values are expressed in the same set of units, eg R = 6,378km, GM = 398,600km^{3}s^{-2}, h in kilometres, results in the period in seconds.

The confusion arises when we refer to satellite orbital data (ephemeris) and the period is identified either as the anomalistic period or the nodal period. Back to jargon again! The difficulty is caused because two different points of reference are being used. The most commonly used term is the anomalistic period which refers to the time taken for the satellite to travel from one perigee to the next. In this case the reference is the satellite orbit itself. The alternative case is where the time between consecutive equator crossings is measured (the point where the satellite orbit crosses the equatorial plane is called the node, hence the term nodal period). Our reference this time is the earth co-ordinate system and, as I have indicated several times before, the earth is far from a perfect sphere. The effect of this is that the nodal period actually varies from orbit to orbit, not by much, but enough to cause errors.

Now the epoch. This is a grand-sounding name for a reference point in time, eg the time for which a particular set of orbital parameters refers. It is usually written in the form 87023·13103915. The first two digits (87) indicate the year, the remaining digits before the decimal point indicate the day number for that year, and the decimal value is the decimal portion of 24h. The last figure is easily converted into hours, minutes and seconds giving an epoch of 23 January 03:08:41·782 1987.

Oscar 10

Most operators have taken the advice of the satellite controllers and have abstained from using the satellite transponder during the months of March and April. At the time of writing, the period of very low solar illumination is not over and it is not possible to say what the state of the satellite will be. If operation is still possible we should see some of the most favourable visibility conditions for some time. Fig 1 shows the situation for the month, which indicates that the satellite will be in range for at least 10h every day.

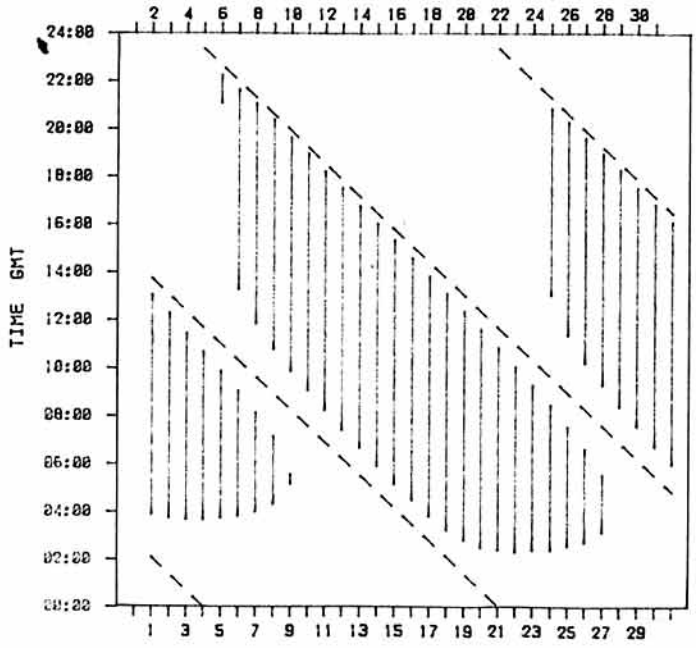


Fig 1 OSCAR 10 VISIBILITY (London area) - JUNE 1987

——— satellite in view _ _ _ _ _ perigee (MA=0)

However, please note that there is likely to be a recommendation to limit operation to certain mean anomaly periods so as to preserve the battery life. What is uncertain is what the attitude of the spacecraft will be, and it is quite likely that the antennas may not be pointed correctly at the earth. If this is the case there could be a great deal of spin modulation caused by the rotation of the satellite around its main axis.

Fuji-Oscar 12

There have been a number of significant developments concerning this satellite though it is still far from fully operational. The digital repeater is operating though only in a limited mode. It appears that the software for full store and forward operation is not yet developed to an acceptable degree. The first transatlantic packet radio contact via FO12 was achieved between W31W1 and G3RUH at the beginning of March and was immediately followed by several others.

Quite a lot of activity has been reported on the linear, Mode JA, transponder but many operators have been put off by the difficulty of achieving QSOs by comparison with Oscar 10. The combination of low orbit and high levels of doppler shift require considerable practice to master. The situation is even more critical on the mode JD transponder, where it is necessary to maintain the correct frequency at the input to the satellite independent of doppler. There has been more testing of the JD transponder, and the mailbox software is under evaluation. One of the major concerns with the satellite is the power budget. Since the JD transponder consumes much greater power than Mode JA, it is likely that digital operation will be kept to short periods.

Satellite launches

Still nothing to report on the launch of Phase 3C. The revised launch manifest for Ariane was due to be published in April but had not appeared by the middle of the month. As for the USSR situation, it now appears that RS9 has been postponed indefinitely and RS10 will not be launched before June.

Other news

Next month sees the second amateur satellite colloquium organized jointly by Amsat-UK and the University of Surrey. It looks as though last year's attendance of 175 will be greatly exceeded, and there may well be some disappointed applicants as accommodation is limited. A very impressive list of speakers is being assembled, including a number from overseas. Leonid Labutin, UA3CR, is hoping to be able to accept the invitation to attend and give a talk on the next Russian satellites. Following a recently-agreed change to its convention, Amsat-UK will also hold its annual general meeting during the colloquium.

A great deal of good-quality software has been written over the last few years for amateur satellite activities. Amsat-UK has recently extended its range of titles, and the full list can be obtained from G3AAJ, Amsat-UK, London E12 5EQ, England, by sending an sae. □

*Transvaal College, New Barn Road, Swanley, Kent BR8 7PW.

DATA COMMS

*Ian Wade, G3NRW**

Amtor primer: part four

This month we look at how to set up an Amtor system ready for use, and how to carry out a QSO.

Listening for Amtor signals

As usual when trying out any new mode of communication, the best thing to do first is to listen to other stations in QSO, to see what goes on. To listen on Amtor, set the Amtor controller to Mode L ("Listen" mode)—depending on the controller, you do this either by typing the "L" command on the keyboard, or perhaps by setting a switch to "Listen".

The next step is to find an Amtor signal. The usual places to look are around 14,075 or 3,588kHz on the hf bands, or on 144·590MHz on vhf. Listen for the characteristic "chirrup chip" repeating roughly twice per second; this is a Mode A QSO in progress. Alternatively, listen for a continuous stream of characters, which may be someone sending a message in Mode B. Transmissions in Mode B sound similar to conventional rtty, except that the bit rate is faster (100bps, compared with 45·45bps for rtty), and Amtor has no long periods of continuous mark tone like rtty.

Having found a signal, attempt to tune it in, and with luck you will get an intelligible message on the screen. It may take a second or so before things start to happen; this is because the controller is attempting to get into sync with the incoming signal. If, however, nothing at all appears on the screen after a few seconds, but the signal appears to be tuned in properly, it is possible that the incoming tones are inverted. For Amtor to work correctly, a mark tone corresponds to a logic "1", and by convention the mark is the higher of the two *radiated* rf frequencies. Inverting the incoming tones (by flipping the NORMAL/INVERTED switch on the terminal unit, or by switching sidebands on the receiver) should therefore fix the problem.

If this still does not work, there may be a problem with the terminal unit (unlikely if it is built into a proprietary Amtor controller, but quite possible if you are using a separate rtty terminal unit). As mentioned last month, some terminal units are optimized for rtty at 45·45/50 bps, and play havoc with Amtor signals at 100bps. If you suspect this, you could try bypassing the input filtering to see if that cures the problem.

After a little practice you will soon get the knack of recognizing an Amtor signal and tuning it in accurately, and then you will be ready to try transmitting. Obviously, if you are still having difficulty in getting any Amtor messages onto the screen, the root cause of the problem has to be found before thinking about transmitting. As with all forms of amateur radio, "if you can't hear 'em, you can't work 'em!"

Transmitting for the first time

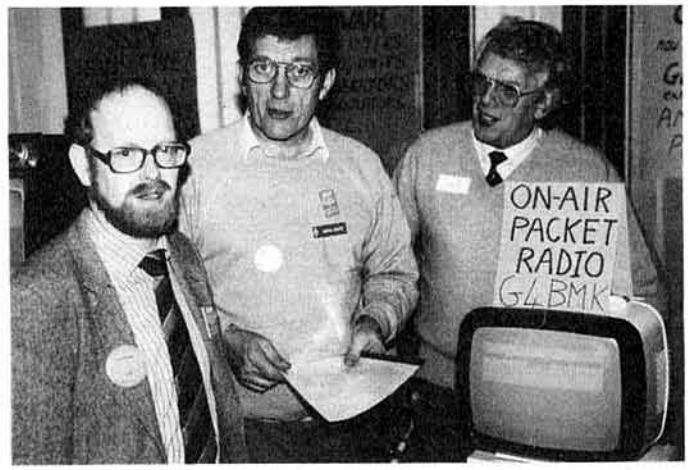
When trying out the Amtor system for the first time, it is probably best to use Mode B (described in detail in April's column). With Mode B, there are no critical transmit/receive changeover timing considerations to think about, and there is no interactive "handshaking" with other stations, so you can carry out tests at leisure without the feeling that the system has taken control! Also, as we'll see later, most Amtor QSOs start in Mode B, so it's necessary to know how to use it in this mode anyway.

If it is at all possible, try to enlist the help of another station when trying out Amtor for the first time, and carry out the tests in a quiet part of the phone end of the band. Then, if things don't seem to be working, you can switch to ssb phone and talk about it. Assuming you have already checked the audio level input to the radio to make sure there is no distortion of the mark and space sinewave tones (on dummy load, please!), the first on-air test is to make sure that the transmitted tones are not inverted. As mentioned above, the mark tone must be the higher of the two radiated frequencies. With the usual tones, this means that the radio has to be set to *upper* sideband; this may mean using "reverse" sideband on 1·8, 3·5 and 7MHz.

To start transmitting in Mode B, type the appropriate command on the keyboard. The transmitter should switch on automatically, and the system should start sending the "Idle 2/Idle 1" character sequence all by itself; see the diagram in April's column. The station collaborating in the test should then be able to tell you that his "Idle" indicator (usually a light-emitting diode on the Amtor controller) has lit, meaning that he is receiving your idle characters correctly. If this does not work, invert the sense of your transmitted tones and try again. If this still does not work, you will then have some detective work to do—there is no point in going any further if the other station cannot resolve your idle characters.

Assuming all is well so far, start typing at the keyboard. The other station should now be able to report 100 per cent copy of your message. Try this a few times, and then you will be ready for your first Mode A QSO!

*7 Daubeney Close, Harlington, Dunstable, Bedfordshire LU5 6NF. Prestel Mailbox 219999743



Seen at NEC (l to r): Mike Berry, G4BMK, of Grosvenor Software; Chris Foster, G4USU; and Dave Gorrill, GM4UJZ, at the G4BMK Dragon packet demonstration. G4BMK also provided the packet system at the NEC special event station GB4NEC. *Photo:* **G3NRW**

Starting a QSO

Before starting a Mode A QSO, it is necessary to tell the Amtor controller your selective calling code; entering this code is a once-only job at the beginning of an operating session. The selcall code can be any sequence of four letters, and is usually your own callsign with the number omitted. For example, my selcall is GNRW. The purpose of the selcall is to allow your controller to recognize automatically when other stations are calling you and to switch to Mode A automatically at the beginning of a QSO.

Calling CQ in Amtor is a little different from rtty. First, you select Mode B transmit, and type something like the following:

carriage return/line feed/letter shift
CQ CQ DE G3NRW G3NRW
MY SELCALL GNRW

Note that in the CQ call you tell listening stations your selcall code. Now, if another station wishes to contact you, he will select Mode A on his controller and enter your selcall. Then the system takes over, and the world springs into life! Your controller will realize that the incoming selcall from the other station matches your own, and will switch to Mode A automatically.

From now on it will be "chirrup chip" all the way. The information sending station (iss) will be sending the message text in three-character data blocks ("chirrup"), and the information receiving station (irs) will respond with the single acknowledgement control character CS1 or CS2 ("chip").

Ending an over

When you have finished sending your message, and want to hand over to the other station, you terminate your over with the special character sequence "+?". The Amtor controller at the other end recognizes this special sequence, and automatically initiates a handover. From then on, the roles of the two stations are reversed—the iss becomes the irs, and the irs becomes the iss.

Transmit/receive changeover timing

As mentioned last month, Mode A requires the changeover time between transmit and receive to be as short as possible, ideally less than about 20mS. If the changeover time is too long, the two stations in Mode A QSO will not be able to handshake properly. Most Amtor controllers have a "Repeat Request" (RQ) indicator and an "Error" indicator which show whether or not the QSO is progressing smoothly. If the RQ indicator is lit for long periods, the other station has not been receiving your data correctly, possibly meaning that the time to switch from receive to transmit on your radio is too long. On the other hand, if the Error indicator is lit for an excessive time, it could mean that your radio is not switching from transmit to receive quickly enough. □

COMPUTING

*John Morris, GM4ANB**

Complex number calculator

Much as I like computers, even I must admit at times that they have their limitations. For simple, one-off calculations a pocket calculator will give you the answers faster and with less fuss. If I want to know how many turns of wire are needed to get a particular inductance on a coil former just fished out of the junk box, it is much easier to look up the formula and pop the numbers into a calculator than to write a program full of INPUTS and PRINTS, which will only get used once.

I fell to musing in this direction while drafting out some ideas on paper recently. Have you ever tried calculating the result of putting two complex impedances in parallel? It is not particularly difficult, but it is boring and time consuming, especially if you have a lot of them to do.

Program 1

```
 10 K$=",C=SR": D$="+-*/": M$="!&": DIM MR(9),MI(9)
 20 II=0: IP$="": OP$=" ": AR=0: AI=0: PO=0: K=0
 30 GOSUB 350: PRINT;OP$;:IF II THEN PRINT ;AR;",";
 40 K=0: T$=GET$: IF T$="" THEN GOTO 40
 50 IF T$>="a" AND T$<="z" THEN T$=CHR$(ASC(T$)-32)
 60 IF (T$<"0" OR T$>"9") AND T$<>"." THEN GOTO 80
 70 IP$=IP$+T$: PRINT ;T$;: GOTO 40
 80 S$=K$: GOSUB 390: IF K THEN GOSUB 120: GOTO 30
 90 S$=D$: GOSUB 390: IF K THEN GOSUB 130: GOTO 30
100 S$=M$: GOSUB 390: IF K THEN GOSUB 140: GOTO 30
110 GOTO 40
120 ON K GOTO 150,170,180,190,210
130 GOSUB 250: SR=AR: SI=AI: PO=K: OP$=T$: RETURN
140 GOSUB 310: ON K GOSUB 230,240: O$=T$: GOTO 340
150 IF II=0 THEN AR=VAL(IP$): II=1: IP$=""
160 RETURN
170 IP$="": II=0: RETURN
180 GOSUB 250: O$=T$: GOSUB 340: RETURN
190 GOSUB 310: GOSUB 350: PRINT ;"STORE:";
200 GOSUB 370: MR(T)=AR: MI(T)=AI: RETURN
210 GOSUB 350: PRINT ;"RECALL:";: GOSUB 370
220 AR=MR(T): AI=MI(T): O$=OP$: GOSUB 340: RETURN
230 D=AR*AR+AI*AI: AR=AR/D: AI=-AI/D: RETURN
240 AI=-AI: RETURN
250 GOSUB 310: ON PO+1 GOSUB 260,270,280,290,300
260 PO=0: OP$=" ": RETURN
270 AR=AR+SR: AI=AI+SI: RETURN
280 AR=SR-AR: AI=SI-AI: RETURN
290 T=AR*SR-AI*SI: AI=AI*SR+AR*SI: AR=T: RETURN
300 GOSUB 230: GOTO 290
310 IF LEN(IP$)=0 THEN RETURN
320 AI=VAL(IP$): IF II=0 THEN AR=AI: AI=0
330 IP$="": O$=OP$: GOSUB 340: RETURN
340 GOSUB 350:PRINT ;O$;AR;",";AI: II=0: RETURN
350 PRINT TAB(1,24);"                                    ";
360 PRINT TAB(1,24);: RETURN
370 I$=GET$: IF I$<"1" OR I$>"9" GOTO 370
380 T=VAL(I$): RETURN
390 FOR I=1 TO LEN(S$): IF T$=MID$(S$,I,1) THEN K=I
400 NEXT I: RETURN
```

The result was Program 1. It is a complex number pocket calculator, for people with very big pockets. It is used just like a normal calculator, but instead of ordinary numbers you can enter complex values. Enter the real part first, then press the comma key and enter the imaginary part. The results are displayed in the same format, so that: 50·3, 2·5 means a real part of 50·3 and an imaginary part of 2·5. This version is only a cheap and nasty four function job, with add, subtract, multiply and divide on the +, −, × and ÷ keys respectively. To get the result press "=", just as on a normal calculator. It also has a 1/x operation (the ! key) and complex conjugate (the & key). Nine memories are provided. Press S followed by a digit to store, R and a digit to recall. Pressing C does a clear. Other functions can easily be added.

The program is written for the BBC, but it avoids most of the special features of that machine, and should be transportable to most computers without too much difficulty. The things that will most likely need changing are:

1) GET$ (lines 40 and 370). On many computers this will be INKEY$. It returns the key pressed.

2) PRINT TAB (lines 350 and 360). Many computers use PRINT AT. Change the value 24 in these lines to the number of lines of text your computer displays on the screen. Output is always sent to the bottom line of the display, and then allowed to scroll up, so giving a record of what was done.

Spectrum users will have to make more extensive changes, due to the heavy use of the ON statement, which is not available on that computer. If you do not feel up to the conversion, send me an sae for a listing for a Spectrum (old fashioned type) version.

The more important variables are as follows:

AR/AI — Real and imaginary parts of the accumulator, used to hold the number just entered or the result of the latest calculation.

SR/SI — Store, used to hold the other number in operations involving two values (add, subtract, etc).

II — Imaginary input flag. Set when a comma is entered, indicating that the real part is complete and the imaginary part is now being entered.

PO — Pending operation. This is a coded value for the operation that will be performed as soon as the second number has been entered.

The program is built round a set of simple subroutines:

310: Get the user's entry and turn it into a complex number in the accumulator.

340: Print an operation key (O$) and the accumulator.

350: Clear the bottom line of the display without scrolling, and leave the cursor at the left edge.

370: Wait for a digit to be pressed, and return 1 to 9 in T.

390: Search a string S$ for a character T$ and return the index. For many computers this can be replaced by the INSTR function.

Operations are driven using three tables. String K$ lists all of the special operations, such as store or recall. When one of these is pressed line 120 steers the program to the appropriate code.

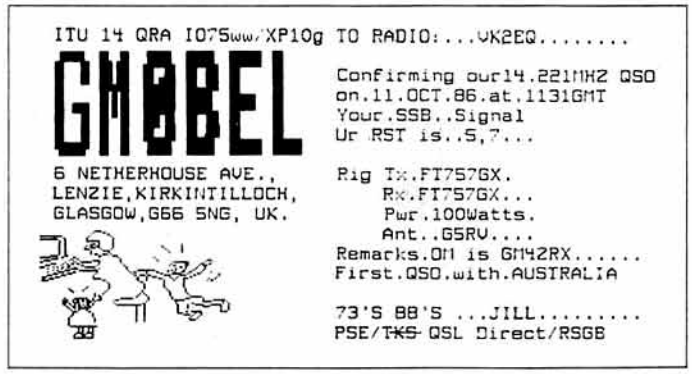
String D$ lists all of the dyadic operations. These are functions which need two numbers, such as addition. When such an operator is entered it is not executed immediately, but is stored as a pending operation in PO, until the second value is entered. All dyadic operations are eventually performed by the routine starting at line 250. An ON is used to call up the required operation. (A piece of trickery is used in line 300, which does the divide. To save space, it uses 1/x followed by multiply).

To include a new dyadic operator add the key you want to use at the end of D$, put the code to execute it somewhere, and add the starting line number of that code to the end of line 250.

Monadic operators — those which work on a single number — can be added in a similar way. Their keys listed in M$, and the appropriate code is called by the ON in line 140.

Writing specialist calculators can be a considerable challenge, especially making them have just the right "feel".

There are many possibilities. If you are interested, one worth looking at is G3SEK's NETAN program (published in *Amateur Radio Software*). This works with complex impedances, and uses "reverse polish" notation instead of the "left to right" evaluation performed by Program 1. □



GM0BEL's computer QSL

Oddbits

A few more computer QSLs trickled in after the April issue had gone to bed, including the one shown above from Jill Lindsay, GM0BEL. It was produced using a Star SG10 printer and a BBC B. The print is two-colour; the callsign and picture in black, and the text in blue.

The card is unique among those I received. It is the only one to have all

* 26 Main St, Hillend, By Dunfermline, Fife KY11 5LE.
Prestel 383824456.

of the QSL information, plus the graphics, printed directly onto a postcard by the computer, without the use of sticky labels or information filled in by hand. Most printers will not cope with this, as the card tends to slip about, making the print illegible. The cartoon was taken from the BYLARA magazine, and reproduced in bit graphics "via graph paper and a lot of patience"!

As anyone with a computer in the shack will tell you, they are superb generators of wide-band RF noise. Associated peripherals, such as monitors and printers, also make less than ideal companions to a high sensitivity rig. There are various products on the market designed to reduce computer rfi. Have you tried any of them? If so, I would be interested in hearing about the results. I would also like to hear any tips you have for reducing the incompatibility between computer and radios. □

QRP

*Rev George Dobbs, G3RJV**

New construction venture

Some amateur radio circuits are best forgotten but others become classics and variations of them continue to appear for many years. Most, if not all, constructors of QRP equipment will know the variable frequency oscillator circuit developed by W2YM which first appeared in *QST* December 1966. This useful little circuit gets an honourable mention in *Amateur Radio Techniques* by Pat Hawker, G3VA, and is exploited to its full potential throughout *Solid State Design For The Radio Amateur* by W7ZOI and W1FB. That is to say nothing of the number of times it has appeared under the pen of G3RJV! A lot of these circuits have been built. Although it is my contention that vfo stability relies more upon the way the oscillator is built and mounted than upon the circuit used, the success rate in producing stable variable oscillators, up to the 10MHz range, using this circuit has been high.

My interest was caught by seeing a new company issue a kit for building a version of this popular circuit. **Kanga Products** is a new company on the amateur radio scene with some interesting ideas in kits and services for the amateur radio constructor. Their vfo kit contains a printed circuit board, a die-cast box and all the components, except the frequency determining tuned circuit, to build a stable vfo. Information for suitable inductance/capacitance combinations from 1·8 to 7MHz is given to enable the constructor to use the kit on the required frequency range. The circuit includes incremental offset tuning and an fm offset facility. I have tried the kit and the combination of a well-tried circuit, a well-designed printed circuit layout and the rigidity of the provided cast alloy box gave good results. The kit sells for £9.45 including postage and VAT.

I mention Kanga Products here, not especially because of their vfo kit, but because of their interesting approach to kit production. Their policy is to supply kits for projects which are usable as main station equipment rather than the usual kits for station accessories or simple transmitters and receivers. The kits supply the basis for the projects allowing the individual to use and "interpret" them as he or she chooses. The pcb and the main components are all supplied, but any items which might be available from the junk box or cheap sources are left to the constructor to find. Should the constructor not wish to search around for the bargain components, an order form, complete with the correct part numbers, is included so that the extra components can be obtained from major mail order companies. So the constructor can save money by using existing or cheap parts or simply tick the provided form and write out a cheque for mail order.

The kits available so far, apart from the hf vfo, are a high-grade superhet receiver board for a single amateur band (a converter will soon be available to give multiband options), and a 1·8MHz ssb transceiver board. Kanga also produce 1·8MHz and vxo modification boards for the FT707. The emergence of Kanga is yet another example of the continuing increase in interest in home construction within the hobby. Information about the Kanga Products kits can be obtained for a large sae to Kanga Products, 3 Limes Road, Folkestone, Kent.

Five hundred one-inch squares

In this column in December 1985, I described the Oner transmitter, a cunning little design by George Burt, GM3OXX. Originally appearing in *Sprat*, the journal of the G QRP Club, the Oner is a complete hf transmitter on a 1in square pcb. The transmitter is vxo controlled and with an appropriate fundamental crystal and a lowpass filter it can be used on all bands from 1·8 to 14MHz. The G QRP Club have been supplying kits of parts for the Oner for over a year and have recently sold their 500th Oner kit.

An enterprising member of the club, Ty Nicholls, provided a fund to supply Oner kits as gifts to amateurs either interested in QRP operation or in parts of the world where electronic components are hard to obtain. Over 50 kits were distributed under this scheme all over the world, from UA9 to VK. The Oner kit has provided many people with their first taste of amateur radio construction, and even more with their first taste of operating on the hf bands with a homemade transmitter. The kits are available at £4 each from Dave Aizlewood, G4WZV, 36 King Street, Winterton, Scunthorpe DN15 9TP. Cheques to "G QRP Club".

Although not wishing this column to be a mail order catalogue, people who are regular QRP operators, especially on 3·5MHz, may like to have a reference list of G QRP Club callsigns, number and names. This new listing contains all the G QRP Club members in callsign order, with their membership numbers and, where known, their first name. It is produced by, and is available from: Chris Page, G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex, BN4 3JW. Cheques for £1·50 payable to "C J Page".

IARU Region 1 QRP Day: 17 June 1987

17 June each year is designated by the IARU Region 1 as International QRP Day. On that day as many radio amateurs as possible are urged to use low power on the bands. This year 17 June is a Wednesday, a working day for most of us, but I hope that everyone reading this column will attempt to come onto the bands using QRP. What is the appropriate power to use? The international standard is 5W of rf output power, although if you wish to claim G QRP Club awards, or assist others to make claims, the level is 3W rf power. Where will the QRP stations be on the bands? Many QRP operators will gather around the international QRP calling frequencies: 3,560, 7,030, 10,106, 14,060, 21,060 and 28,060kHz on cw.

Do give it a try. Reducing power is not as drastic as it may appear, look at it in theory. Assuming an "S-unit" on a typical S-meter to represent a 6dB change, the following chart shows what happens as power is reduced. The chart assumes that a 1,000W rf signal is being received at exactly S9 and then shows what power levels will give one "S-unit" reductions.

Watts/S-unit chart

S9	1,000W	S6	15·5W	S4	1W
S8	250W	S5	4W	S3	250mW
S7	62·5W				

The chart shows that in theory a station can reduce power from 1,000W to 4W and still be readable at S5. As the chart shows, 6dB is a *four times* power change, so it is possible to reduce power four times and only lose one S-point. Conversely, to increase by one S-point the output power has to be raised four fold—something to bear in mind when considering linears.

Operating QRP does require more discipline and cunning but the results never fail to surprise the first time user of low power. Remember on cw to send easily readable morse. The speed is not too important but do not, like many stations do, show off on your electronic bug key and liberally spray around dots in the information. Good and adequate spacing is required, as it is with any cw operating. Experienced operators will tell you that most difficult to read morse is so because of bad spacing. Please do not send your callsign as "G3RJV/QRP": that is **illegal** within the terms of the UK licence. It is permissible to send "G3RJV (Space) QRP".

The Suffolk Trophy

To encourage operation on International QRP Day, The G QRP Club offers an award called the Suffolk Trophy.
Elegibility: any member of the G QRP Club.
When: Annually on Region 1 QRP Day, 17 June.
Period: Any six hours during the day, taken in not more than two periods. Start/Finish times to be shown in the log.
Contacts: Contacts with any station in IARU Region 1 count.
Form of contact: Normal QSOs, there are no special contest exchanges.
Bands: Any bands for which the operator is licensed.
Power: Not to exceed 3W rf output (cw) or 10W P.E.P. (ssb).
Scoring: Each Region 1 country contacted on each band counts one point. The claimed score should be the total of IARU Region 1 countries contacted on all bands used. For example six countries on 7MHz and 16 on 14MHz give a score of 22. Only one contact per country per band is allowed, irrespective of mode.
Entries: These should give name, address, call, power and mode used, brief equipment details, and the callsign, time and band of each contact claimed for scoring purposes. A summary giving the claimed score for each band and the overall claimed score must be included.
Entries to: A D Taylor, G8PG, 37 Pickerill Road, Greasby, Merseyside, L49 3ND to be received by 17 July. Any received after that date will be disallowed.
Awards: At the discretion of the committee the winner will receive a memento trophy and a book token for £15. Second and third will receive certificates.

So I hope to see you on the air, QRP, on 17 June. □

*St Aidan's Vicarage, 498 Manchester Road, Rochdale OL11 3HE.

Contest News

First 1·8MHz contest 1987 results

The increased European activity on 1·8MHz has changed the identity of this contest. In this year's event, the top three stations averaged 53 per cent overseas contacts and around 25 per cent of their contacts were with USSR countries. A dipole at 60-70ft high seems to offer the optimum choice of building a solid base of UK contacts, while enabling the longer distance stations to be worked. It is interesting to note that many European entrants were using more adventurous antennas such as bobtail curtains, delta loops and high dipoles, yet the average UK antenna seems to be a G5RV.

G3SJJ used a TS930S and dipole at 70ft, with a 500ft beverage to cope with excessive supply-line noise. G4BUO and G4BWP also had high dipoles, and achieved a first hour scoring rate of 87 contacts.

Several entrants commented on key-clicks from a GW4 and two G3s; with over 100 stations active for the whole contest period and packed into just 35kHz, wide signals can cause severe problems. While most entries were well presented, ancient log sheets caused extra work.

Subject to Council confirmation, the Somerset Trophy will be awarded to G3SJJ, and the Maitland trophy to GM3UM. (Since the winner is also the adjudicator, the first three logs were checked by another member of the HF Contests Committee.) *G3SJJ*

British Isles section

Posn	Callsign	Valid QSOs	Bonus QSOs	Total points	Posn	Callsign	Valid QSOs	Bonus QSOs	Total points
1	G3SJJ*	201	74	972	26	G3VYI	87	53	524
2	G4BUO*	201	71	957	27	G2MJ	106	46	515
3	G4BWP*	199	68	940	28	G4AKY	92	52	505
4	G3RPB	187	72	920	29	G4EBK	91	46	501
5	G3KDB	189	70	916	30	G4ARI	87	47	496
6	GW4IOI (op GW3NYY)	187	70	911	31	G4CNY	79	45	462
					32	G4ICP**	83	42	453
7	G3FXB	186	64	874	33	G3MCX	67	37	386
8	G4WQN	168	70	856	34	G3OVL	67	37	382
9	G3TXF	171	64	826	35	G3BPM	64	38	378
10	G3IGW	154	66	786	36	GM3CFS	57	40	375
11	GM3YOR	153	63	766	37	G3ILO	64	35	366
12	G3JKS	153	63	743	38	GM3UM***	62	36	365
13	G4GLL* **	136	60	705	39	G4HSD	54	39	358
14	G3OLB	148	51	692	40	G3AWR***	64	33	355
15	G3SWH	138	53	679	41	G3DOT	56	36	345
16	G3SWC	123	52	628	42	G3GMS	56	31	323
17	G4OTU	114	58	627	43	G3GMM	54	31	315
18	G3SXW	117	55	623	44	G3BGM	51	33	312
19	G4OGB	118	54	622	45	G0DYX	50	31	308
20	G3YEC	113	51	594	46	G4UZN	49	31	302
21	G5MY* ***	105	56	593	47	G3VNG**	47	31	291
22	G4ODV	113	57	587	48	G3FVW	40	32	237
23	G3TBK**	116	54	554	49	G3ZRZ	40	28	230
24	G3ZGC/A	100	50	550	50	G4JSN**	31	19	187
25	G4WYG	94	52	538	51	G4NFX	31	18	186

Overseas

Posn	Callsign	Valid QSOs	Bonus QSOs	Total points	Posn	Callsign	Valid QSOs	Bonus QSOs	Total points
1	OL1BLN/P*	74	39	406	21	HB9BXE*	28	17	174
2	OZ1W*	57	35	353	22	UP2BRG	27	17	165
3	OK1DRO*	54	31	317	23	OK3CXS	27	19	159
4	F9KP*	54	29	305	24	UZ3DD	24	15	156
5	SP1PEA*	48	26	276	25	ON4HX	18	14	143
6	DL4EBN*	45	28	274	26	RA4FET	20	15	134
7	RA3DX*	46	23	262	27	UO5WU*	19	14	126
8	UP2BH*	47	23	252	28	UO5OAL	17	13	116
9	UP3BA	43	25	248	29	UA6HRZ	17	13	115
10	UP2BO	44	20	242	30	YU7BW*	17	12	108
11	UQ2GN*	39	24	238	31	UB4LCD	14	10	90
12	DK9NH	39	24	236	32	UB5QHR	13	10	89
13	UC2WAZ*	39	24	234	33	UA1DX	12	10	85
14	DL1ZQ	36	25	232	34	UV9FM*	12	8	80
15	UA1DZ	46	25	231	35	UA3ATV	23	5	79
16	RA1CW	40	23	228	36	UA9CBO	12	7	76
17	UB5ZAL*	36	24	227	37	UY5TE	8	7	58
18	PA3AMA*	35	25	224	38	OK2BMU/P	7	4	55
19	ON6TJ*	34	20	216	39	UV6HFK	4	3	29
20	UQ2GFB	39	21	201	40	OZ3FYN	1	1	8

SWL section

Posn	Station	Valid QSOs	Bonus QSOs	Total points	Posn	Station	Valid QSOs	Bonus QSOs	Total points
1	BRS528668*	94	62	592	4	UC200643*	24	12	152
2	BRS1066	87	53	526	5	UB50641883*	15	11	100
3	UQ2037200*	26	15	162	6	UR208363*	4	1	16

Check-logs received with thanks from: GW3JI, G3LIK, OZ1JNR, RV9CFA, UA1ASM, UA6LFQ and UP1BXF. Disqualified: UP2-038-1580.
* Certificate winner, ** First-time entrant, *** Senior citizen.

144MHz Low Power & SWL Contest rules

1500-2300gmt 8 August 1987

The general rules published in the "Operating Guide" supplement, *Rad Com* January 1987, will apply. There will be three sections, section F for fixed stations, section O for all other transmitting stations, and section L for listeners.

County/country multipliers will be used (general rule 14).

Output power must not exceed 25W p.e.p at the transmitter.

All entries and check logs to: VHF Contests Committee, c/o J Pilags, G8HHI, 43 Bartons Drive, Yateley, Camberley, Surrey GU17 7DW.

432MHz Low Power & SWL Contest rules

0900-1500gmt 9 August 1987

The general rules published in the "Operating Guide" supplement, *Rad Com* January 1987, will apply. There will be three sections, section F for fixed stations, section O for all other transmitting stations, and section L for listeners.

County/country multipliers will be used (general rule 14).

Output power must not exceed 10W p.e.p at the transmitter.

All entries and check logs to: VHF Contests Committee, c/o D A Yorke, G4JLG, 40 Edge Fold Road, Worsley, Manchester M28 4QF.

1·3GHz/2·3GHz Contest rules

0900-1500gmt 23 August 1987

The general rules published in the "Operating Guide" supplement, *Rad Com* January 1987, will apply. There will be two sections, section F for fixed stations, and section O for all other stations. Entrants should complete a multi-band summary sheet (4422) as well as cover sheets for each band. Fixed stations must use the same callsigns on both bands. Scoring will be at one point/km on both bands, and crossband contacts will count for half points.

All entries and check logs to: VHF Contests Committee, c/o M Pharaoh, G3LCH, 49 Streathbourne Road, London SW17 8QZ.

144MHz Trophy and SWL Contest rules

1400-1400gmt 5/6 September 1987

The general rules published in the "Operating Guide" supplement, *Rad Com* January 1987, will apply. There will be three sections, section S for single-operator stations, section M for multi-operator stations, and section L for listeners. The Thorogood Trophy will be awarded to the winner of the single-operator section, and the Mitchell-Milling Trophy to the leading multi-operator entrant. Certificates will be awarded to the leading stations in each RSGB zone, and entrants should include their zonal code (see p15, *Rad Com* January 1987) on the cover sheet. If you wish to enter the concurrent IARU contest, please complete an extra cover sheet (427), and score contacts using both the radial ring system and one point/km.

All entries and check logs to: VHF Contests Committee, c/o D A Yorke, G4JLG, 40 Edge Fold Road, Worsley, Manchester M28 4QF.

21MHz CW Contest 1987 rules

Special note for both sections: entrants are particularly requested to use standard size (A4) log sheets.

TRANSMITTING SECTION

1. The general rules for RSGB hf contests, published in the "Operating Guide" supplement. *Rad Com* January 1987, will apply.

2. Eligible entrants. Single operator stations only. British Isles entrants must be members of RSGB. Overseas entrants, all licensed amateurs.

3. Period. 0700 to 1900gmt, Sunday 18 October 1987.

4. Sections.

(a) British Isles section.

(b) QRP British Isles section. British Isles stations using less than 10W input.

(c) Overseas section (including EI).

(d) QRP Overseas section. Overseas stations using less than 10W input.

5. Frequency/mode 21MHz. CW only. Entrants are requested **not** to operate in the band 21·075 to 21·125MHz.

6. Exchange. RST report plus a progressive QSO number starting with 001.

7. Scoring.

(a) British Isles stations. Only contacts with overseas stations will count for points. Each contact shall score three points. The final score is the number of countries worked multiplied by the total number of points. The ARRL Countries List will apply with the exception that VO1, VO2, VE, VK, ZL and USA and Japanese call areas, irrespective of prefix, will count as separate countries. Contacts with British Isles stations will not count for points or multipliers.

(b) Overseas stations. Each completed contact with a British Isles station will score three points. The final score is the number of British Isles prefixes multiplied by the total number of points. British Isles prefixes are; G0, G2, G3, G4, G5, G6, G8, GD0, GD2, GD3, GD4, GD5, GD6, GD8, GI0, GI2, GI3, GI4, GI5, GI6, GI8, GJ0, GJ2, GJ3, GJ4, GJ5, GJ6, GJ8, GM0, GM2, GM3, GM4, GM5, GM6, GM8, GU0, GU1, GU2, GU3, GU4, GU5, GU6, GU8, GW0, GW2, GW3, GW4, GW5, GW6 and GW8. Contacts with GB stations will not count for points or multipliers.

Duplicate contacts. Unmarked duplicate contacts for which points have been claimed will be penalized at 10 times the claimed points. Entries containing more than five such duplicates will be automatically disqualified.

8. Logs. Log sheets to be headed: Date/time gmt; station worked; RST and serial number sent; RST and serial number received; multiplier; points claimed. They should be submitted with a cover sheet indicating antenna, equipment and power used and must include a separate list of countries worked as specified in rule 7 above.

9. Declaration. Each entry must be accompanied by the following declaration signed and dated: "I declare that this station was operated strictly in accordance with the rules and spirit of the contest and agree that the decision of the Council of the RSGB will be final in all cases of dispute".

10. Address of logs. RSGB HF Contests Committee, c/o M Harrington, BRS20249, 123 Clensham Lane, Sutton, Surrey SM1 2ND, England.

11. Closing date for logs. British Isles entrants, 25 November 1987: overseas entrants, 31 December 1987.

12. Awards. The leading British Isles station will be awarded the T E Wilson G6VQ Cup, and will also receive RSGB publications to the value of £10. Certificates of merit will be awarded at the HF Contests Committee's discretion to the leading three stations in each overseas country.

RECEIVING SECTION
Rules as transmitting section except where specified below.
2. Eligible entrants.
(a) British Isles. RSGB members only.
(b) Overseas (including EI) all swls.
Holders of transmitting licences for frequencies above 30MHz may also enter the receiving section.
7. Scoring. British Isles swls should only log overseas stations in contact with British Isles stations participating in the contest.
Overseas swls should only log British Isles stations in contact with overseas stations participating in the contest. Scoring and multipliers as in transmitting section.
11. Logs. Log sheets to be headed: date/time gmt; callsign of station heard; report and serial No sent; callsign of station being worked; multiplier; points claimed.
Note. In the column headed station being worked, the same callsign may only appear once in every three contacts except when the logged station is a new multiplier for the receiving station.
Each entry should be accompanied by a completed declaration: "I declare that this station was operated within the rules of the contest and that I do not hold a transmitting licence for frequencies below 30MHz".
12. Awards. Certificates of merit will be awarded at the HF Contests Committee's discretion to the leading three entries from the British Isles, and to the leading entrant from each overseas country.

3·5MHz Hopscotch Contest 1987 rules

1. Eligibility. Open to RSGB members, single-operator only.
2. Where and when. 3,520-3,570kHz, cw only, 1300-1600gmt Sunday 2 August 1987.
3. Exchange and scoring. Send RST, serial number starting from 001, county code and name. Score 10 points per contact. Only contacts between UK stations count.
4. QSY rule. The station soliciting calls (by CQ, QRZ etc) may make only one contact on that frequency—he must then QSY at least 3kHz before making any other contact.
5. Logs. Sheets (preferably HFC1) to be headed: date/gmt; callsign of station worked; RST/serial sent; RST/serial received; county code received; name received; points. Cover sheet to show county code and name sent. Logs to be postmarked not later than 17 August and posted to: HF Contest Committee, c/o Mrs H Claytonsmith G4JKS, 115 Marshalswick Ln, St Albans, Herts AL1 4UU accompanied by the declaration: "I declare that this station was operated strictly in accordance with the rules and spirit of the contest and agree that decisions of the RSGB shall be final."
6. Certificates. The winner and runner-up will receive certificates of merit.
Note—The rules are unchanged, and please note that contravention of Rule 4 means disqualification. Please send your log to help with adjudication (after checking for duplicates) and do include any comments.

RSGB SSB Field Day 1987 rules

1. Eligible entrants. Members or groups of members of the RSGB located in the British Isles.
2. The general rules for RSGB hf contests, published in the "Operating Guide" supplement, *Rad Com* January 1987 will apply.
3. Period. 1500gmt Saturday 5 September to 1500gmt Sunday 6 September.
4. Sections.
(a) Open. Multi-operator, maximum licensed power. Equipment: one transmitter and one receiver, or one transceiver plus an additional receiver if desired. Antenna: no restriction.
(b) Restricted. Multi-operator, 200W p.e.p. input maximum. Equipment: only one transmitter and one receiver, or one transceiver. Antenna: only one antenna may be used which must be a single element such as a dipole, long wire, W3DZZ, or trapped vertical, having not more than two elevated support points. No part of the antenna may be higher than 15m above ground level.
Notes (these apply to both sections).
(i) Stand-by equipment is allowed, but it may not be connected at the same time as the main equipment.
(ii) The use of support points for antennas from permanent buildings or structures is not permitted.
5. Location. Each portable station must operate from the same site for the duration of the contest and may not be located in a permanent building or use public mains supply.
6. Power. Power for all equipment may be derived only from a portable generator on the site, accumulators, or batteries.
7. Installation. No equipment or antennas may be installed or erected on the site prior to 24 hours before the start of the contest. This does not apply to the storage of equipment.
8. Contacts. Phone only in the 3·5, 7, 14, 21 and 28MHz bands.
9. Contest call and exchange. Call "CQ Field Day". Exchange RS plus serial number starting with 001.
10. Scoring
(a) QSO with a fixed station in IARU Region 1 ... ... 2 points
(b) QSO with any station outside IARU Region 1 ... ... 3 points
(c) QSO with a portable or mobile station in IARU Region 1 ... 5 points
See Appendix for list of IARU Region 1 countries.
11. Multiplier. Each DXCC country worked on each band gives one multiplier.
12. Final score. The total points scored on all bands is to be multiplied by the total number of different countries worked on each band to give the final score (ie total QSO points × multiplier = final score).
13. Logs. Separate logs are required for each band, together with a check list showing the countries worked on each band. Log sheets are to be headed: date/gmt; station worked; RS and serial number sent; RS and serial number received; operator; new country/multiplier; points. RSGB HF Contest Log Sheets should be used.
14. Declaration. Logs must be accompanied by an RSGB HF Contest Cover/Summary Sheet with the declaration signed by the person responsible for the contest entry.
15. Address for logs. RSGB HF Contests Committee, c/o P Miles, G3KDB, PO Box 73, Lichfield, Staffs WS13 6UJ.
16. Deadline for logs. Postmarked not later than the Monday 22 days after the end of the contest.
17. Awards. The leading station in the open section will receive the Northumbria Trophy. The leading station in the restricted section, and the entrants placed second and third in each section will receive certificates of merit. Certificates will also be awarded to the stations submitting the leading check log from each continent.
18. Any log found to contain more than five unmarked duplicate contacts for which points have been claimed will be automatically disqualified. Points to the rate of 10 times the contact value will be deducted for each unmarked duplicate contact up to five.
19. Data Protection Act. Entrants should note that the contest adjudicator may enter information from their logs into a micro-computer for the sole purpose of checking for duplicate contacts and preparing contest tabulations. If any entrant objects to this, they must clearly state their objection on the cover sheet so that the adjudicator can hand process their information.
Appendix
IARU Region 1 countries include those in Europe and Africa, the USSR, Mongolia and ITU Zone 39. For a precise definition refer to the RSGB *Amateur Radio Operating Manual.*

Low Power Field Day 1987 rules

Comments received from last year's event were discussed by the HF Contest Committee, but it was decided not to make any further changes in the rules this time.
1. The general rules for RSGB HF Contests, as published in the "Operating Guide" supplement, *Rad Com* January 1987, will apply.
2. Date and time. 0900-1200gmt and 1300-1600gmt, Sunday 19 July 1987.
3. Sections. (a) 10W rf output maximum. (b) 3W output maximum. RSGB members resident in the British Isles. Single- or multi-operator.
4. Frequencies. 3,510-3,560kHz and 7,010—7,040kHz, (IARU Region 1 contest-preferred segments). CW only. Contacts may be made on both bands during each session.
5. Exchange. RST plus serial number starting 001 and continuing through both sessions, together with location (defined by a place name) and county code as shown in the "Operating Guide", *Rad Com* 1987.
6. Scoring. Portable or mobile stations: 15 points, Fixed stations: five points. Note: stations outside the UK may be contacted.
7. Documentation. Standard RSGB hf contest log sheets (HFC1 Rev79) should be used, with column (5) headed 'Location and county code received'. Duplicates must be clearly marked without claim for points. Unmarked duplicates will be penalized at the rate of 10 times number of points claimed, and logs containing more than five unmarked duplicates for which points have been claimed would normally result in disqualification. Each entry must be accompanied by a cover sheet (HFC2 Rev80) or a standard RSGB declaration signed by the operator responsible for the entry.
8. Special conditions
(i) Power. The power for all parts of the station must be derived from dry batteries, accumulators or 'natural' sources (eg solar cells or wind-driven generators). The practice of float charging batteries from petrol, gas or diesel driven generators is not permitted.
(ii) Equipment. Entrants using equipment capable of running more power than the permitted output power for the section entered must specify how the power limit was adhered to.
(iii) Antennas. The maximum height must not exceed 35ft (10.66m) above ground level.
9. Address for entries. Logs should be sent to: HF Contests Committee, c/o J C Burbanks, G3SJJ, "Southlands", 16 Cotgrave Road, Plumtree, Nottingham NG12 5NX.
10. Data for entries. Logs must be post marked not later than 15 days after the end of the contest.
11. Awards. The Houston-Fergus Trophy will be awarded to the leading station in section (a). Certificates of merit will be sent to the first three stations in each section and to the fixed station submitting a check-log giving the most points to portable stations.

IARU Region 1 VHF/UHF/SHF Contests rules

1. Eligible entrants. All licensed amateurs in IARU Region 1 can participate in the contests. Multi-band entries from UK groups competing in the IARU Region 1 UHF/SHF Contest, working from a single location and using one callsign on each band, will be accepted for the "all other stations" section of the contest. The contest entry should show which single callsign should be used in the overall tabulation of the results. Contestants must operate within the letter and spirit of the contest and at no greater power than permitted in the ordinary licences of their country. Stations operating under special high power licences do so *hors concours* and cannot be placed in the contest proper.
2. Contest sections. The contest will comprise two sections for each band:
1. Single-operator station, operated by the owner of the licence (no club stations).
2. All other stations.
3. Dates of contests
VHF contest: The contest will take place during the weekend of 5 and 6 September 1987 on the 144MHz band.
UHF/SHF contest: The contest will take place during the weekend of 3 and 4 October 1987 on all bands from 432MHz to 24GHz.
4. Duration of contest. The contest will commence at 1400gmt on the Saturday, and end at 1400gmt on the Sunday.
5. Contacts. Each station can be worked only once on each band, whether it

is fixed, portable or mobile. If a station is worked again during the same contest, only one contact will count for points, but any duplicate contact should be logged without claim for points and clearly marked as duplicate. Contacts made via active repeaters, translators, eme or meteor scatter do not count for points. Any telephony contacts made with stations generating in the cw (A1A) sub-bands shall not count for points.

6. Type of emission. Contacts may be made on A1A, R3E, J3E or F3E. F2A may be used above 1GHz. Only one transmitter may be used on each band at any time.

7. Contest exchanges. Code number exchanges during each contact shall consist of the RS or RST report, followed by a serial number commencing at 001 for the first contact on each band, and increasing by one for each successive contact on this band. This must immediately be followed by the locator of the sending station (eg 59 003 JO22PB).

8. Scoring. Points will be scored on the basis of 1 point per kilometre. The final claimed score must be shown on the first sheet.

9. Entries. Entries should be sent to the RSGB VHF Contests Committee, c/o the adjudicator for the RSGB contest on the same date. Separate cover sheets (Form 427) should be completed for the RSGB and IARU events, but common log sheets may be used with both radial ring and points per kilometre scoring shown.

10. Awards. The winner of each section will receive a certificate. The entrants compete for the following challenge trophies:

VHF contest: (a) The IARU Region 1 VHF Trophy for the winner of the single-operator 144MHz section. (b) The PZK Trophy for the winner of the all other stations 144MHz section.

UHF/SHF contest. (a) The Vittoria Alata Cup 1, for the winner of the single-operator 144MHz section. (b) The Vittoria Alata Cup 2, for the winner of the all other stations 432MHz section.

Overall winner: An overall winner of the IARU Region 1 UHF/SHF Contest will be declared. For this competition the scores of entrants will be combined using the following multipliers:

432MHz	× 1
1,296MHz	× 5
2,320MHz	× 10
Higher bands	× 20

The entrant with the highest score will be awarded the IARU Region 1 Medal.

IARU Region 1 VHF/UHF/SHF Listeners Contest rules

The IARU Region 1 VHF/UHF/SHF Contest rules should be used, with the following differences.

1. Eligible entrants. All listeners in Region 1 may take part. Licensed amateurs are not eligible to enter.

2. Contest sections. (a) There will be one section in the September 144MHz contest. (b) There will be one section for each band from 432MHz to 24GHz in the October contest.

3. Reporting. Any station may be logged only once on each band, whether it is fixed, portable, or mobile. CQ or test calls will not count for points and should not be logged. Stations heard via active repeaters, translators, eme or meteor scatter do not count for points. The callsign of the station contacted by the station heard may only appear five times, or if there are more than 100 QSOs logged, only once in every 20 logged contacts.

4. Scoring. Points will be scored on the basis of one point per kilometre between the listener and the station heard.

DF Qualifying Event—Northampton

Date: 14 June 1987.
Map: OS Sheet 152 1:50,000 series, Northampton and Milton Keynes.
Assembly: 1300bst for start at 1320bst.
Location: 1km northeast of Castle Ashby, NGR865600.
Competitors requiring tea should notify Mr D Newman, Haynes House, 78 High Street, Whittlebury, Towcester, Northants NN12 8XJ; tel 0327 857350 (home) not later than 7 June 1987.

28MHz Phone Cumulatives Autumn 1986 results

It now seems to be the "norm" for only a small percentage of those active to send in logs, and only 26 of the 100 plus stations that were on submitted entries. Conditions were generally poor and, with an apparent lack of activity in the north of England, long-haul inter-UK contacts were the exception this time round. From various comments in the logs, it seems that thermostats, tv time-bases and leaky power lines have much to answer for; however, every entrant remarked on the friendly nature of the activity sessions and how they wish them to continue.

The winner once again was G4BLX, operating from Ditchling in Sussex. He must have a superb QTH and a good beam, as he hears and works many stations that are inaudible in other locations in the south. His best session netted him 60 contacts, and in total he worked 26 different counties, excluding those adjacent to West Sussex. He has asked us to say that he feels embarrassed by his success in the 28MHz events and that this will be his last competitive entry.

There was a general moan about the adjacent county rule and, as mentioned in the report on the 28MHz CW Cumulatives, the HF Contests Committee will revert to the original rules so that each new county worked counts for a bonus. We were unhappy about adopting the adjacent county exception, and changed the rule on the insistence of some entrants who considered the London entrants had a substantial advantage over those who lived away from the major areas of activity. As will be seen from both the cw and phone results, the change made little difference.

The adjudicator thanks all those that entered or sent in check-logs. The comments were very welcome, as they gave useful feedback and certainly are a pointer to the HFCC to continue these friendly events. The next series of 28MHz cumulatives will be in the autumn and the dates will be announced shortly. Please check the rules when they are published, as there will be some changes in the bonus system.

G4RWW

RESULTS BASED ON BEST THREE SESSIONS

Single-operator Section

		3 Nov	11 Nov	19 Nov	27 Nov	5 Dec	Total
1	G4BLX	—	269	275	—	284	828
2	G4WQN	236	ck	269	273	—	778
3	G0AGE	—	241	258	272	ck	771
4	G0BIR	—	ck	249	187	200	636
5	GW4HSH	ck	165	174	171	ck	510
6	G4NLZ	151	—	197	153	—	501
7	G4WEY	—	181	146	153	—	480
8	G3MGW	—	127	ck	165	136	428
9	G0AEV	ck	104	159	ck	144	407
10	G3SJX	—	98	179	112	—	389
11	G3OTE	—	132	—	107	110	349
12	G0EZL	ck	92	142	108	ck	342
13	G0BWV/P	—	—	66	154	107	327
14	G4WFS/M	ck	93	ck	107	116	316
15	G3WBM	ck	78	97	116	—	291
16	G2HLU	—	—	127	100	49	276
17	G3MCX	ck	73	95	93	ck	261
18	G3UHU	ck	ck	72	79	58	209
19	G0AQF	—	68	55	66	ck	189
20	G4SBD	24	ck	72	23	ck	119
21	G4XYX	ck	—	22	19	23	64
22	G3EPO	20	—	—	20	20	60
—	G6LX	ck	ck	ck	—	—	—

Multi-operator Section

1	G0BBZ/P	—	177	—	145	156	478

Receiving Section

1	RS87156	—	132	116	—	81	329
2	G1GMZ	—	—	105	75	71	251
3	RS20249	—	80	—	81	72	233

21MHz CW Contest 1986 results

Delay in publishing the results this year is entirely due to more detailed checking, and the committee gratefully acknowledges the response from amateurs contacted to verify QSOs made. Regrettably this year the committee has had to disqualify several Bulgarian stations for unverifiable multipliers and QSOs.

The final results show an increase over last year and hopefully with conditions improving we should see a greater entry this year. In answer to many requests, a list of countries worked and equipment used by leading G stations is shown.

The committee would welcome more swl logs from overseas as they are extremely useful for log checking. The log from South Africa was first class and contributed a lot of detailed information.

HF Contests Committee

UK SECTION

Posn	Callsign	Score	Posn	Callsign	Score
1	G4EDG	51,204	26	G3VYI	9,393
2	G4BUO	43,968	27	G3KSH	8,073
3	G3KDB	39,936	28	G3SDK/A	6,660
4	G4CNY	39,711	29	G6QQ	5,760
5	G4AMT	35,568	30	G3HGJ	5,628
6	G3NOM	33,825	31	G4UZN	5,472
7	G3RTE	28,998	32	G3BPM	5,070
8	G3SYA	26,235	33	G3JKY	4,080
9	G3JKS	25,137	34	G6NK	3,933
10	G5LP/A	24,702	35	G4KMB	3,564
11	G4WQN	24,600	36	G4PKU	3,540
12	G2QT	19,845	37	G3AWR	3,480
13	G3LZQ	19,344	38	G4RHS	3,381
14	G0CLP	18,744	39	G3HJF	2,839
15	GW3MPB	17,958	40	G4HPS	2,622
16	G3SWH	17,901	41	G3NKS	2,223
17	G4ODV	17,835	42	G4HZV	2,142
18	G3JYP	17,526	43	G3TXF	2,109
19	G3LET	16,836	44	G4XTM	1,935
20	G4OBK	14,637	45	GM3CFS	1,287
21	G3APN	13,344	46	G4LZB	1,030
22	G3YEC	11,856	47	G4TJE	729
23	G5MY	11,433	48	G3COJ	460
24	G3TBK	11,235	49	GW4KVJ	198
25	G3XTT	9,828			

OVERSEAS SECTION

Posn	Callsign	Score	Posn	Callsign	Score
1	G6ZY/EA6	8,304	30	UA6ALV	1,161
2	9J2BO	5,166	31	UM8DX	1,134
3	RB5QW	5,095	32	UB5IAL	918
4	YO3CD	4,788	33	N2KW	912
5	RB5EX	4,173	34	Z23JO	888
6	ZB2EO	4,134	35	IK6ASR	792
7	LZ1MG	4,032	36	SM0KV/O	720
8	YU5JA	3,978	37	F6EPQ	672
9	YU2LIX	3,630	38	RB5MP	648
10	JG1FVZ/5N26	3,597	39	YU7SF	486
11	KC7UU/5B4	3,150	40	OK3IA/UA3	468
12	UJ8JA	2,871	41	UY5TE	450
13	VO1SA	2,808		YB2FEA	450
14	IK2EGL	2,322		HB9NL	450
15	IK1ICC	2,208		UR2RND	450
16	RB5JW	2,178	45	YO5BAT	432
17	YO6EZ	1,950	46	W4MLA	420
18	YU5GBC	1,881	47	UV9WN	375
19	LZ2KBI	1,863	48	PY1APS	348
20	YO2GZ	1,677	49	YU7MGU	336
21	EA8AGF	1,632	50	VU2UR	306
22	YO6HQ	1,539	51	RB5QZ	300
23	ZS1WQ	1,536	52	LZ1BJ	288
24	UZ6LZB	1,530	53	UA3TAM	225
25	UI9AWX	1,323	54	UZ1TWB	144
26	IK2AHB	1,260	55	Y22WF	117
27	UA6LAM	1,200	56	UQ1GWY	18
28	EA2AMU / F6GYU	1,176			

C QRP

Posn		Score	Posn		Score
1	G4ELZ/P	13,221	4	G2HLU	1,776
2	G4ARI	4,851	5	GM4HQF	720
3	G4ETJ	3,402	6	G8QM	504

DX QRP

Posn		Score	Posn		Score
1	DL6SF	432	2	UA3QJC	228

SWL

Posn		Score	Posn		Score
1	BRS1066	13,728	2	BRS52868	3,825

SWL DX

Posn		Score	
1	ORS89020/ZS	4,512	Check logs: YU5BV, UP2BGR, YO5TA, GI5TK, VS6UO, SM0BDS, UQ2GLQ, G3OZF

EQUIPMENT USED BY LEADING G STATIONS

G4EDG	TA33	TS830
G4BUO	HB33SP	Ten Tec Omni D
G3KDB	4-ele tet	TS930
G4CNY	2-ele Quad	TR7
G4AMT	2-ele Quad	HW101
G3NOM	TH2	TS830

Countries worked
CE, CT, DL, EA, EA6, EA8, EI, F, FM, FR, FY, HA, HB9, HB0, I, IS0, KP4, LU, LZ, OA, OE, OK, ON4, PA, PY, PZ, SM, SP, SV, TA, TR8, UA, UA9, UB5, OC2, UG6, UI8, UJ8, UL7, UM8, UO5, UB2, UQ2, UR, VK2, VK3, VK9, VO, VP2E, VP2M, VP9, VQ9, VS6, VU, W1, W2, W3, W4, W5, W6, W7, W8, W9, W0, XE, Y, YB, Y0, YU, Z23, ZB, ZC4, ZS, 4X4, 5B4, 5H3, 5N0, 9J2, 9V1, 3B8, 3D6, 9Y4, VE1, VE3.

Club News

The following is the latest information received by RRs from the RSGB affiliated societies, clubs and groups in time for inclusion in this issue. Basic unchanged information on other affiliated organisations will be published again in July 1987.

RSGB affiliated organizations are requested to report all programmes and new items to their regional representatives regularly. Information for inclusion in the **September** issue should reach them by **29 June**, and for the **October** issue by **10 August.**

Club programmes are given in order of date, subject, time and place of meeting. All callsigns of club secretaries and other contacts are QTHR (correct in the current *RSGB Call Book*) unless otherwise stated.

All clubs welcome visitors and would be pleased to hear from potential new members.

REGION 1—RR B Donn, G3XSN, 7 Thurne Way, Liverpool L25 4SQ. Tel 051-722 3644.

Accrington (NWRG)—18 Jun (Surplus equipment sale), 8pm. The Globe Bowling Club, Willows Lane, Accrington, Sec G0DTI.

Barnoldswick (Rolls-Royce ARC)—3 Jun ("The use of scopes in amateur radio", G3YEE), 7.30pm. Morse class, Mondays. RR Sports & Social Club, Barnoldswick. Sec G4ILG, tel 0282 812288.

Chester (C&DRS)—2 Jun (Committee Meeting), 9 (Treasure hunt. 7pm), 16 (Surplus sale), 23 (Barbecue, bring your own steaks), 30 (Visit by RR). 8pm. Rugby Union Football Club, Hare La, Vicars Cross, Chester. Details G6IFA, tel Chester 336639.

Darwen (DARC)—6, 7 Jun (HF NFD), 10 (Open meeting), 7 Jul (Fox hunt). Highfield Working Mens Club, Ratcliff St, Darwen. Details G2AKK, tel 0254 73767.

Leyland (CLARC)—1 Jun (NFD planning), 8 (Committee meeting), 15 (First aid, Vernon Sandiford). Morse classes 7.15, G0ASH. Priory Club, Broadfield Drive, Leyland. Sec G4ZYN, tel 0257 452287.

Liverpool (L&DARS)—2 Jun ("History of aviation", Bill "VEH"), 9 (Raynet and open night), 16 (Inquest on NFD), 23 (VHF NFD preparations), 30 (Fox hunt), 7 Jul (Junk sale). 8pm. Morse and RAE Classes 7pm. The Churchill Conservative Club, Church Rd, Liverpool 15. Sec Lynn tel 051-728 8811.

Macclesfield (M&DRS)—2 Jun (Construction evening), 9 (Guest speaker), 16 (Committee meeting), 23 (Open meeting), 30 (Field evening). 8pm. The Fermain Club, Oxford Rd, Macclesfield. Sec G1NUS, tel 0625 24534.

Manchester (SMRC)—5 Jun (tba), 12 (Visit to R Gorton & Associates Electronics Ltd), 19 (Midsummer df & barbecue), 26 ("The history of the SMRC", G3HZM), 8pm. Sale Moor Community Centre, Norris Rd, Sale. Details G2AKR.

Stockport (SRS)—10 Jun (NFD post-mortem), 17 (Informal natter night in the bar), 24 ("Behind the controls"), 8pm. The Blossoms Hotel, junction of Bramhall Rd and A6. Sec G4FFW, tel 224 7880.

Tarporley (Mid-Cheshire ARS)—1 Jun (Committee meeting), 3 (HF NFD planning), 6, 7 (HF NFD), 10 (VHF NFD planning), 17 (Barbecue and social), 20 (Visit to Dinoring power station, Wales), 24 (Cheshire West Group Raynet), 7.30pm. Activity and construction nights every first Wednesday, RAE and morse classes. Cotebrook Village Hall, Nr Tarporley. Details G1SIB, tel 0928 88153.

Thornton Cleveleys (TCARS)—1 Jun (Preparations for HF NFD), 8 (Informal), 15 (Visit by RR1), 22 (Informal), 29 (VHF FD preparations). 7.45pm. Club net Sundays 11am, G4ATH, on 1·865 MHz. 1st Norbreck Scout HQ, Carr Rd, off Fleetwood Rd, Bispham, Blackpool. Details G4BFH 0253 853554.

Warrington (WARC)—2 Jun ("Morse receiver Mk2, G8HLZ), 9 (RSGB films: "Electromagnetic Waves", "Thin Film Microcircuits"), 16 (Barbecue hosted by Debby and Mike Mansfield), 23 (Open forum), 30 ("Rip-van-Winkle's story", G4ZZG), 7 Jul (RSGB film: "JARL visit to China"), 8pm. Grappenhall Community Centre, Bellhouse Lane, Grappenhall, Warrington. Sec G0CBN, tel 0925 814005.

Wigan (W&DARC)—3 Jun (Club night), 10 (DF night), 17 (General meeting), 24 and 1 Jul (Club nights). 7.30pm. Poolstock Cricket Club. Details G0DTY, tel 47416.

Would you please observe the 144MHz bandplan —144·500MHz sstv calling frequency and 144·700MHz facsimile calling frequency. The gentlemen's agreement is not being observed and a strong complaint has been made. Thank you. Also I wish to thank Southport ARC for their hospitality on my recent visit. *RR1*

REGION 2—RR P R Sheppard, G4EJP, 9 Elvington Crescent, Leconfield, Beverley, N Humberside HU17 7LX. Tel 0401 50397.

Catterick (Royal Signals ARS G4RS)—27 June (AGM) Vimy Barracks, Catterick. Details G3EKL.

Denby Dale (DDARS G4CDD)—21 Jun (Annual rally) Shelby High School. Details G3SDY, tel 0484 602905.

Halifax (H&DARS G2UG)—16 Jun (Treasure hunt), 21 (Summer open forum). 7.30pm. Running Man ph. Details G0DLM, tel 0422 202306.

Keighley (KARS RS 84851)—9 Jun (Informal meeting), 30 (Visit by RR2). 8pm. Victoria Hotel. Details G1IGH, tel 0274 496222.

Leconfield (RCTARS G4GGD)—1-28 Jun (Planned special event, GB4RSI), 4 Jun (Monthly meeting). 8pm. Normandy Barracks. Details G4EJP, tel 0401 50397.

North Wakefield (NWRC G4NOK)—4 Jun ("Semiconductors", G3JMS), 11 (On the air), 18 (Spen Valley junk sale), 25 ("Land mobile radio", G3SEY). White Horse ph. Details G4RCH, tel 0532 536633.

Pontefract (P&DARS G3FYQ)—4 Jun (Informal discussion on club equipment), 11 ("History of amateur radio", G3VID), 18 (Raynet practice), 25 (Informal evening). 8pm. Carleton Community Centre. Details G6OJX, tel 0977 83792.

Spen Valley (SVARS G3SVC)—4 Jun (Treasure hunt), 18 (Surplus sale). Old Bank wmc. Details G4PHR, tel 0924 499397.

UK FM Group (Northern G8KFM)—7 Jun (Monthly group meeting). 7.30pm. Royal Hotel, Barnsley. Details G4UNA.

Wawne (Raynet Group G4UWE)—8 Jun (Communications tests with county groups), 21 (Exercise Warmon). Meetings 7.30pm. EP Cell, Meaux Rd. Details, new controller G8DCD, tel 0482 657727.

York (YRCA G4YRC)—9 Jun (Club visit to Signal Corps), 21 (Annual Barbecue). Ashcroft Hotel. Details G3WQM, tel 0904 793672.

REGION 3—RR G Ross, G8MWR, 81 Ringwood Highway, Coventry CV2 2GT. Tel 0203 616941.

Birmingham (Midland) ARS—16 Jun (Foxhunting tips, G8FTU and G8DEJ). Meetings every night. Unit 5, Henstead House, Henstead St. (off Bromsgrove St). Sec G8BHE, tel 021-422 9787.

Coventry (CARS)—5 Jun (Morse tution), 12 (Portable night on the air), 19 (Night on the air), 26 (Surplus equipment sale). 8pm. Scout HQ, 121 St Nicholas St, Radford, Coventry. Sec G3UOL, tel 414684.

Evesham (ERAC)—4 Jun (Activity night and df hunt). Details G4UXC, tel Evesham 831508.

Halesowen (MEB RC)—9 Jun (Amateur tv, G5KS), 23 (General meeting). 8pm. MEB Social club, Mucklow Hill, Halesowen. Sec G4RWH, tel 021-747 8784.

Malvern (Malvern Hills ARC)—9 Jun (Construction group). 8pm. Red Lion Inn, St Anne's Rd, Malvern. Sec G4BVY, tel 06845 66822.

Shrewsbury (Salop ARS)—4 Jun (Natter night), 11 (Calibration night), 18 (HF night on the air), 26 (Crewe station visit). 8pm. Old Bucks Head, Frankwell, Shrewsbury. Sec G0EIY, tel 0743 6779.

Stratford-upon-Avon (S-u-AARC)—8 Jun (The 1680 Eddystone receiver), 22 ("Audio", G0AJA). Sec G8OVC, tel S-u-A 750584.

Warwick (WARS)—9 Jun (DF hunt and barbecue), 23 (Technical topics). 8pm. St John Ambulance HQ. 61 Emscote Rd, Warwick. Sec G6VHI.

Wolverhampton (WARS)—2 Jun ("Advanced fastening techniques", G1DIL), 9 (Activity meeting), 16 (Open forum), 23 ("Non-destructive testing", G0EZT), 30 (Night on the air). 8pm. Electricity Sports Club, St Marks Rd, Chapel Ash, Wolverhampton. Sec K. Jenkinson, tel 0902 24870.

Wythall (WARC)—2 Jun (Committee meeting), 23 (Night on the air). 7.30pm. Community Centre, Silver St, Wythal. Sec G0EYO, tel 021-430 7262.

REGION 4—RR M Shardlow, G3SZJ, 19 Portreath Drive, Darley Abbey DE3 2BJ. Tel Derby (0332) 556875.

Alfreton (ASDARC)—2 Jun (visit by Lowe Electronics), 7 (Special event station, Derby city transport open day). 8pm. ECP Social Club, Carnfield Hill, Alfreton. Sec G1FSR.

Derby (DADARS)—4 Jun (Junk sale). 7.30pm. 119 Green Lane, Derby. Sec G3KQF, tel Derby 772361.

Leicester (LRS)—8 Jun (Committee meeting), 15 (Lecture, tba), 22 (NFD post mortem), 29 (VHF NFD final arrangements). 7.30pm. Gilroes Cottage, Groby Rd, Leicester. Sec G4PDZ, tel Leicester 871086.

Loughborough (L&DARC)—2 Jun (Night on the air), 9 (DF event no 3), 16 (Magazine review and

tech class), 23 (Portable evening, Black Swan), 30 (Social evening), Hindleys College, Shepshed. Sec G0FIT.
Sleaford (SADARC)—21 Jun (GB2CS at Sleaford Carnival), 27 (Station at Rauceby Hospital Fete), 28 ("Oscilloscopes", G3URD). 8pm. Hale Magna Village Hall, Great Hale. Sec G2HHK.

REGION 5—RR J S Allen, G3DOT, 77 Rosslyn Crescent, Luton LU3 2AT. Tel 0582 508515 or at work on 0582 21151.
Bedford (B&DARC)—4 Jun (Visit by G3OSS), 18 (Homebrew evening). Allen's Club, Hurst Grove, Queens Park, Bedford. Sec G4VHF, tel 0234 751763.
Milton Keynes (MK&DARS)—8 Jun (Members construction competition), The Meeting Place, Hodge Lea, North Milton Keynes. Sec G0ERE, tel Cranfield 750629.
Northampton (NRC)—11 Jun (Bring and buy), 18 (Mobile df hunt), 25 (Final NFD briefing). Sec G8EUX, tel 0327 51716.
Shefford (S&DARS)—4 Jun (Final briefing for NFD), 11 (What went wrong on NFD), 18 (tba). 8pm. Church Hall, Shefford, Bedfordshire. Sec G4PSO, tel Hitchin 57946.

REGION 6—RR N P Taylor, G4HLX, 87 Hunters Field, Stanford in the Vale, Faringdon, Oxon SN7 8ND. Tel 03677 503.
Aylesbury (A Vale RS)—3 Jun ("Lundy Island Expedition", Lionel Parker), 17 (Visit by RR). 8pm. Hardwick Village Hall, 3 miles north of Aylesbury. Sec G6SIB.
Harwell (HARS)—16 Jun ("Computers in amateur radio", G4HLX), 7.30pm. Harwell Lab Social Club. Sec G6LNU, tel Wantage 68453.
High Wycombe (Chiltern ARC)—24 Jun ("HF wire antennas and feeder systems", G5RV). 8pm. Sir William Ramsay School, Rose Ave, Hazelmere. Details G4XVP, tel 0404 35275.
Maidenhead (M&DARS)—4 Jun (Quiz against Reading &DARC), 16 (VHF field day preparations), 7.30pm. Red Cross Hall, The Crescent, Maidenhead. Sec G8RYW.
Newbury (N&DARS)—9 Jun (tba), 7.30pm. Newbury Technical College. Sec G3VOW, tel Newbury 43048.
Oxford (O&DARS)—10 Jun (Natter night), 24 (tba), 7.45pm. Oxford Civil Service Sports Association Club, Govt Buildings, Marston Rd, Oxford. Sec G4PUU, tel Oxford 52859.
Reading (R&DARC)—4 Jun (Quiz at Maidenhead &DARS). 9 (VHF NFD discussion), 23 ("HF linear amplifiers", G3RZP), 8pm. Clubroom, White Horse ph, Emmer Green, Reading. Details G4YFB.
Slough (Burnham Beeches RC)—1 Jun (Natter night and films), 15 (visit to Gatwick Airport), 8pm. Haymill Community Centre, 112 Burnham Lane, Slough. Details G6EIL, tel Maidenhead 25720.

REGION 7—RR R Sykes, G3NFV, 16 The Ridgeway, Fetcham, Leatherhead, Surrey KT22 9AZ. Tel 0372 372587.
Bexleyheath (North Kent RS)—2 Jun ("Propagation", G3LTP), 16 (Midsummer df hunt). 8pm. The Pop-in-Parlour, Graham Road, Bexleyheath. Sec G4DIB, tel 01-467 2603.
Coulsdon (CATS)—8 Jun ("Field Days—organization and operation", G6HC). St Swithuns Church Hall, Grovelands Road, Purley, Surrey. Sec G6HC, tel 01-684-0610.
Cray Valley (CVRS)—4 Jun (DF hunt meeting), 18 (DF hunt). 8pm. Progress Hall, Admiral Seymour Road, Eltham SE9. Details G3TAA.
Croydon (SRCC)—1 Jun ("Test equipment", Sound Technology). 8pm. TS Terra Nova, 34 The Waldrons, South Croydon, Surrey. Details G1LKJ, tel 01-688 4075.
Crystal Palace (CP&DRS)—20 Jun ("Radio control of models", G8HDP). 8pm. All Saints Parish Room, Upper Norwood, SE19. Sec G3FZL, tel 01-699 6940.
Dorking (D&DRS)—9 Jun (Informal, at the Falkland Arms), 23 (Activity evening—144 and 432MHz ssb, at Ranmore Common). 8pm. Sec G3AEZ, tel 0306 77236.
Kingston (KDARS)—17 Jun ("Converting cb rigs to 28MHz", G4XRU). 8pm. "Alfriston", 3 Berrylands Road, Surbiton. Details G3IMK, tel 01-397 6924.
Redhill (RATS)—16 Jun (Surplus Equipment Sale). 8pm. Constitutional and Conservative Club, Warwick Road, Redhill. Sec G8JVX.
Sutton and Cheam (S&CRS)—19 Jun (Club quiz versus CATS), 21 (144MHz foxhunt). 8pm. Downs Lawn Tennis Club, Holland Avenue, Cheam, Surrey. Sec G4FKA, tel Epsom 21349.
Thames Valley (TVARTS)—2 Jun ("Independent television", G3OGP). 8pm. Thames Ditton Library, Watts Road, Giggs Hill, Thames Ditton. Sec G3ENI.
Wimbledon (W&DRS)—12 Jun ("Making light bulbs", G4SQG), 26 (Club bazaar). 8pm. St Andrews Church Hall, Herbert Road, Wimbledon SW19. Sec G3DWW, tel 01-540 2180.

The Wimbledon Bazaar is well worth a visit, with both club and trade stands. I shall be there and look forward to meeting members. *RR7*

REGION 8—RR M Elliott, G4VEC, 20 Haysel, Sittingbourne, Kent ME10 4QE Tel 0795 70132
Burgess Hill (Mid-Sussex ARS)—4 Jun (Informal), 11 ("Packet radio"), 18 (Club 21st anniversary at the Windmills, Clayton), 20 (Burgess Hill town festival), 25 (Talk, tba), 2 Jul (Informal). 7.45pm. Marle Place, Leylands Rd, Burgess Hill. Details G0GMC, tel 07918 2937.
Chichester (CARC)—2 Jun (Goodwood evening meeting). Details G4EHG, tel Chichester 789587.
Dartford (DDFC)—2 Jun (Pre-hunt meeting), 7 (Club hunt, 2.30pm, Dartford Heath), 14, 28 (RSGB event), 30 Pre-hunt meeting). Pre-hunt meetings are held after 9pm. Horse and Groom ph, Leyton Cross, Dartford Heath. Details G8DYF, tel Greenhithe 884467.
Gillingham (Medway ARTS)—Club has moved to new premises: Matthews Riding School, Lower Rainham Rd, Gillingham. Meetings held Fridays, 7.30pm. New sec G1MSS, tel 0474 814874.
Hastings (HERC)—17 Jun (Visit to Dungeness power station). Details G4NVQ, tel Hastings 420608.
Herne Bay (East Kent RS)—4 Jun ("144MHz dx", G8VR), 18 (Car rally). 7.30pm. Cabin Youth Centre, Kings Rd, Herne Bay. Details G4RIS, tel Whitstable 262042.
Horsham (HARC)—4 Jun (Talk by G5RV), 8pm. The Guide Hall, Denne Rd, Horsham. Details G4UDU, tel Hassocks 5517.
Maidstone (MYMCAARS)—5 Jun (Rally report and NFD planning), 12 (Natter night with RAE and cw), 19 ("Electronics and mechanics of a provincial newspaper", G6HXR). 8pm. YMCA Sportscentre, Melrose Close, Maidstone. Details G0BUW, tel 0622 30544.
Margate (Radio Club of Thanet)—7 or 14 Jun (Treasure hunt), 9 (RSGB presentation by RR8), 27 (Special event station for Dickens week). Grosvenor Club, Grosvenor Place, Margate. Details G1HWG, tel 0843 42480.

REGION 9—RR A H Hammett, Rosehill, Ladock, Truro, Cornwall TR2 4PQ. Tel 0726-882 758.
Axe Vale (AVARC)—5 Jun ("The flying doctor service in Western Australia", G4MRB), 3 Jul (144MHz foxhunt). Details G3VW.
Exeter (EARS)—8 Jun ("Workshop techniques"). Details G3YBK.
Exmouth (EARS)—3 Jun ("QRP operation", G4EBQ), 17 ("Cellular Radio", G8XQQ), 1 Jul ("Video cameras", G0ETZ). Details G1GZG.
North Cornwall (NCARC)—3 Jun (Foxhunt). Wainhouse Corner ph. 7.30pm. Details G0DBD.
Redruth (CRAC)—4 Jun (Business meeting and natter night), 5 (Visit to English China Clays, 2pm), 8 (MsDos workshop at Cornwall College), 18 (Constructors evening), 1 Jul (Monthly meeting). Details G4ZUI.
Torbay (TARS)—New sec J Dart, tel 0803 51995.

REGION 10—D H Phillips, GW4KQ, 17 Pentre Gardens, Grangetown, Cardiff CF1 7QJ. Tel 0222 35648.
Cardiff (CRSGBG)—8 Jun ("BBC radio link communications", GW4RWX). 7.30pm. Pant-Mawr Hotel, Whitchurch, Cardiff. Sec GW0CUM, tel 04463 3212.
Bristol Channel Repeater Group—New committee for 87/88: Chairman GW1FJI, Vice-Chairman GW8HEZ, Secretary GW6MBU, Treasurer GW6ZUQ. Repeater Keepers: GW8UXI, GW6CUR, GW4HWR, GW1UIK, GW6ZHM, GW4KQ.
Rhondda (RARS)—11 Jun (GW2FOF evening). 25 (Meeting night), 9 Jul ("Human machine as radio operator"). Sec GW4BUZ, tel 0443 432542.

Many thanks to the committee and members of the Rhondda Amateur Radio Society for the hospitality that was shown at your recent get together evening. *RR10*

REGION 11—RR B H Green, GW2FLZ, 1 Clwyd Court, Tan-y-Bryn Road, Colwyn Bay, Clwyd LL28 4AH. Tel 0492 459288.
Colwyn Bay (Conwy Valley ARC GW6TM)—18 Jun (AGM). 8pm. Green Lawns Hotel, Bay View Rd, Colwyn Bay. Sec GW4KGI, tel 0745 823674.
Deeside (Alyn & Dars)—9 Jun (Talk & demo by MGR Services). 14 (GW4IEQ df hunt), 21 (WEPRE park fun day), 27 (Special event station at British Aerospace family day), 28 (Treasure hunt and barbecue at Halkyn), 12 Jul (DF hunt). 8pm. Shotton Social Club, Shotton Lane, Deeside. Sec GW1ILZ.
Porthmadog (P&DARS)—25 Jun (Talk by GW3UTI). 23 Jul (Foxhunt, start at the Ffestiniog Railway station). 8pm. Harbour Cafe, Ffestiniog Railway, Porthmadog. Sec GW1EGQ, tel 0766 2684.
Welsh Language Group—Every Wednesday at 11.15gmt on 3·750MHz. Join the net for discussions in Welsh, net controller GW2HFR.

Will secretaries please send their programmes for insertion in "Club News" as soon as possible. *RR11*

REGION 16—RR A Owen, G4HMF, 102 Constable Road, Ipswich, Suffolk IP4 2XA.
Bury St Edmunds (BStEARS)—16 Jun (NFD plans). 7.30pm. County Upper School, Beetons Way, Bury St Edmunds. Details G1FUU, tel 0359 50271.
Chelmsford (CARS)—2 Jun (Constructors contest). 7.30pm. Marconi College, Arbour Lane, Chelmsford. Details G4KQE, tel 0376 83094.
Colchester (CRA)—11 Jun (Constructors contest), 25 ("Cellnet", G3ZNU). 7.30pm. Colchester Inst, Sheepen Rd, Colchester. Details G3FIJ, tel 0206 851189.
Felixstowe (F&DARS)—1 Jun (Visit to Electricity Board), 15 (Social), 29 ("Air traffic control"). 8pm. The Scout Hut, Bath Rd, Felixstowe. Details G4YQC, tel 0473 642595 (daytime).
Ipswich (IRC)—24 Jun (Treasure hunt). 8pm. Rose and Crown ph, Norwich Rd, Ipswich. Details G4IFF, tel 0473 44047.
Leiston (LARC)—2 Jun ("Satellite tracking on the beeb", G0CFB). 7.30pm. Sizewell Sports & Social Club, King George's Ave, Leiston. Details G0CJX, tel Saxmundham 3222.
Loughton (L&DRAS)—6/7 Jun (Field weekend), 19 (tba). 8pm. Loughton Hall, Rectory La, Loughton. Details G4FKI.
Vange (VARS)—4 Jun (Bring & buy), 18 (Club project contest), 25 ("sstv", G3RYE). 8pm. Barstable Community Centre, Basildon. Details Mrs D Thompson, tel 0268 552606.

REGION 17—RR T Emery, Wilverley, Old Lyndhurst Road, Cadnam, Southampton SO4 2NL. Tel 0703 812435.
Basingstoke (BARC)—1 Jun (Preparations for VHF NFD), 7.30pm. Forest Ring Community Centre, Sycamore Way, Basingstoke. Sec G1OQU, tel 0256 59644.
Blackmore Vale (BVARS)—9 Jun (DF hunt), 23 (Project night). 7.45pm. The Bell and Crown, Zeals, (on the A303). Sec G4YXX, tel 0963 32389.
Binstead IOW (BARS)—Now meets Mondays at 7.30pm at Brickfields Horse Country Centre, Newnham Road, Binstead, Isle of Wight. **Please note change of meeting place** which has better car-parking. President/Sec G4VJF.
Bournemouth (BARS)—5, 19 Jun (Natter nights). 8pm. Kinson Community Centre, Kinson, Bournemouth. Sec G4DJG, tel 0202 526793.
Eastleigh (Itchen Valley ARC)—12 Jun ("History of pcb design", G6LMK), 26 ("The Radio Investigation Service", DTI). 7.30pm. The Scout Hut,

Brickfield Lane, Chandlers Ford, Eastleigh. Sec G1IPQ, tel 0703 736784.
Fareham (F&DARC)—3 Jun ("Build your own black box", G0AMS), 10, 24 (Natter nights), 17 Jun (Discussion night). 7.30pm. Portchester Community Centre, Portchester, Hants. Sec G3CCB, tel Fareham 288139. (I hope that G3CCB has fully recovered from illness, *RR17*.)
Farnborough (F&DARS)—10 Jun (Trip on the Basingstoke canal), 24 (VHF NFD preview). 8pm. Railway Enthusiasts Club, Access Road, off Hawley Lane, Farnborough. Details M C Graffius, The Paddock, Diamond Ridge, Camberley, Surrey, GU15 4LB.
Horndean (H&DARS)—4 Jun ("Voyager satellite", G6GLJ). 7.30pm. Murchiston Hall, London Road, Horndean. Sec G4RLE, tel 0705 755274.
Liphook (Three Counties ARC)—6 Jun (Lurgashall Fete; portable station), 10 (Junk sale), 24 ("Nuclear energy", CEGB). 8pm. The Railway Hotel, Liphook. Sec G0BTU, tel Petersfield 66489.
Lymington (L&DARS)—20 Jun at QTH of G3ZJY. Next meeting in September. Sec G2AIV, tel Lymington 72844.
New Forest Repeater Group (GB3NF)—For information or to join the group and help support the repeater, please contact G6DLJ, tel 0703 847754.
Portsdown Hill Repeater Group (GB3PH)—For information or to join the group and help support the repeater, please contact Mr A L G Price, tel 0329 281852.
Salisbury (SREWS)—Advance notice that RSGB d/f qualifying event is to be held at Salisbury on 2 August. Sec G4LDR, tel 0980 22809.
South Dorset Repeater Group (GB3SD and GB3DP)—For information or to join the group and help support the repeaters, please contact G3VPF.
Trowbridge (T&DARC)—10 Jun (Junk sale), 24 (Natter night). 8pm. Territorial Army Centre, Blythsea Road, Trowbridge. G2BQY has been appointed president of the Club. Sec G0GRI, tel 0380 830383.
UK FM Southern Repeater Holding Group (GB3SN)—For information or to join the group and help support the repeater, please contact Mrs Jan Steele, tel Fleet 613311.
Wessex (W Amateur Wireless Club)—3, 17 Jun. 8.15pm. **Change of meeting place.** The Cricketer's Arms, Park Lane, Wimborne, Dorset. Sec G1HBF, tel 0202 895100.
Winchester (WARC)—19 Jun ("Solar Cycle 21", RSGB tape & slides). 8pm. Durngate House, Winchester. Sec G1XCT, tel Winchester 880605.

REGION 18—RR Ian Gibbs, G4GWB, 61 The Gables, Widdrington, Morpeth, NE61 5QZ. Tel 0670 790090.

Newcastle (Tyneside ARS G3ZQM)—3 Jun ("G3ZQM on the air"), 10 (Lecture tba). 17 (Barbecue), 24 ("SEE W",G3UND). Scout Centre, Harbottle St, Byker, Newcastle. Sec G4KOT, 091 2341148.
Morpeth (Northumbria ARC, G4AAX)—4 Jun (Business meeting), 6 (Barbecue afternoon), 11, 17 (Informal), 21 (Junk sale at G8TQL's QTH, 2pm), 25 (Informal). Old Telephone Exchange, Cresswell Rd, Ellington, Morpeth. Sec G0EVV, 0670 513026.

REGION 19—RR R J Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ. Tel 01-989 6741.

Chiswick (ABCARC)—16 Jun (Members problems, discussion). 7.30pm. Chiswick Town Hall, High Rd, Chiswick W4. Sec G3GEH, tel 01-992 3778.
Stevenage (SDARS)—2 Jun (Open evening), 7 (Stevenage fete/exhibition), 16 ("There's a bit of a lift on", G3YLA). 7.30pm. SITEC, Ridgemond Park, Ford Ave, Stevenage.
Edgware (EDRS)—6/7 Jun (NFD), 11 ("Hi-fi criticism, musically on common sense", G3OSS), 25 (Informal-vhf briefing). 8pm. Watling Community Centre, 145 Orange Hill Rd, Burnt Oak. Sec G4IUZ, tel Hatfield 65707.
St Albans (Verulam ARC)—9 Jun (Informal), 23 ("Box 88 Moscow", G3FXB). RAFA HQ, St Albans. Details G4JKS, tel St Albans 59318.
Welwyn (Welwyn & Hatfield ARC)—1 Jun (Radio control demo), 6 Jul (28MHz band). Lemsford Village Hall, Brocket Rd, WGC. Sec G4WLG, tel 0707 335162.
Westminster (Civil Service ARS)—1 Jun ("HF baluns", G4UBB), 15 (Natter/operational session). 12.30pm. CS Recreation Centre, Monck St, SW1. Sec G6IMM, tel 01-698 4437.

REGION 20—RR C R Hollister, G4SQQ, 34 Battersby Way, Henbury, Bristol BS10 7SU. Tel 0272 508451.

Bath (B&DARC)—10 Jun (Computer night, G6MRJ), 24 (Planning for Longleat Rally). 7.45pm. Englishcombe Inn, Englishcombe Lane, Bath. Details G3FIH, tel 0225 837539.
Bristol (BRSGBG)—22 Jun ("HF antenna for small gardens", GW4HWR), 28 (30th Longleat Mobile Rally). 7.30pm. Small Lecture Theatre, Queens Building, University of Bristol, University Walk, Clifton, Bristol. Details G4SQQ, tel 0272 508451.
Bristol (SBARC)—3 Jun ("Agriculture explained", Tony Yeates), 10 (Preparation for field day, G4KUQ), 13 (Club open day, special event station GB2WFH), 17 (HF activity evening, G3RZY), 24 (Preparation for Longleat Rally). 7.30pm. Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol. Details G4RZY, tel 0272 834282.
Gloucester (GARS)—3 Jun (NFD final preparations), Visit to Berkley Power Station (date tba). 7.30pm. St John's Ambulance HQ, 2 Heathville Road, Gloucester. Details G6AWT, tel 0452 504515.
Stroud (SARS)—10 Jun (Final briefing for expedition to Steepholm Island), 24 (DF hunt & barbecue). 8pm. Nelson School, Stratford Road, Gloucester. Details G0DZM, tel 0453 832773.
Taunton (T&DARC)—After many months with no permanent meeting place, the Taunton & DARC is now able to meet regularly again. 7.30pm, first and third Friday of each month, Basement, County Hall, The Crescent, Taunton. Details G0FMF, tel 0823 51526.
Weston-super-Mare (MARS)—8 Jun ("The life of a ship's radio officer"), 22 (Constructors night). 7.30pm. The Bristol Hotel, Locking Road, Weston-super-Mare. Details G1DJW, tel 0934 514429.
Yeovil (Y&DARC)—11 Jun ("Decibels", G3MYM), 18 ("How to make a tuned circuit", G3MYM), 25 (Natter night). 7.30pm. The Recreation Centre, Chilton Grove, Yeovil. Details G3GC, tel 0935 75533.

Many thanks for the warm reception from the members of the Bath & District ARC. Hope to see everybody at Longleat on the 28th. (I will probably be hard at it on the bring and buy). *RR20*

OBITUARIES

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

Cdr D H Acheson, G3WJT
"Digs" Acheson died on 8 March. He was mainly active on 3·5MHz and was for some years a popular net controller for the Radio Amateur Invalid & Blind Club, of which he was a local representative and, until recently, vice-chairman.
Mr R E Buckley, G0FEB (ex G8CTT)
Dick Buckley died on 31 March 1987 at the age of 34. He was a member of the Cray Valley RS and the North Kent RS. He was operational on all bands from 1·8MHz to 1·3GHz on most modes, but particularly on vhf and uhf.
Mr H Bull, G0AVX
Hugh Bull, who died recently, had been a wartime listener and swl, and became licensed on his retirement. A member of the Chesham & DRS, he operated solely on cw, using a half-size G5RV antenna and a TS430, and was a keen contest operator.
Mr D J Collins, G2FLB
Dennis Collins died on 4 April aged 64. Dennis was first licensed in 1939 as 2FLB, and was a member of the WACRAL, and was active on 14MHz cw until a few days before his death.
Mr K Feltham, G4MIL
Ken Feltham died on 20 March 1987 aged 72. For many years he was a member of the Exeter ARS and latterly of the Exmouth ARS. He was also a member of the G-QRP Club.
Mr F R Fowler, G4YIN
Roy Fowler died on 25 February 1987. He was frequently to be heard working dx on hf, or on vhf where he began a successful daily morse class in September 1985.
Mr C A Harvey, W1RF
Cliff died on 25 March aged 79. A member of RSGB, he was the designs genius of the Harvey Wells Radio Co. He regularly contacted a number of British stations, having made over 2,000 contacts with G2MI and almost as many with GM4CUB.
Mr W E Macdonald, G4NZA
Bill Macdonald died on 28 January aged 63. He was a member of the Taunton ARC, where his dedication to morse was of great value.
Mr R C Mayman, G2ABR
Ron Mayman died on 14 February 1987. He had a life-long interest in amateur radio and during the war he served with the RAF as a wireless radar mechanic. He was a founder member of the Hull Radio Club and a member of RAOTA. His callsign, G2ABR will live on via his eldest son, Chris, G4SJI. His youngest son, Tony, G6JFU, will take G4SJI when he passes the morse test.
Mr T E L Price, GW0GAH
Tom Price died on 2 April 1987 aged 66. He was first licensed as GW1LLP in February 1985 and obtained GW0GAH in November 1986. He was a member of Holyhead ARC and was a link station for Raynet.
Mr L O Rogers, G2HX
Owen Rogers, who died on 2 April, had been a member of the RSGB and held the callsign G2HX for over 50 years. He also was a life member of the Gloucester ARS and held the post of technical officer to that society for 30 years. His interest was working dx on cw, and experimenting with wire antennas, although in recent years he was only active on the local top band net on Sunday mornings.
Mr R Young, G4MQH (ex G8HFN)
Rod Young died on 27 February aged 33. He obtained his Class B in his teens, and his Class A licence in 1981. He was a keen constructor, particularly of QRP equipment. He was a past chairman of the Bolsover ARS, and a founder member and the first treasurer of QT1-TNA, and the talking newspaper for blind radio amateurs.
Also:
Mr W R Andrews, G3LRE on 18 January 1987
Mr D F Baker, RS46162
Mr N Burton, BRS11494 on 28 December 1986
Mr D Cameron, G2BKC on 4 December 1986
Mr C J Carroll, G3KCC on 27 September 1986
Mr P D Close, G2DNW in October 1986
Mr W Copeland, G1LOD
Mr B H Court, G1OVQ on 25 February 1987
Mr S C Cushing, G4LIV on 1 September 1986
Mr D R Dallimore, G1UUW on 4 November 1986
Mr P R N Dimond, RS34301 in September 1986
Mr R F Doughty, G4KET on 13 November 1986
Mr E Dowdeswell, G4AR on 2 February 1987
Mr G R Dowthwaite, G3BNA in May 1986
Mr T Grierson, VK5SA on 6 September 1986
Mr M T Gwynne, GISKU on 15 January 1987
Mr A A Hammond, G6AH on 13 January 1987
Mr D Hirst, RS87741 on 5 February 1987
Mr C J Kerfoot, GIPHG on 16 February 1987
Mr A L Jeffrey, G5UV
Mr A Jones, RS39781
Mr W L Lilley, G8MKU in June 1986
Mr W J J McAdam, GI3TPE on 23 September 1986
Mr M C McCrea, GI0ATU on 18 November 1986
Mr H T Moreton, G1VIV on 25 December 1986
Mr M Morgan, G8JU on 20 February 1987
Mr R C Morgan, GW3ZFS
Mr G Moses, G3STM on 14 March 1987
Mr P J Murphy, EI2EP
Mr R J Newey, G8AJI on 27 January 1987
Mr W Pawsey, G3MFI
Mr A V Piper, G4LHS on 29 December 1986
Mr A Porter, GM3EUV in March 1987
Mr C H Ridge, GM3SBB on 3 February 1987
Mr C C Russell, G4IQS on 10 February 1987
Mr K F N Saunders, G1ETG on 29 September 1986
Mr B E Setchell, RS52796 on 19 February 1987
Mr E J Sloper, G4UOU on 28 February 1987
Mr P G Steadman, G0CZX in February 1987
Mr P Tew, G6LPE on 11 February 1987
Mr A W H Wennell, G2CJN on 18 October 1986
Mr K M Winwood, RS50235

Members' Ads

The Conditions of Acceptance are published below the Member's Ad form circulated with every issue of *Radio Communication*.

The current rate is £2.30 for 40 words or less: advertisements containing more than 40 words will cost an additional £2.30 for every additional 40 or less words. Each advertisement must be accompanied by the correct remittance, either as a cheque or postal order made payable to Radio Society of Great Britain.

FOR SALE •••••••

TRIO TR9130 2m multimode, Daiwa 12A supply, 3-way antenna switch, pow/swr meter, MC-60A base/mic, MM preamp, also HK-702 morse key+ oscillator, Datong morse tutor, spare pwr supply swr+ coax+ magmount. Everything boxed, must go, £650 ono. Howard, G6TMN tel: 0704 24575.

TRIO TR2300 2m fm, vgc, all extras, £115 ovno; MML 144/30LS 30W PA, £60 ono; BBC micro+ DFS and single disk drive, word processor, rtty, Elite, etc, £350 ono. Chris, G6NMR, QTHR tel: 0283 814369 w/ends only.

HW9 QRP RIG, all WARC bands, immac built, Maplin Gold 3A/12V reg supply included, any inspection, £235. No offers. G4YZX, QTHR, tel: 0304 375136.

PORTABLE VIDEO SYSTEM, vhs Hitachi VT8E portable rcdr, slow motion, stereo, tuner timer etc; Canon VC200 colour camera, pwr zoom, titling facility, as new, only 6mths old, 6mths warranty, £850. Might consider FT101ZD plus cash, tel: 0940 28476.

PLESSEY 1200 DATA TERMINAL, contains 110 cps paper tape punch and reader in rack cabinet, mechanics, drive circuits and psus working. Any reasonable offer? Buyer collects. G4EMB, QTHR, tel: 0621 891090.

COMPLETE HF STN: Trio TS510+ psu/spkr/mic, Datong speech processor, hb linear, 18AVT, swr meter, £325; DXSV, £25; Joymatch atu, £15; PM2000 wattmeter, £35; KW LP filter, £10; 2m portable/base/mobile, Yaesu 209, case, FNB3 nicad, NC9C chgr, mobile/mic/headset, GPV5 colinear, 5/8 mag mount, 7/8 gutter mount, £275; MM low noise rf switched preamp, £20; 2m cvtr 28/30, £10. Prefer buyer inspects and collects or pays carr. G4BWX, QTHR, Morecambe, tel: 0524 414013 after 6pm.

GEN/COV RX UNIDEN CR-2021 am ssb cw+ fm, digitals, scanning, rf gain+ atu, wide/narrow filter, 12-mem as new, boxed with manual, £150. G1KQA, QTHR, tel: Lea Valley 764930.

HEATHKIT HT-1G 32ft tower, comp kit, never erected as new, £100, buyer arranges collection; Heathkit valve voltmeter IM-13U, professionally assembled, perfect, £10+ carr; Philips N2234/15 cassette rcdr new and boxed, £10+ carr. G4DMP, NOT QTHR, Leeds, tel: 0532 860439.

TIMESTEP 12-CHANN WEATHER SATELLITE rx, xtals 137.5 and 137.62, £50, buyer collects or pays carr Hewlett Packard oscilloscope HP185B mainframe, HP187B dualtrace vertical amplifier 1GHz, service manual, £60 ono. Buyer collects. Mike, G8GTP, QTHR tel: 061 7666269.

CREED 444 TELEPRINTER, tape punch and tape reader not fitted, in gd wkg order; also BT plinth No 1A, suitable for Creed machines. Both these items going free, cannot deliver, must be collected. G4KZZ, QTHR, Coventry, tel: 0203 444160.

FDK MULTI 750XX 20W multimode, boxed as new with manual and mobile mount, sell £220 or exch FT290 cash adj considered. Paul, G1LZH, QTHR, tel: 021 230 3832 daytime OR 021 430 5632 evenings.

YAESU FT102 fitted am/fm board, FV102DM vfo SP102 spkr, above mint, little used, £725, prefer buyer collect; Hanson P-meter FS50HP 20/2kW, £55; 2m tvtr MMT144/28 3mths old, OK above tx, £75; Swedish 2m 3-ele beam, £20. G3IJL, QTHR, tel: 01-749 1454.

TA20 tx as removed from aircraft, 108-138MHz, PA is QQVO 6-40, will strip and make good 2m linear, many other good items incl meter and "N" type aerial c/o relay, £35 plus carr. G6BTO, QTHR, letters only please.

ICOM R71E rx fitted fm 250Hz cw filter speech synth with instr book and service manual, £595. BRS88617, 19 Lydgates Road, Seaton, Devon EX12 2BX tel: 0297 20906.

STANDARD C58 2m multimode with mobile mount 7/8 antenna, psu, nicads, chgr, case, swr meter, coax. All you need to get on the air. The cost??, £250 or offers? G6LOH, Julian Tether, Highview, Culworth, OX17 2AX, tel: 0295 768152.

ADMIRALTY rxs B40/D mini-valves, perfect order, £85 with circuits; top cover for BBC.B Micro, £5; brand new 5V/12V psu ideal disk drives, £5 ea; brand new Storno vhf/2m pwr amplifier 24V/35W easily converts to 12V, £10; several unused binders for Nicro and Acorn user mags, £2.25 ea; five Nixie tubes, £4; push-button car radio, perfect, £8; large qty spares for B40/62B range rxs except valves. All items post extra, Paul, tel: 0843 61448.

TRIO 440S with PS50, SP430, mic, auto atu AT230 160-10m inc WARC, narrow ssb filters, manual, handbook pkg, mint £1400 ono, incl free MBA64 Amtor/rtty package for C64. Would cost £1850++ gen reason, demo welcome. Paul, G4AMZ Macclesfield tel: 0625 610852.

YAESU FL2100Z linear plus two new spare 572B valves; also HF5V vertical antenna. Sale prompted by impending retirement so realistic offers please Allen, G3DRN, QTHR, tel: 01-947 3914.

HQ1 MINIBEAM, ex condx, £100; also Tektronix scope 545a, gd condx, offers? GODOE, tel: 01-391 0514, evenings.

METEOR 600 freq counter, unused, £80 ono. Would exch for gd HRO many command rx spares. GW3UMD, QTHR, tel: Cardiff 761813.

HQ1 MINIBEAM, hardly used, £115; 14AVQ/WB, mint condx, £65; AR40 rotator, again hardly used, £50; buyer collects or pays carr. GW4CFC, QTHR, tel: 0248 712944 OR 0286 870636 daytime.

TRIO TS130V 8-band 10W hf tcvr fitted 500Hz cw filter, hand/mic, instr and service manuals; TL120 100W linear, DFC230 digital vfo with memories, orig pkg, all in gd condx, £475. Sam, G4DDK, QTHR, Suffolk, tel: 03948 495.

VERSATOWER P60, tiltover, heavy duty winch operated, galv steel, purchaser collect; Yaesu FL2100 linear, vgc; Icom IC22A 2m tcvr, vgc; Mosley Mustang, 3-ele hf beam; Jaybeam 10Y/2m beam Sensible offers? G3YPD, QTHR, tel: 0543 264882.

TRIO R2000, little used, owner just licensed rx in mint condx, £375. Nick, GOHAZ, tel: 0326 241044.

BC221 MAINS also Scarab MPTU1, boxed for Spectrum. Offers? G3DMO, QTHR, tel: 0734 581481.

FL2100Z LINEAR, perfect condx, hardly used, trying QRP, £500. G4KJV, QTHR, Seagry, tel: 0249 720456.

COMPLETE HF STN Trio TS830S with YK88C filter, AT230 atu, SP230 spkr low pass filter, MC50 desk/mic, T200 dummy load, manuals, mint condx, £795 ono. G4ZCI, QTHR, tel: 0536 513897.

GOING BRITISH AND H/B, hence Yaesu sale FRDX400, £100; FT7, £180; FT290R, £200; buyers collect for cash. WANTED: KW1-60 or Codar AT5 and KW77. GW4BZI QTHR, tel: Chester 675794.

N1700 VCR, new heads, 6hrs use, switched 2hr/4hr plus full workshop manual, £65; cleaning tape, £3; 75 tapes feature films mainly westerns, £2 ea; accept £145 for all. Exch amateur gear, WHY? Buyer collects. G5PW, West Yorkshire area, tel: 0274 875566.

FT225RD+ muTek, £525; FT901DM, all options narrow cw filter, £450; FT780R 70cm multimode, £300; NAG144XL 2m linear 250W o/p, £230; 2m QRO W1SL with 2x4Cx350A+ 2 new spares, 1000W o/p, tunes up easily, clean with fully-metered pwr supply Variac in EHT primary, full spec on request, £500; DL7YC 70cm new 4Cx250B Eimac 300W run off 2m supply, £180 QRO atu SPC design rated 5k, £100; Hygain 20m 3-ele Yagi as new, £90; 2m 19-ele Cushcraft, £50; Datong auto clipper, £50; muTek TVVF50C 2m-6m tvtr boxed, £160; Admiralty morse key, vgc, £40; hf amp J-500 all parts for ps, £130; new valves TY76000, £100; YD1240 2.5k-160MHz 21-ele Tonna, £20; 2x32-ele quadloop with p/d, £30; many other bits. G6RFL, QTHR, tel: 0274 676957 evenings.

YAESU FL2100Z hf linear, gd condx, seeks good home £490 to G4MQJ might help! Also Heathkit 'scope 10-18U, £25; SL250DX mobile hf linear switchable 200W ssb broadband, £65. G4MQJ, QTHR, tel: 0283 63108.

FT757AT ANTENNA TUNER, boxed and new, £235; Daiwa CN2002 auto ant tuner, gd condx, £125 ono. WANTED: Icom IC2KL and hf mini-type beam. tel: 0534 54186 after 6pm.

DATONG UP-CVTR PC1, £100; Trio mic M60 new, boxed, £65. G6TPQ, QTHR, tel: 061 633 3895.

C64 CASSETTE PROGRAM will tune rtx IC-720 from the computer, different possibilities, freq i/p from keyboard, variable steps searching, 64-memories, memory scanning etc, needs a simple 8-way cable to be wired up, will work with R70 rx and other hf Icom equip, £15. WANTED: Info on Interdata computer and Eldorado Electronics freq meter. I5XWW Crispino Messina, Via di Porto 10, 50058 Signa (FI), Italy.

CREED 2300 TELEPRINTER, ex condx, could possibly deliver. Best offer secures. G4VMO, QTHR, tel: 021-706 3570.

KW2000B KW108 KW107 KW160, lot £300; FT290R with MM 30W linear; Drae 6A pwr supply; 7/8 gutter mount whip; 5/8 magmount whip; 2m slim-jim, lot £300; 18AVT/WB, new coil, £30; Datong rf clipper £25; Datong UC1, £25; Uniden CR2021, £40; Arac102 2/10m rx, £30. G3WBV, QTHR, Croydon, tel: 0689 41656.

STORNO CQM713P3 high-band 25W synthesized fm, suit 2m conversion, £25; large Voltex psu 5/12/12/24V, £15; 813 PA stage 40-10m inc unknown valve, £15; PF1 rx on RB10, £6; Class-D wavemeter, original, needs vibrator, £10. G4EPX, QTHR, tel: 0734 787298

RCA AR88D communications rx, gd condx; 'S' meter, product detector, £50. G4BOO, QTHR, Thatcham, tel: 0635 68640.

STANDARD C58 MULTIMODE 2m portable tcvr c/w chgr, mic, case. Smaller than a FT290R! £200 ono. Going QRT on 2m. Mr C Phillips, G4LXJ, NOT QTHR, Southampton area, tel: 0703 551045.

2off 3" magslips+ 'M' motor; 2off WW treble horn spkrs, mint; Varley 12V-240VAC vibrator unit pair 40V 3A Variacs 240V 2A bench Variac motor gen 12V-325V 250mA ditto 12V-210V 70mA unused 6" image intensifier ex-medical. No reasonable offer refused. G3EFK, tel: 07375 51212.

TONO 5000E unmarked, £800; BNOS 180W 2m linear amp 10W i/p, £180; Drake MN2700 atu, £200; Daiwa CN2002 auto atu, £200; Heathkit HW8 QRP hf, £100; Yaesu FRG9600, £350; Datong D70, £35; Yaesu FC102, £130. GM4RGS, QTHR, tel: 0224 781145.

YAESU FRG7 rx immac condx, £100 ono; Versatower BP60 post only, £100 ono. G1AWE, tel: 0582 63699.

70cm 4Cx250B linear with psu contest proven, £200; spare EHT rectifier, reservoir capacitors on pcb 30uF 3kV £17.50; psu 13.8V 12A h/b, £30; psu 0-30V 20A h/b, £35. G4CRF, QTHR, tel: 0582 68446.

SILENT KEY SALE: FR101D dig r/out fitted fm det 2m/6m cvtrs FL101 YO101 FL2100 (not Z) IC21XT Dressler vhf/amp d200 R2000 gen/cov rx fitted vhf cvtr ICS/Amtl Philips monitor model 80 70tv/tvtr printer Fastext 80; other items available. Jackson G3LKZ, tel: 0206 396352 evenings OR 01-242 4433, ext 4302 office.

TS530S hf tcvr AT230, £600; TR9000 2m multimode plus BN0S 6A psu, £350; also FT225RD 2m multimode base muTek front-end and xtal bank, £550. All boxed and vgc, prefer buyer collects, demo OK. G0CNV, QTHR, tel: 0482 643231 anytime.

SONY 2001D rx, 3mths old, as new, airband; 150-29.999KHz fm 76-108MHz; usb/lsb am/fm, 32-mem scan facility, ANI AE, with built-in fet rf amplifier, £240 ono. Morrison, 7 Somerset Way, Wem Shropshire SY4 5UP.

FDK725X 144-148MHz, Titan 5/7A psu, Baildon overvoltage protector unit, Drae vhf wavemeter, Heatherlite safety mic, slim-jim, 5/8+8/8 whips. Sell for £260 or exch for FT707+fm (reason for sale) with cash adj. tel: 012476097 daytime only.

HEATHKIT 1680 RX £55; HW202 fm tcvr wkg requires 6&44MHz xtals, £50; AEA M60 cw/rtty reader has built-in display, £95; MM Meosat cvtr unused, £120 Atlas TX110 xmit module, £55; Atlas ant xformer, £15; UPC 1KW atu has roller coil, £150; Leader hf/vhf sig/gen still in orig box, £45; large frame tent, £175 ono; new hi Z scope probe, £5; MM 70cm tripler, £12; HEF4059BT programmable divide by N counter new/unused, £2.50; Pye Westminster osc boards, £2.50 ea; also other Pye boards, call for details; commercial rtty modem with tech details, £15; buyer collects or pays carr. G8AWB, tel: 0935 813097 w/ends only.

YAESU FT221R perfect condx with full muTek front-end, £325 ono; homebrew linear 2m 100W with preamp, really has to be seen - work of art! £150. Prefer sell as comp stn but will consider splitting. G0DOO, QTHR, tel: 0623 750149.

WELZ DCPS 10-80m vertical £95; 10XY crossed Yagi for 2m, £25. Phil, G0ELX, tel: 061 456 6272.

FT290R NICADS case mic chgr, ex condx £220; AOR 2001 scanning rx 25-550MHz psu boxed, vgc £235 ono Anadex DP9501 printer dot matrix 200 cps incl manuals serial and parallel i/faces, £125. Dermot G8SIN, QTHR, tel: 0865 61797.

10FM LCL PROF-CONV 5W, 100KHz shift for VS repeaters, hardly used, £40; linear amp for 10m, gives 60W with 5W i/p 100W max, £30. G4UVQ, QTHR, tel: 0462 674437.

18AVT VERT ANT 5-band 10-80m 2yrs old, £45. G4UVQ QTHR, tel: 0462 674437.

2m ANTENNAS HS-GP23 colinear, £20; Jaybeam GP, £5; HB9CV, £5; Halbar QD Horiz, £12; magmount, £5; Kenwood PB-21 NI-CD, £10, all vgc. Des, G4NEK, QTHR, tel: 0234 852865.

WW2 EQUIPMENT: 19 set Canadian and British and ancillary equip; 62 set, C12, A14. Prefer buyer inspects and collects. G3SZM, QTHR, tel: 0903 41810 after 7pm and at w/ends.

HF5 VERTICAL AERIAL with G/plane 10-15-20 40 & 80m £65; Sinclair Spectrum plus 128k computer, £85; portable colour tv 14", £75; Jaybeam 10-ele 2m beam, £16. All gd condx. WANTED: BBC computer. Alan, G0EGX, QTHR, tel: Tiptree 815978.

DYMAR 880 fm 3-chann portable 2 spare batt packs. L/B, £15 ono. Kenalwood am, h/b, 6-chann plus cel-call module, £20 ono. G1DXO, QTHR, tel: Norwich 745734.

TS770E 2m and 70cm tx plus SP70 spkr, ex condx, £450; R600 gen/cov rx, hardly used, £250; ICR70 gen/cov rx, mint condx, fm board and SP3 spkr, £450. All above in orig boxes. G4WFT, tel: 0933 313150 after 6pm.

TELEGRAPH POLE, hollow glass-fibre type, 28ft long tapered 10" dia base to 5" top. Ideal with or without additional extension mast for multi-ele beam, £45. Buyer collects. G3WIF, QTHR, Bristol, tel: 0272 293738.

TA33 JNR ATOP ADJ LADDER MAST, rotator & control by Welz, c/w cop/cov'd cable, 3 b/room semi det d/glazed, gas c/h, side extn, c/w kitchen, frt & rear entries, patio, ext toilet & w/shop, Dexion w/bench & racks with 10' frt extn wine cellar with var stks & containers with extensive Dexion racks, greenhouse, 90' gdn well stked fruit trees etc, frt porch, roof recently retiled, roof space c/w fluo light & teles ladder, part floored with timber & h/rd for storage c/w many ham radio spares if req. Sit 12m N London in rural setting off Epping Forest & Roding Val. Easy access to M11 M25, N Circ & M1 etc. 2 London tube stns nearby, £57,000, QTH A W Sheppard, G3JBS, QTHR, tel: 01-508 4296.

NRD525 plus matching spkr NVA-88, £925. tel: 0604 718707.

LATTICE TOWER SECTIONS, triangular cross-section 12.5ft long, h/duty, c/w jointing plates, nuts & bolts, guying points if required, 4 sections available, £30 per section. Buyer must collect. G3XBN, tel: 0273 506797 office hours OR 0273 G3XBN, tel: 0273 506797 office hours OR 0273 557766 home.

VERSATOWER 60ft head unit brake winches and wires, ground post TB3; Daiwa DR-7600X rotator, beam and rotator bought 1986, £750. Will split. tel: Poole 683093 office hours please.

ROBOT MODEL 800C KEYBOARD speciality mode terminal Ideal for sstv graphics, colour, b/w, grey scale, checkerboard, partial frame, b/w reversal, small/large chars with 8-mem for storable messages; tx/rx rtty 45.5 50 56.8 74.1 100 Baudot; also 110 Baud ASCII, with all usual features plus Selcom facility and memories; tx/rx cw 3-99wpm with Autolock speed, also has side-tone oscillator for morse training, c/w manual, will demonstrate if req, £525 ono. G0BDD, QTHR, tel: 073 129 351.

CAMERA: Sony HVC3000P. Offers? or exch for FT290R+ or IC290D. WANTED: RS232 type TNC and manual for Marconi CR300. Mike, G1XED, QTHR, tel: 0423 507653

VERSATOWER 2-section with winches flexible steel wire rope cap and topmast; 10-ele 2m Skybeam; 2m 8/8 beam; 70cm 8/8 beam; low loss cables; CD44 rotator and control unit, £300 total. G8BJP, QTHR, tel: 0843 31069 evenings.

YAESU FT480R multimode mobile, mic, 5/8 fold-over HQ2NE antenna, gutter clip, cable, mobile mount brkt, all unmarked and used very little, £325 ono. Howard, G1WQZ, tel: 0394 460 474 between 5pm-9pm only please.

SX200 VHF/UHF SCANNER RX, comp boxed with Discone antenna, £175; 70cm antennas Jaybeam MBM48 as new in box, £30; also helical 12-turn G3RUH, new never assembled, £45. G1GQL, QTHR, tel: 0425 54946.

AOR2001 SCANNER RX, new condx, boxed, £200; Discone+ cable, £15; Heathkit HI-Z desk/mic HDP-121A, £20; unused 12"/18" spun aluminium parabolic dishes, £15 ea; well-built hb rf speech processor, needs aligning, £10; buyer pays carr. GM4GTU, QTHR, tel: 0224 743039.

COBRA 148GTL converted to 10m covers 28.110-29.700 plus legal fm CB; all modes incl cw; present owner not impressed with 10m mobile, £135 ono. G0EKE, QTHR, tel: Peacehaven 4348.

TRIO TS430S, mint condx, boxed, PS430 psu, desk/mic, low pass filter, Hansen FS200 swr bridge £1,000, will not split. FT290R, vgc, £200; 600W dummy load, £20; Zmatch atu, £50; rotator, £40. Pat, G0BXY, tel: Leicester 867966.

P40ft VERSATOWER POST MOUNT. 2off Autobrake winches, rotator bearing, unused, CD45 rotator and all parts. House move forces sale. Buyer collects. £200. Harlow, G0FMZ, tel: 0279 21812.

ASR33 TELEPRINTER, ASCII coded 20mA current loop i/face, paper tape punch and reader, c/w handbooks and stand, £15. G8EQD, QTHR, tel: 0709 556864.

MARCONI UHF GENERATOR, £95; AVO sig/gen, £30; scopes double-beam, £40; single, £25; mod meter, £45; counters 500MHz, £45; 200MHz, £25; Realistic rotator, new in box, £40; vhf sig/gen, £80; uhf Westminster on 70cm, £45. G4LUL, tel: 0457 65185 evenings.

ICOM IC251E 2m tcvr with muTek front-end, £400 ono Yaesu FT790R 70cm multimode, mint condx, £260 ono; Tonna 5-ele 6m Yagi, £30 ono. G3ILO, tel: 0453 83 3411.

TW4000A DUAL-BANDER gd condx fitted speech synthesiser with box and part of service manual, £330 ovno; Dragon 32, gd condx with software incl morse tape, £35. G1LYO, located near Cheltenham, tel: Alderton 0242 62 639.

TRIO R1000 fm fitted; MMT28/144 tvtr little use; Dawe 610B o/p meter SMC10FM little use; Trio MC35S mic new 50Kohms; 2m tcvr fm 143/149 25W variable o/p; FT790+ 30W linear; MM4001 rtty unit hardly used. G4YUG, QTHR, tel: 0473 830147 anytime.

DRAKE TR7A TCVR; PS7 pwr unit; MN2700 matching network; SP75 speech processor; MS7 extension spkr Drake desk/mic; all manuals, in mint condx, very little used, the 'Rolls' of tcvrs, £1,100 ono. Howard, G1WQZ, tel: 0394 460 474.

ICOM IC720A all-band tcvr; ICAT500 atu; ICPS15 psu ICSP3 external spkr; ICSM5 Electret mic; manuals, boxed, hardly used, ex condx, comp stn, £1,100 ono G1WQZ, tel: 0394 460 474 between 5pm-8pm only.

YAESU FT290R+ muTek+ nicads+ 30W linear+ pwr supply+ 5/8 and magmount. The lot £275, may split. Jeff, G6JJP, QTHR, Worcs, tel: 08865661.

G4MH MINIBEAM c/w rotator, control unit, coax and cable, all vgc, £70 ono. Buyer to inspect and collect from Northants area. G4LEM, QTHR 1984 onwards.

TS830S 270Hz cw filter and VFO230, £725; R600 gen/cov rx, £200. G3OZF, QTHR, tel: 0296 748354.

KW TENTEC 2kW atu type 229 open feeder/coax outlets, built-in swr bridge, £170; Daiwa CN620AX pointer meter 1.5-150MHz 20/200/1kW scales, £60, both vgc. WANTED: FT225 or Icom 251E. Mrs Catterall, Chorley, XYL G4OBK, NOT QTHR, tel: 02572 63772 office hours.

HOMEBREW GALVANISED TOWERS: 4 sections 7ft long, overall length 28ft tapering from 6" from centre to 3" each end. Towers to clear at £35 ea, buyer collects, Kent. G1HSI, tel: 0679 66093.

QTH CLWYD 11 miles SW Chester 550' ASL 2 bed semi det house, gas c/h, consent for tower. Offers about £20,000. GW4DJW, tel: 0978 83 4118.

YAESU FT726R 2m, 70cm, 6m, hf, sat units, boards, fitted vgc, £1,200. No offers please. Reason for sale updated to FT7676X. G0FZD, QTHR, Rotherham, South Yorkshire, tel: 0709 366538 after 5pm.

MARCON SIG/GEN TF144G, £25; Marconi RC osc TF1370A incl spare set, £30; xtal calib no 7, £8; thermal noise gen CT82 15k-160m, £10; Dawe White noise gen 419C, £35; stabilised pwr supply RA98 valved, £15; OSTs 1935-1975. Hindle, tel: 061962 7577.

CBM PET 8" 3032, £75; CBM disk 2031, £125; Eprom prog Davidson Richards for above, £75; toolkit ROM, £10; KRAM ROM and data, £20; misc disk and progs etc, CBM tape cass, £20. WANTED: AX25, WHY? G4ANP, QTHR, tel: 0709 893995 evenings.

YAESU 9600 incl Revcone antenna and preamp, all as new with boxes, only £350; Yaesu FT225R, superb condx incl muTek front-end and mic, the best vhf rig for only, £350. G6VQW, QTHR, Leamington, tel: 0926 25430.

FT790: mic, batts, case, chgr, 1/4-wave, 5/8-wave, £280; FT290: muTek+ AJH 2-100W linear, £270. G4JGC QTHR, tel: 01-747 0624, 24hrs.

PACKET RADIO AX25L2 terminal unit TNC200. Will run from any computer or terminal with RS232/423 serial port, BBC B or master driver program provided, total £115; Yaesu FT707 or FT107 fm board with instrs, £55. Clive, G4ODM, QTHR, tel: Basingstoke 26050.

FT290R INCL NICADS, case, shoulder strap, chgr, manual, box, no mods, £270. WANTED: Pneumatic mast and 12V pump. Derek Brandon, 1 Woodlands Road, Saltney, Chester CH4 8LB, tel: 0244 673563.

TRIO TH41E 70cm handheld, 6mths old with chgr, new spkr/mic and dc cvtr, all boxed and in ex condx, £155. G0DGB, QTHR, tel: 0385 47306.

70cm MULTI U11 fm 10W/1W 23-chann 4 auto scan instr manual. Can be seen wkg, £80. Buyer collects G4WLI, tel: 051 327 4280.

FT902DM, ex condx, £550. G2BZR, QTHR, tel: 0827 892818 after 4pm.

PHILIPS 50W public-address amplifier, EL36 o/ps, 4 i/ps, 70V "line" o/p, ex condx, ex-church, size: 15"x11"x7", £15. Buyer collects. GW0GHF, QTHR, tel: 0222 703429.

IC260E 2m MULTIMODE, mint, comp mobile mount, £265 MML144/100S 2m linear, £100; SU4000 rotator comp, 6-core cable, gc, £50 or exch FT707, atu, psu. Don G0FJO, Weymouth, tel: 0305 779028 evenings.

YAESU FT707 hf ssb tcvr 10m-80m c/w FP707 psu FC707 atu YM37 mic, h/phones. All above in mint condx and gwo, price £550. Bart, RS48056, tel: 0282 39874 anytime.

TRIO R1000 GC rx 0.5-30m, mint condx, £225; Sony ICF7000 synthesized GC rx am/fm/ssb psu, purchased Christmas, £125, both carr pd. WANTED: KW204 or similar tx, must be gd condx. G0GGI, QTHR, Cumbria tel: 0229 89635 anytime.

TRIO TS700S, vgc, £380; MM 144 100S 2m PA, £80; MM 2m cvtr 28MHz I.F, £23; Shure 444D as new, £45; Trio fist/mic N.C, £14. All items as new and boxed Grant, G4ILI, QTHR, tel: 0452 855339.

DRESSLER D200 2m valve linear amplifier 500W ssb, £400; Sony ICF7600D rx, £70; SEM 2m transmatch £15 Carr extra. GM0ELL, QTHR, tel: 041 339 4552 evenings.

HIFI SALE OR EXCH: Celef PE1/2 spkrs, £250; Denon TU200 stereo tuner, ex spec, £85; Sugden A48II Amp £130; JVC KD65 cassette deck, £75; Ultimo 10X m/coil, £25. WANTED: 2m or 70cm radio. Details Ken G1GPC, QTHR, Harlow, tel: 0279 26647.

PYE OLYMPIC M202 fm B-band 12-chann, with manual, no xtals, £34; ITT4Cx250B c/w NATO base, both new, £30; Microlab/fxr micrometer variable attenuator model AJ310N 500-6000MHz, £14. Buyer collects or plus carr. G4XEB, QTHR, tel: 0638 742544.

TRIO 2550E 50W fm with voice module, mint, £275;

FRG7700M, FRT7700, FRV7700(C), vgc, £335; Realistic PR031 scanner, £95; Junkers key, £30; Einstein 500k computer, colour monitor, progs, books. Offers? Swap for radio gear. G4EMG, tel: 01-534 3460 evenings OR 01-553 7308 daytime.

80M CW XTALS, all HC6-U 3504, 3511, 3515.5, 3518, 3519.5, 3534.1, 3542, 3559.5, 3566, 3582, £1.20 ea inc p&p. G3SZM, QTHR.

SHIMIZU SS105S with all options, £200; Kenwood AT130, £70; Kenwood VF0120, £40; CB Ranger 4800 modified 10m, £20; all in brand new condx. G3IRM, QTHR, Bury St Edmunds, tel: 0284 4318.

NCX5 HF SSB TCVR 5-bands 100W o/p with mains psu and spare valves, £120; UHF cvtr MMC 432/144S, new £30. G3YKI, QTHR, tel: 01-440 0189.

4CX1000A BASE CHIMNEY and heater txfmr in gwo. Offers or WHY? tel: 09912 777.

YAESU FT726R 2m 70cm sat boards with spkr unit, Yaesu SP102, vgc, £950 OR p/exch Yaesu FT727R with cash adjust; Yaesu FT209RH 5W handheld spkr/mic NC-18C chgr, £235, all boxed with instr books. G1EMW, QTHR, tel: 0366 500656.

FT290R WITH LISTEN ON i/p by Arrow Electronics and manual, £250; also "Chitchat" modem multi-standard auto answer or originate model CC2123A as new, boxed with manual, £95. G6UND, QTHR, Medway, tel: 0634 31468.

FT290R MOBILE MOUNT, £200; IC2E spare nicads, chgr vgc, £150. G4WCP, QTHR, tel: 0424 441741.

FT2F WITH YAESU PSU, also Eddystone 888A rx with spkr. Property of the late G3ORR. Offers please to G3YMS, QTHR, Titchfield, tel: 0329 43488.

AR2001 SCANNER 25-550MHz, £190; Tandy vhf/uhf scanner antennas, £10. WANTED: Tandy Pro 2004 300-chann scanner, Revcone, Discone, antennas, Yaesu FT23 2m handy. G8RHU, QTHR, tel: 0273 516801

FT290R, muTek, case, strap, nicads, chgr, part mobile mount, flex whip, vgc, £250; C-64, cassette unit, MPS-801 printer, software, homebrew rtty/cw tranceive i/face, all for £250. Will exch all for TS130S or similar hf rig. GW4WJO, QTHR, tel: 0407 2330.

TS430S MINT, fm board, cw and ssb filters MC42S mic, plus Turner JM+2/U, £720 with box and manual. G0EHQ, QTHR, tel: 0527 79636.

HAMMARLUND HQ145 VALVE RX 500KHz, 30MHz xtal filter, bandspread, £95; Realistic DX400 digital synthesised rx L/M/hf vhf/fm, £125; FRG7 fitted ssb filter, fm board, £110. WANTED: Postwar National rx, not hro, MCR1 coilpack N82. G4HHZ, QTHR, tel: 0962 822401 daytime OR 0703 268705 evenings.

FRG7700 WITH 12-mems, £275; FT790 case, chgr, etc £300. G1SHV, tel: 01-941 6519.

TRIO TR7010 2m ssb/cw tcvr, fitted preamp, £79; Trio VF0700S remote vfo, suit TR7010 or TS700S, £39; Philips 890 digital car fm stereo cassette, £59; Telequipment D33 d/b 'scope, £49; all with instr manuals. G8VPG, QTHR, tel: Saltford 873098 pm only.

YAESU FT230 25W fm tcvr, vgc, incl mounting brkt, manual etc, comes with mobile antenna and gutter mount, £190 ono. GM0DTJ, tel: 0224 834078 daytime OR 03586 438 evenings.

STOLLE 2050 ROTATOR, aerial, brand new, orig pkg, never used, £50, bargain! Suffolk, tel: Stowmarket 612994.

TIMESTEP SATELLITE I/FACE+ ROM for BBC Micro, £30; microwave modules cvtr 137-28, £25; Vosat rx (Wood & Douglas), £30. GM0FON, NOT QTHR, tel: 041 942 7986.

HEATHKIT MODEL 10-124, 5" oscilloscope, vgc, £50 ono, buyer collects. G4PEZ, QTHR, Louth, Lincs tel: 0507 602371.

SILENT KEY: swl rx FRG7700, immac condx, no mods, £175 ono. G3MGW, QTHR, tel: Brightlingsea 2382.

FT101ZD PLUS MATCHING SP901 spkr, £350; FC902 antenna tuner, £110; Daiwa DR7500R rotator, £90; Burns TC-101 wavemeter, £40; all in ex condx with orig boxes. G4JYK, QTHR, tel: 0260 277356.

KW2000 WITH PSU mic if req, used daily, 9 spare valves incl PA, gd condx, circuit diags and literature, £100 ono. QTH changed, now Aylesbury area, tel: 0296 624674.

ICOM25E C/W "hand DF" mic, ex condx, £160; MMT 144-28 tvtr c/w att and all plugs, ex condx, £50. GM6VPP, QTHR, tel: 041 336 4038 after 6pm.

HQ1 MINIBEAM well worn but complete, hence price, £35; 2m 4-ele Jaybeam quad new condx, £10; AVO valve tester with handbook, £12; all items for collection from Rugby. G3ADZ, QTHR, tel: 0788 815222.

TONNA 19-ELE 70cm, new unused, £19; Tonna 9-ele 2m gd condx, £10, buyers to collect. WANTED: Daiwa CN-502 swr meter. G4SOX, QTHR, tel: 0926 498388.

LUCAS NASCOM3 Micro with 64k RAM board and I/O board, £100; Gemini 64k RAM board, £35; AVC board, £50; Hitachi mono monitor, £40; 20 used 5.25" floppy disks in A4 folder, £10, West Drayton, tel: 0895 442012.

VERSATOWER GROUND POST for P40 or P60, less pulley wheels, £45, buyer collects. GM2FHH, NOT QTHR, tel: 0224 638113 office hours only.

RACAL RA17/L rx gen/cov 0.5-30MHz, ex condx, £175. G3ZJK, QTHR, tel: Rugby 810535.

YAESU FT726R with 2m, 70cm, 10/12/15m satellite unit, full Duplex cross-band, 600Hz cw filter, mains and dc leads, SP102 external spkr with audio filter, freq coverage 143.5-148.5, 430.0-440.0, 26.0-30.0, 24.5-25.0, 21.0-21.5, 2m linear BNOS LPM144-10-180, hf linear CP-163X-II, immac condx, £1,295; Yaesu FT709R 70cm handheld with FNB3(3W), FNB4(4W), NC15 fast chgr/dc adaptor and spkr/mic, £330. Bruce, G4WVX, QTHR, tel: 06286 64415.

ICOM 471E SUPERB! 70cm equip in orig pkg, bargain for quick sale, £450. GW6HQA, QTHR, tel: 0978 358480.

DATONG D70 MORSE TUTOR, £33; Hi-mound HK707 morse key, £9, both with orig boxes. GM0EFQ, QTHR, Edinburgh, tel: 031-665 4415.

70CM EQUIP: FT790R tcvr; FL7010 10W linear, both vgc, boxed with manuals, nicads and chgr; SMC mobile antenna; MET 17-ele antenna, £320. G1HZS, Melton Mowbray, tel: 0664 64287.

IC2A 2 P/packs chgr, spkr/mic, IC-CP1 chgr case, T144M ant, £110 plus postage. G4DLN, tel: 04012 4233.

TOKYO HI-PWR ATU HC400L, £110 as new; Radprint rtty tu, £30; Himound HK707 morse key, £10; Brother HR-5 printer plus mains, £75, bargain! Welz SP200 pwr meter, £20; Himound MK704 manipulator, £15; 10m 3-ele beam, £30. Norman, G4SFO, QTHR, tel: Rugby 810344.

COMMODORE 8023P TRACTOR PRINTER plus IEEE i/face, £150; psu adjustable voltage, £10 to clear. Many other oddments. Give me a ring! Norman, G4SFO, QTHR, tel: Rugby 810344.

SWAN 100MX, little used, all solidstate hf tcvr 3.5-30MHz, £280; FDK rx 40 vhf handheld rx, nicad etc, 141-180MHz, £85. GM4DKL, QTHR, tel: 086 284 2556.

FV707DM EXTERNAL DIGITAL VFO for FT707, FT77, little used, £95; Welz AC38M atu 3.5-30MHz unused, £55; Hansen FS603M pep meter 430-440MHz 5/20W, £35 George, GM4DKL, tel: 086 284 2556.

SONY RX 2001D with psu antenna, boxed as new, £225 Robert, G6SFD, QTHR, tel: Dronfield 413413.

MODEL AIRCRAFT RADIO CONTROL KITS, engines, rxs txs, servos props, tanks, wheels, goodies galore! Selling up to concentrate on amateur radio. 20yrs accumulation of equip for sale. Mike, GM4KLO, QTHR tel: 041-639 2729 anytime.

AMT-1, vgc, manual, boxed, £120. G3AKF, QTHR, tel: 0428 712574 evenings.

ICOM ICR7000 rx, remote control, AH7000 Discone, immac condx, £850. WANTED: Yaesu FT902DM, 101ZD with fm. John, G4YDM, QTHR, tel: 091-416 2606.

DRAE MORSE TUTOR, £20; BNOS 6A pwr supply, £75 new £35 used little; also TR2400 2m handheld, £100. tel: 0270 257578.

FT290R RARELY USED, muTek fitted, carrying case, set nicads, NC11C chgr, MMB11 mobile mount, manual £300 ono. G4UBO, tel: 0924 384021.

TRIO TR2600E 2m tr 3600E 70cm handheld STZ base chgr SMC30 spkr/mic 4PB26 nicads, as new £550. G4TDR, QTHR, tel: 0902 765374.

HEIL SS2 special comms spkr, see Amcomm advert, £41. G4CHP, QTHR, tel: 0508 470365.

SPECTRUM 48k COMPUTER ZX printer and paper, amateur software rtty with tu and cw plus contest dupe chelker and caps propagation, £75; want BBC with disk drive, Trio vfo 240 for 830 etc, £50. Ron Stone, Oswestry, tel: 0691 831111.

YAESU FR101 SOLIDSTATE RX, all modes, 21 500KHz bands covering 160-10m plus 2 and 6m self contained psu, gd condx, £200 ovno. G3FPB, QTHR, tel: 0529 306229 anytime.

USE YOUR 2m multimode rig to get onto hf, WPO communications tvtr, 2m to 10/15/20m, £100 ono. GM4WJA, QTHR, tel: 0343 41806.

HEWLETT PACKARD RF pwr meter 431B 10MHz to 10GHz cw head and lead gwo £110; sweep oscillator 8690B with 8698B PIN leveled solidstate plug-in 0.4 to 110MHz, £180; sig/gen 606B 50KHz to 65MHz, £50; 8708A synchronizer for above, £50; 3200B sig/gen 10MHz-500MHz small size, £150; 1801A 50MHz scope plug-in, £70; 1123A active probe dc 220MHz fet i/p in case with lots of accessories, £50; portable oscilloscope dual-beam 25MHz BW small size and light-weight all solidstate, mains or 12Vdc operation, £100; hp 2590A microwave freq cvtr, will extend your 400MHz counter to 15GHz, £75. John, G8BXH, tel: 01-428 0974.

FT101ZD FM Mk3 with fan, £475; Datong DC144/28 2m cvtr, £20. G4HLX, QTHR, tel: 03677 503.

SOMMERKAMP FT767DX, FT707, plus mic, £375; Shimizu SS105S 5-band hf, cw, ssb, fm, 10W rig with mic plus TL120 200W pep linear, £350, both recently serviced, no split, no offers; also swap 48k Spectrum with i/face and microdrive as well as leads, books, 2 games and boxed, for a hd psu 25-40A 13.8V. G4XPP, QTHR.

YAESU FT707 FC107 FP107 hf tcvr, atu, ps Adonis AM503 mic, Daiwa low-pass filter, HF5 antenna, wavemeter, DFC, Icom IC22 2m fm, Icom 1050 10m fm, ST5C rtty tv, morse key, job lot £725. Ashley, C4MGD, Essex, tel: 0268 685160.

HOKUSHIN HS HF5 vertical plus radial kit, £35 plus postage or WHY? small rx etc. G3KMH, QTHR.

TRIO TH21E plus nicad pack, chgr, 5/8 extending aerial and adapter also soft case and belt hook, £200. G6OLM, QTHR, Basildon, tel: 0268 414394.

BROTHER HR5 PRINTER, £35; Seikosha GP100A printer, £40; Alphacom 32 printer for Spectrum, £15; also lots of Spectrum software eg Tasword, Masterfile, Betabasic, the Quill, £5 ea; many more. John, G1UZN, QTHR, letters only please.

OFFERS INVITED FOR A MATSUSHITA MV1200 facsimile machine c/w Visual Sciences Incorporated 20290-100 modem, gd physical condx, but unknown electrical/electronic condx, buyer collects. G3ZDG, QTHR, tel: 0264 88768 after 6pm.

G BEDWELL have Philips tape rcdr for your blind friend, pse ring me, P Karagianis tel: Reading 722085.

TANDY TRS-80 model 4P, 2 disk drives and DMP120 printer all in ex condx, plus lots of software, £500 ono or exch for 2m multimode or WHY? G6BKX, QTHR, tel: 021-526 6850 after 6pm.

VIDEO SYSTEM c/w camera rcdr psu tuner, perfect colour, both portable and fixed stn use, sacrifice £600, no offers, demo arranged, new batty fitted range finder, Ferguson Videostar system. G4IZW, QTHR, tel: 0228 20786 anytime.

FT101ZD, trusty reliable old friend, fitted fan, cw filter, am unit and new PA valves, c/w mic, workshop manual and spare pair 6146Bs, yours for just £440 ono, buyer collects. Russell, G4ZRZ, QTHR, tel: 01-416 0514 evenings.

COLLINS KWM-1 TCVR, MM1, SM3, spare valves, pwr supply ex condx, £300; FT290R Mk1, 30W Amp, vgc, £300; Trio TL911 linear with new valves, £200; Kenpro KR400 rotator, vgc, £50. G4KSG, QTHR, tel: 021-743 7979.

ICOM IC202E TCVR with nicads, £100; FT790 as new with orig pkg, £260; MM432-20 linear, £45; two 12-ele ZL ants with pwr splitter coax connections, £45; 70cm 4-dipole vertical array 6dBd gain, £12. GOEWN, tel: Sheffield 421781.

TRIO TR751E 144MHz multimode, 6mths old, still under Trio 'Passport' warranty, £649 new, only £530 ono; Memotech 64k Z80A computer Spectrum compatible as new software and owner's club membership, only £80 ono. G8TNU, QTHR, Thame, tel: 0494 81 7833.

YAESU FT101Z+ FC902 atu, £400, will only sell both items together, both ex condx. tel: 0724 872727 between 7pm-8.30pm.

NFDs COMING 30' fully portable aluminium telescopic pneumatic mast, adjustable base for uneven ground, fully guyed, excellent seals, recently serviced, £120 ono. G3MSV, QTHR, Devon, tel: 0395 68259 anytime - answering machine.

YAESU FRG7 RX, vgc, £80; Commodore VIC-20 16k computer with C2N cassette, 1541 disk drive, 1520 Graphic printer-plotter joystick, basic manuals, floppy disks, games and things, £150 ono. G3MSV, QTHR, Devon, tel: 0395 68259 anytime, answering machine.

FT101 160-10m WORKSHOP MANUAL, ex condx, £300;

FC102 1.2kW atu as new, boxed, £120; FT290R nicads chgr, mobile mount, 7/8 whip gutter-mount, boxed £280; FT690 brand new, £230; microwave modules 25W linear and preamp, £45; AR1002 lightweight rotator £40; morsematic iambic keyer and trainer, memory approx 500 chars, fabulous machine, £85; bencher keyer, £35; Hallicrafters S27 wartime rx needs slight attn, £45; trap dipole 10-80m, £20; HQ1 mini-quad, £75; Jaybeam 6XY, £25 OR £1,000 compl. G4VVF, tel: Yateley 872467.

WIND GENERATOR, brand new, high quality with regulator, 4A, 12V at 22mph, half orig price, "Rutland" model, 1yr old, ideal portable operation £120. G3VZJ, The Danes, Slindon, Arundel, West Sussex, BN18 0ND, tel: 024-365 312.

YAESU FT480R MULTIMODE, instr book, mobile brkt, gd condx, £300; Tonna 17-ele, slight damage to directors, £20; Wolfson W1200 2m scanner fitted 8 xtals, gd wkg condx, £40. G1LUN, QTHR, tel: Leeds 676949.

CODAR PR30 PRESELECTOR, £10; Yaesu FRG7 rx, £125; unused ZX Spectrum Plus, £50; Scarab rtty terminal unit with Spectrum i/face and software, £60; Hallicrafter Super Skyrider rxs, £60 and £40. tel: St Albans 39333.

WW2 No.17 SET Super Regen 2V valve tcvr comp and in ex wkg condx, £25; ex-WD crank-up mast 33'0" brand new 4-section solid brass with winch, £100, carr extra. G4OLE, QTHR, tel: Wolverhampton 23105 evenings.

GRUNDIG SATELLITE 600 professional rx LSB/am/USB rx 2yrs old, only used in bedroom, £150. WANTED: Yaesu FRG9600 scanner; tel: Lymington 73294.

YAESU FT780R 70cm multimode, mint condx, boxed, with mobile mount, £325. G4KUR, QTHR, tel: 021-704 1236.

YAESU FT225RD fully loaded, the best one you will find! £600; Welz SP200 and Tono ASW430 meters, Icom 471E, as new, £550; all offers considered. Mike, G6GZZ, QTHR, tel: 01-977 7491.

IC240 WITH MANUAL+ extra pwr lead, £90; TR2400 2m handheld, £75; Cushcraft 3-ele 2kW hf beam, £120; 17-ele 2m Tonna, £25. G4KMG, Fareham, tel: 0329 41921.

BULLETINS/RADCOMS 1950-1986, covers and adverts removed and amateur bound in vols with index, cover the cost of this ad and they are yours to collect. G3GPB, QTHR, tel: 01-764 1380.

SOMMERKAMP FT277B hf tcvr, 160-10m, cw filter, fan C3LLL fm unit, manual, gd condx, £275; Collins 51J2 rx, 0.5-30.5MHz in 30 bands, manual, £100. G4IPI, tel: Maldon (Essex) 76572.

DRAKE TR7, PS7, NB, 500Hz filter, vgc, £850; Western PM-2000 pwr meter, vgc, £50. G4CNY, QTHR, tel: 0432 273323 daytime.

TONO 9000E communication terminal, as new, also 14" Tono 1200G monitor, sends/receives, cw, rtty ASCII KCS, £550; will consider exch for solidstate hf tcvr. This is a bargain, don't miss it! G3YVP, QTHR, tel: Wigan 41298 OR 222437 after 5pm.

TRIO TS830S, mint condx, very little used, £750. House purchase forces sale. Pete, G0EDU, QTHR, tel: 0386 858829 evenings.

KW1000 LINEAR, half-hour use since new, set of spare o/p valves, £450; Shure 444 mic, £20; 52ohm dummy load, £20. G4AQV, QTHR, tel: 0533 552809.

TRIO TS120V, digital freq controller, boxed, gd condx, p/exch for 101, 530 or similar. May sell. GM0GAV, tel: 073 886 309.

FT690R SOMMERKAMP, £200, as new, boxed, manual, or would consider swap for gd gen/cov rx. G4XAQ, QTHR tel: Nottingham 866462 daytime OR 0332 792140 after 4pm.

FT203R 2m/fm tcvr, c/w FNB3 and case, £165; BBC.B Micro, c/w dual d/s disk drive, 1200/75 modem, Solidisk 32k 2meg board, £350; Epson P40 printer, £45, various ROMS, £10. Martin, G1PXZ, QTHR, Stockport area, tel: 061-600 2982 daytime OR 0663 44051 evenings and w/ends.

IC751, £825; IC471E internal psu, £525, both ex condx. G1EGC, QTHR, tel: 02403 2752 early evenings

SX400 SCANNER, gd condx, £350 ono. G4VYI, QTHR tel: 0742 338485.

TRIO MC-85 MIC, mint, £73; spare imported copy "Yagi antenna design" by W2PV, brand new, £10. G4CHP, QTHR, tel: 0508 470365.

2x10ft SECTIONS TRIANGULAR STEEL lattice tower c/w top plate, bearing, 10F dural pole, AR22 rotator, fittings and cable, h/d 2m 6-ele Yagi, Norstel clamp, 4R67 coax and N connectors, home-built W3DZZ traps, balun, wire, Pyrex insulators, £75 the lot, prefer buyer collects. GW3YSP, NOT QTHR, tel: 0656 842027 evenings.

COLLECTION VINTAGE WIRELESS, testgear valves inc WW2 morse tape keyer, wire rcdr, incomplete A Mk3 B Mk2, MCR1, HRO M/X, psu/LS, nine coil-box, also Toroidal txfmrs, Hi-Q inductors, sae lists. G3EUR, 74 Humber Avenue, South Ockendon, Essex RM15 5JN, tel: 0708 852371.

YAESU FT101EE, am/fm, mic, manual, Yaesu ext spkr, T.W solidstate 144MHz tvtr, leads, vgc, £350. G4BMO, Hampshire, tel: Fareham 230737.

FT77 100W fm, used only for listening, FP707 psu, FC707 atu, YM34 desk/mic, immac condx, £550. Derek GW1PQE, QTHR, 7 High Terrace, Holyhead, Gwynedd, tel: 2194.

AMT2 MICROPROCESSOR CONTROLLED terminal unit rtty Amtor ASCII morse RS232, £150. G4UVJ, tel: 0268 697978.

SOTA 144-1,296MHz tvtr, £80; Daiwa DR7500 medium duty rotator with DC7001a 360deg controller, £65; new 4Cx350A valve, £20; two new high-pwr Thomson TH326 valves, eme on 1,296, see "VHF comms" for amplifier design. Andrew Renouf, tel: 0752 665342.

YAESU FRG7700 rx, FT7, FT202R, FT404R, Collins 32V3 CD45/2 rotator, 18TD, TH2/Mk3 G-whip. Dermot, E15J, tel: 071 60761.

MML 70/100 4m linear amp, £75; MET 50/3 unused, £30; MET 70/3, £18; Wood & Douglas 70PA2, £4, buyer to collect aerials. G4TIF, QTHR, tel: 0926 313669.

TRIO/KENWOOD R600 gen/cov rx 0.30MHz ex condx, £200 ono. tel: Grimsby 0472 58449 after 6pm.

MORSE AND RTTY READER model MBA RO will read cw from 3 to 80wpm built-in display readout screen, £55. GOGNO, NOT QTHR, West Sussex, tel: Burgess Hill 41011.

EXCELLENT VHF QTH, Farnham, Surrey: 3-bed semi, full gas central heating, price £65,000 includes shack and antennas. G4AGQ, Farnham, tel: 0252 722649.

TRIO TS130S with PS30 and MIC30S, £525; Icom 02E, £150; ICS AMT2, £150; all immac and very little used, carr extra. G3GVV, QTHR, Tonbridge, tel: 0732 353360.

SILENT KEY SALE: TH6DXX, £250; P60 c/w post, £250; Ham IV, £175, combined offers? Tonna 5/50MHz, £25; 12AVQ, £50. TR9000, accs, psu, £300; muTek 28/50MHz tvtr cabled for TS830/930, as new, £225; Datong Woodpecker blanker, £45; Heath monitorscope £40; 3 swr meters £8-£10 ea; Electrovoice 727 desk mic, £8; dx Edge, £8; 40W mains invtr, 12V, £8; invtr psu suit KW2000 etc, £10; QSTs from 1962, offers? All prices ono. c/o G3SEK, tel: 0235 31559

STORNO 600 mobile rx/tx mid-band, rx 140MHz easily retunes to 2m, no control boxes, £10 ea. G6HXB, tel: Uxbridge 32601.

SILENT KEY SALE: Drake R2B, £120; Liner2, £45; Hamgear PM2A, £15; SST2 atu, £10; 2 Vanguard 2 Amiod Storno COM69, offers? Class D wavemeter, £10; c/o G3ZUM, QTHR, Birmingham tel: 021-747 5077

YAESU FRG9600 Mk2 scanner rx 60-950MHz and psu, brand new in box, new March 1987 from RWC with Revcone Discone antenna, total cost £565, sell for £450, no offers, buyer inspect/collect. Mike, Wiltshire tel: 0722 23500 after 5pm or w/ends.

IC201 MULTIMODE 2m 12V mains, faulty squelch and S meter, hence price, £125 ono; Jaybeam 5-ele 2m, £5 HW100 Lo-loss coax 15m, £5; HB9CV 2m 2-ele, £3; can deliver 50mile radius. GW3YTL, QTHR, tel: Ruthin 4010 evenings and w/ends only.

KW107 SUPERMATCH ATU, £80; Heathkit monitorscope SB610, £40, buyer collects. G8WTY, QTHR, tel: Malvern 4968.

TRIO TR7800 2m fm tcvr, £165. G4DUE, QTHR Stafford tel: 0785 823720.

DRAKE TR7 TCVR, PS7 psu, MN2700 atu, SP75 speech/proc, 7077 desk/mic, mint condx, boxed, £1,350 ono Mosley TD3JR trap-dipole 20/15/10m plus UR67 feeder, unused, £68; Philips System-four, carphone direct-dial, memory, £675 tel: 0602 609345 anytime

FT102 AM/FM, ex condx, used mostly for rx last 2yrs, £525 OR take modern rx in p/exch. G4VEN, QTHR, tel: 0705 473764 evenings.

TRIO TS180S+ matching PS30 psu, gd condx, £395; Trio TH21E 2m handheld plus spkr/mic, larger nicad chgrs, soft case, as new for less than price of basic rig, £190; Drake R4, vgc, recent full alignment, manual spare valves, £150; Tentec Century 21 QSK, cw tcvr modified for optional external rx, manual, £130; MMS2 advanced morse trainer, cost £169, accept £95. G4HUX, QTHR, tel: 091-237 2798.

TS430S, £590; TV502 2m tvtr, £110; Drake MN-4 80-10 atu, £65; MFJ 941-D 160-10 atu, £60; Icom 551D all-mode 6m tcvr, £395; Azden PC2000 2m tcvr, £170; Hammerlund SP600 540KHz-54MHz, £55; BC221, £25. G3KSG, QTHR, tel: 0293 773545.

PYE PF2UB 3-chann, 70cm tcvr, vgc, fitted RB11, SU18, SU20, Toneburst, case and mic, £60; 2m linear amp with preamp 1.5W i/p 15W o/p, £25; Cobra 21X 10m fm converted CB tcvr, £25. G0EVZ, QTHR, tel: 0438 369460.

ALTRON MINIBEAM 2-ele incl balam, £55.
WANTED: Kenwood Trio SP930 spkr. G4YTF, QTHR, tel: 0533 416796.

FT290R CHGR, HELICAL, Howes tvtr, 2m i/p 10W o/p, read freq direct on 290, worked USA on ssb from urban garden, 290 has broken telescopic ant so £300(?) the lot OR exch TS120V or FT7. Kevin, G0DBI, tel: 0202 526548.

TRIO TR7730 2m fm synth tcvr 25W o/p 5-mem band and memory scan c/w mobile mount and orig pkg £165 G3WZT, QTHR, tel: 0403 710565.

HEATHKIT HW100 5-band cw/ssb 180W pep tcvr with HP23A pwr supply and manual, gd condx, £120. G3BUF QTHR, Melton Constable, tel: 0263 861434.

YAESU FT757GX HF TCVR, matching FP757GX psu and MD1B8 desk/mic, all vgc, with orig box and manuals £625 ono. G4UMO, QTHR, tel: 061-437 7281.

ICOM R70 WITH FL44A 2.4KHz I.F xtal filter. WANTED: Manual for Marconi Marine Pacific (or borrow). RS90487, 3 Albert Road, Bognor Regis PO21 1NL.

FORTOP ATV TCVR, £100; 18-ele parabeam 70cm, £10; 9-ele Tonna 2m, £10; Realistic DX200, £50; Daiwa 144MHz linear 25W, £20. Will swap all above for Beeb computer. G0DVZ, QTHR, tel: 051-625 2271.

3kW KUBOTA PETROL GENERATOR, ideal for contests or NFD. Full o/p @ 12V, 110V or 240V. New price over £700, yours for £399. G6JNS, QTHR tel: 0905 620041 anytime.

10FM 40-CHANN 4W MOBILE RIG: Amstrad CB901 fitted with Spectrum conversion board, £55. G4TLS, QTHR, tel: 0403 53051.

KW2000B, ac psu, Shure 444, £175 ono; KW107 Supermatch as new, £80 ono; FX1, hf, and Drae vhf/uhf wavemeters, £15 ono each. Lots of old components. Any offers? Mark, G4EZR, QTHR, tel: 0689 37953.

TELEFUNKEN M-24 portable studio tape rcdr c/w workshop manual, English, all valves fitted, accessories, storage deterioration only. Offers? G1NTG, tel: 0524 761078.

AR2002. Sorry all you lads who phoned last time, it's available again due to time waster! £345; TR2600E, soft case, spkr/mic, mobile stand, chgr, PB26 (x2), £375; 7600D, £125; Kawai X430 organ, £1,690 ono. All boxed, vgc. G3XLL, QTHR, tel: Mellis 596.

YAESU FT200, FP200, gd condx, spare 6JS6s, 7360 others; recent realign in current use, £180. G3SZS QTHR, tel: 0452 713761 evenings.

CDE AR40 ROTATOR, new, unused, £65; 1935 HMV model 442, mains s'het table radio in orig condx and wkg Offers? G3ONU, tel: 0923 676344.

TRIO TS430S hf tcvr, gen/cov rx, fitted with fm unit, am filter, mint condx, £695. G4CEC, QTHR, Bedford, tel: 0234 720389.

TWO 47-ELE JVL LOOP YAGI, 23 cm, £35 ea; 23-ele Tonna, 23 cm, £20; 21-ele Tonna, 70cm, old style, £20; Yaesu FC902 atu, £95; Commodore 1520 plotter, £30; DX1296 preamp, £25. John, G4ZTR, QTHR Colchester, tel: 0206 860238 evenings.

FT790R 70cm multimode with MM432/30L 30W linear amplifier, £350. G8KER, tel: Rugby 832887.

YAESU FRDX400 hf rx fitted with 2m+6m cvtrs 5KHz+ 600Hz filter+ notch filter, am/fm/ssb, plus matching spkr unit, both in mint condx, £175. GM6JOD, QTHR, tel: 0294 217383.

WANTED••••••••••

EARLY WIRELESS AND XTAL SETS; particularly WW1 sets or parts, early valves, horn spkrs, bound volumes "Wireless World", catalogues, prewar tv, also interested tinplate trains and good hf tcvr.

Jim Taylor, G4ERU, 5 Luther Road, Winton, Bournemouth, tel: 0202 510400.

B&B OR COTTAGE IN SCOTLAND during August. DJ9UN, Dick Steinhauser, Tannenweg 3A, 8702 Eisingen, West Germany.

MANUAL PRESELECT RADIO: am/fm, battery/mains, suitable for blind person, tel: 0232 793276 or write: 10 Church Road, Belfast, BT6 9RZ.

FC107 YAESU atu c/w leads, manual, gd price paid, must be in gd wkg condx, grey fascia preferred, but not essential. G4AHI, QTHR, tel: 0268 774195, evenings.

TRIO/KENWOOD: atu AT-130 with WARC. G4ZIB, QTHR, Kidderminster, tel: 0562 851046 evenings.

MK KEYBOARD MORSE SENDER. GOGOG, tel: 0602 871910.

MODERN HF RX R1000 R2000 FRG7700 etc. Will collect Rugby, tel: 0788 817932 after 6pm.

FT107 WITH PSU or TS530ST or similar tx, must be mint condx. Nick, GOHAZ, tel: 0326 241044.

HELP! Has anyone a circuit diagram or manual for a Totsuko ssb tx/rx model TR2100M? Will pay any costs and return post. G1MKD, QTHR, Great Missenden, Bucks, tel: 024028 325.

LARKSPUR B47 or B48 radio sets, prefer complete installation, also any Clansman bits & pieces wanted for military vehicle club, Diorama need not be wkg. G4YMP, QTHR, tel: 0424 51795.

HOME-MOVIE PROJECTOR 9.5mm gauge, say Pathe 200B/ Specto. Having recently discovered cans of my 1950's family home-movies, I would enjoy watching these again as family now deceased. Write with details G3OEJ, QTHR. No callers please, disabled pensioner.

SONY SERVICE INFO for AVC 3420CE camera and CVM90UB monitor, all costs refunded and replies answered. G8UDJ, QTHR, tel: 0865 735821.

TECHNICAL BOOKS: History of Marconi company; MIT radiation series; threshold signals, xtal rectifiers; principles of microwave circuits; components handbook. Medium duty rotator KR400 etc FOR SALE: Cossor 4" crt. Offers? Cooper, 52 Eastheath Avenue, Wokingham, Berks RG11 2PJ, tel: 0734 791488.

SIDE SWIPER KEY: AKA double-speed key, preferably a Bunnell, offer £50 or thereabouts. State make. G3HDB, QTHR.

SONY ICF2001D. Beginner would like mint condx model. Alan Newton, tel: 02372 78205.

FV102DM EXTERNAL VFO for FT102, best price paid, must be in mint condx, buyer collects or pays carr G4ZOY, QTHR, Ashington, tel: 0670 811950.

FV102DM, FC102, SP102, FL2100Z or similar linear, also Icom 451E or similar 70cm base tcvr. May consider TS780. GODZJ, Leics, tel: 0455 282168.

URGENTLY: YAESU FT230 mobile 2m rig. Condx and price to G1EXK, QTHR, tel: Norwich 45791 after 6pm

WARTIME SUITCASE RADIO A Mk3 (B2 minor) or any other clandestine and resistance type radios for collection. Any condx welcome. Manuals and accessories. G40FO, QTHR, tel: 01-949 2317.

VACUUM VARIABLE/fixed capacitors module 11 for Plessey PR1551 rx; Bird Thruline equip; CDE rotator with/out control unit; Drake hf equip for repair/rebuild; vacuum relays. tel: 03306 613 after 7.30pm and w/ends.

MONITOR SCOPE URGENTLY SOUGHT any model considered eg SB610, SB614, KW108, YO901 or WHY? also scrap SB610 for txfmr, else selling SB610; txfmr requires EHT rewind, £25. GM4GTU, QTHR, tel: 0224 743039 evenings OR 0224 646464 extn 251 daytime. Your help appreciated.

EARLY WIRELESS AND XTAL SETS: particularly WW1 sets or parts, early valves, horn spkrs, bound volumes "Wireless World", catalogues, prewar tv, also interested tinplate trains and gd hf tcvr. G4ERU, Jim Taylor, 5 Luther Road, Winton, Bournemouth, tel: 0202 510400.

CB RADIOS: Have you given up CB? Why not donate your set to CB for the Blind Scotland regd charity No. 286044. tel: 041 429 6921 9am-5pm Monday to Friday or send to: PO Box no 8, Falkirk FK2 8YB, GM0ETC.

ICOM 251E with muTek front-end; 4m tvtr 28MHz I.F FOR SALE: TR7500 2m/fm 10W synth rig in orig pkg c/w workshop manual, £175. tel: 040372 2444, evenings.

BELCOM LS102L, gd price for gd rig. Will travel to see rig. GM1FMP, QTHR, tel: 041 649 5371.

TWTA PLUS PSU for 10GHz; SMA or WG16' I/O. Gd price pd for right item. HP431 or HP432 pwr meter + heads. Naylor, tel: 0268 751417 after 6pm or w/ends.

G2DAF RX Mk2 with mechanical filter preferred but anything considered incl non-worker or unfinished project. Also G3PDM rx. G4LSA, QTHR, tel: 0785 74388.

RUBBER DUCK FOR TRIO 2300. tel: Bude 0288 2747.

KW VICEROY Mk4, KW Vanguard and KW77 rx, must be in gd wkg order and original. Steve, G4LJZ, QTHR, tel: 0749 77250.

CRT FOR TEKTRONIX 545B part no T5470-31-2 to replace one with cathode to grid flashover. Phil Pardey, RS87250, Glyn House, 43 Burgh Heath Road, Epsom KT17 4LY, tel: 03727 25564.

HAS ANYONE COPY OF AMATEUR RADIO TECHNIQUES 7th edition which they no longer want? Thompson, C3AMF Friedhofstrasse 17, 7024 Sielmingen, West Germany.

HF BAND EQUIP in first class order, comp line-up preferred, Drake KW FT101 etc. Cash settlement. Will collect within 150 miles. G3RYV, QTHR, tel: 066 67 467.

TRIO TS830S in gd condx with or without filters and vfo; also Commodore 1541 disk drive. Details to GW3CDP, QTHR, tel: 0792 813205.

MUTEK 251ub FRONT-END BOARD for Icom IC251E; Datong D70 morse tutor. G8WAS, QTHR, Romford, tel: 0708 42309.

WARTIME MANPACK SETS WS-18, WS-68, supply unit No.5; also tx unit to complete WS-48; also the following manuals, AP-2276 series, AP-2536C, TM11-487, TM11-227B and TM11-227E. G4WWX, QTHR.

VIBROPLEX BUG KEY standard or de-luxe model. G3VMW, QTHR, tel: 0937 844510 after 6pm.

AMSTRAD 464 with colour monitor, j/stick+ software, exch for hf, rx of equal value, must have digital readout, circa £150. RS90165, tel: 0329 289160 evenings.

CIRCUIT AND MANUAL for Trio JR 500S rx will photocopy or pay for cost of copying also mods for Trio 9R59D rx to prevent pulling of vfo. GW3YTL, QTHR, tel: Ruthin 4010 evenings.

MOTOROLA CD100 uhf mobile tcvr service manual to buy or copy. G1PJO, NOT QTHR, tel: 0778 344934 after 4.30pm.

DRAKE "C" LINE RX or tx and accessories; MN4 MN2000 4-NB DC4 set of spare tubes etc, etc. G3ESY, tel: 0432 57651 anytime.

TRIO TR2300 with nicads chgr etc. Must be cheap. G8RHL, NOT QTHR, tel: 0226 755803.

HANDBOOKS FOR PET/CBM 3032 possibly personal computer guide by Osborne McGraw-Hill; also handbook for Epson printer TX80B. G2ABC, QTHR, tel: Truro 78393.

TRIO 530S, 430S or 130S and BBC Model B. G3XFB, QTHR, tel: 0902 850033.

SERVICE MANUAL for Pye Westminster W15 AM; Circuit diag for Lafayette HA600, buy or copy, all costs reimbursed. G8CMP, QTHR, tel: 051-424 5169.

HELP OR ADVICE on servicing Racal Tactical green equip, back pack tcvr, your price willingly paid. G3YJD, QTHR, tel: Watford 45133.

WILL PAY FOLLOWING PRICES for National Company Malden HRO equip, orig manuals, £5-£10; speaker enclosures, £15-£20; psus, £5-£10; rack mounting combined spkr/psus, £30; rack mounting coil holders, £10-£20; German and Japanese WW2 HRO copies, £150. tel: St Albans 39333.

JOYSTICK AND JOYMATCH preferably of type for high i/p. G4CNB, tel: 0621 782388.

FT75B, new owner urgently requires ext vfo or info for same. GW4UZL, tel: 034 882 346.

PYE POCKETFONE 8 service manual to purchase or copy. Chris, G4VFK, QTHR, tel: 0602 226321.

TRIO AT230 atu, must be gd condx, dummy load 50ohm at least 100W continuous. Pete, G3WBI, QTHR, tel: 0282 59116.

SCANNER 2002, 2001, 9600, IC7000 or similar, must be fb condx; also TS440 or TS430 in fb condx. Details and prices etc to G2SP, QTHR, tel: 0602 256597.

TRIO TR9130 2m multimode, must be in ex condx, or Icom 290E or 290D must be in ex condx. Above to be c/w mobile brkt and handbook. Phil, G6DBO, QTHR, Staines, Middx, tel: 0784 56169.

MM MORSE TALKER MMS1, cash waiting for one at sensible price, also 2m 100W o/p amplifier, solid state. G3ZUM, QTHR, tel: 021-747 5077.

TEN-TEC CORSAIR, TS930S or similar. Tony, G4ZYQ, QTHR, Preston, tel: 0772 742823 after 2pm.

CIRCUITS, HINTS, TIPS or any other data for the following: AOR2001 scanner, Standard C146 2m handheld and Kenwood TR-7800. Tony Cox, G8TEE, 66 Royal Mint Street, London, E1 8LG.

FT7B YAESU SOLIDSTATE hf tx/rx 50W o/p with mic and, if poss, YC-7B digital display and FP-12 ac psu. Must be c/w manual and perfect wkg order, no mods. GOAES, QTHR, tel: 0622 685443.

EDISON "GEM" PHONOGRAPH CYLINDERS circa 1900 and any info on the history of the "Gem" and its manufacture. Also Edison Idelia phonograph. G3HGE, QTHR, tel: 028484 452.

RAD COMS 1956, 1969, 1981, 1982, complete years required; will collect if reasonable distance or pay postage. G1ALZ, Worcestershire, tel: 0562 2567 daytime OR 0562 743004 after 6pm.

VFO FV101DM OR FV901DM; also HT psu for 813 linear Could arrange to collect within 100 miles. FOR SALE: Microwave modules atv cvtr, £19; Datong FL1, audio filter with auto notch, £30. G4WOX, QTHR near Newcastle, tel: 0670 815587.

EDDYSTONE EA12 hf rx. G3PJK, QTHR.

ROTATOR KR400RC OR SIMILAR, suitable for 2-ele Triband quad, tower mount. Am fed being too late with "For sale" ads. Can anyone help? Bob, GOARF, QTHR, Hereford, Pembridge, tel: 05447 350.

COPY OF MANUAL for Eddystone 770R rx, copying and postage costs will be paid. Peter, G4DXO, QTHR, Brighton, tel: 0273 561616.

70CM QRO LINEAR eg 4Cx250 incl psu; also FT780 or similar, 2m masthead preamp, muTek, ssb, etc; must handle 400W. Mike Willis, tel: Guildford 571281 extn 2302 office hours OR 234122 evenings.

ALL MEMBERS' ADS RECEIVED UP TO 22 APRIL

HAVE BEEN INCLUDED IN THIS ISSUE

KW TEN-TEC CORSAIR II

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2·2/50 **5p**	22/25 **6p**	47/50 **6p**	150/16 **7p**	470/16 **11p**	1000/25 **18p**
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0·47/35 **14p**	4·7/25 **15p**	22/6 **20p**	33/10 **30p**	100/3 **35p**
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100/1A 1N4002	**4p**	1000/1A 1N4007	**7p**	60/1·5a S1M1	**5p**	100/1A Bridge	**25p**
400/1A 1N4004	**5p**	1250/1A BY127	**10p**	30/45mA OA90	**6p**	30/150mA AA143	**8p**

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LEDs Red, Green, Yellow 3 & 5mm, **10p.** 8mm, **35p.** Grommets 3 & 5mm, **2p**
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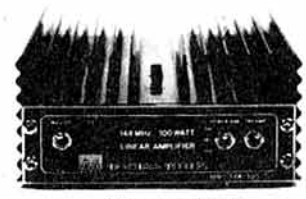

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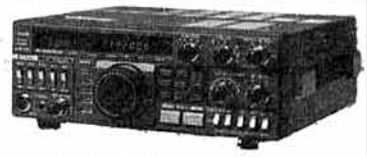

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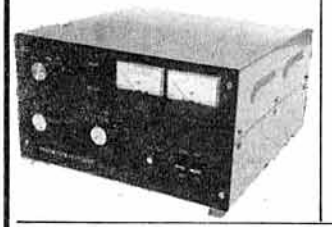

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MATCHING Another advantage of the capacitors in circuit is to provide proper matching from the 50 ohm impedance of the coax cable to the 800 ohm travelling wave impedance of the wire of the dipole. This is fully explained in the article "A no-compromise multiband, low VSWR dipole" by GM3HAT in the May 1987 edition of HAM RADIO magazine in the USA.
EFFICIENCY The third advantage of putting capacitors in series with the conductors of the dipole is to increase the travelling wave magnitudes, by reason of the diminished series impedance presented. The major part of the 50 ohms source impedance is not now in series with the travelling waves, there is only a transformed down component of it presented. Thus the travelling waves are only damped by radiation (and a little copper loss) and not half-damped by source impedance.
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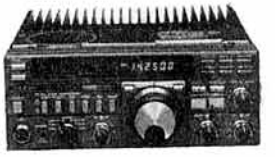

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"ALL RISKS" INSURANCE for portable/mobile/base station amateur radio and ancillary equipment. A service for RSGB members only. Also public liability and equipment insurance for affiliated clubs and societies. Details and leaflets from Nick Gibson, Amateur Radio Insurance Services Ltd, 19 Quarry Street, Guildford, Surrey. Tel: 0483 33771.

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Morse Code for Radio Amateurs	£3.15	£2.68
RSGB Amateur Radio Call Book, April 1987	£6.46	£5.49
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Radio Communication Handbook Vol 2 (hb)	£9.41	£8.00
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Radio Data Reference Book (5th edn)	£9.59	£8.15
Teleprinter Handbook (2nd edn)	£8.05	£6.84
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PRICES. These include postage, packing and VAT where applicable, and are subject to change without notice. For airmail despatch, please ask for price before ordering. Goods are obtainable, less p & p, at RSGB headquarters between 10am and 4pm, Monday to Friday.

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MICRO BOOKS

If you own a computer you will find our stock of books on all types of computer topics invaluable. Take your pick from our recently expanded range.

MICROCOMPUTERS IN AMATEUR RADIO by Joe Kasser, G3ZCZ, contains valuable reading for anyone who wishes to use microprocessors to control amateur radio equipment. The book contains an introduction to the computer as a station accessory, followed by chapters on Microprocessors, Standard I/O Devices, Interfaces to the Amateur Radio Station, Categories of Systems, Programming the Microprocessor, The Golem-80 Project (a design for a home-constructed computer), Monitor and Debugging Software, and Assembly Language Software Programming Techniques. There then follow four chapters on hardware and software techniques for Morse Code transmission and reception, RTTY, Logging, and a Self-Operating RTTY Contest Station. There are eight appendices covering a whole range of useful data. All this in 308 pages costs just £9.99 to RSGB members by post. Published by TAB Books.

To complement this book is another by Joe Kasser entitled ***SOFTWARE FOR AMATEUR RADIO***. This book contains a wide range of Basic programs that have been tested and debugged under operating conditions. Chapters include Computer-aided Design and Circuit Analysis, Logging, Awards, Contests, Simulations and Modelling, Antenna Positioning and Pointing, Satellites, Hardware-dependent Software, and Digital Communications. Full program listings are provided in many cases, and sample contest and antenna positioning programs are contained in two appendices. A thoroughly practical look at Basic programming for the radio amateur, ***SOFTWARE FOR AMATEUR RADIO*** costs £14.50 to members by post and contains 280 large-format pages. Published by TAB Books.

Another book to whet your appetite is ***AMATEUR RADIO SOFTWARE*** by John Morris, GM4ANB. This book, published by the RSGB, contains almost 100 different programs of use in amateur radio. Following the introductory chapter there are chapters on CW Sending and Receiving, RTTY and Data (including Amtor and packet radio), Antennas and Propagation (including programs for troposcatter path loss, power budgets, hf predictions, linear array analyses and microwave horn design), Distances Bearings and Locators, and Satellite Tracking. There follows a chapter devoted to programs suitable for predicting the position of the sun and moon. Finally there is a chapter on Circuit Design Aids, and a miscellany of listing programs and a network analysis calculator. The three appendices include Basic conversion guides for the BBC, ZX Spectrum, and Sinclair QL computers. All-in-all a very readable book in a friendly, chatty style. This hardbound volume contains 328 pages and costs a mere £7.76 to RSGB members by post. At that price it has to be the bargain of the year.

While on the subject of computer software, a reminder that the RSGB ***SOFTWARE REGISTER*** is now available from headquarters. Compiled by John Morris, this is a list of over seven pages containing a directory of amateur software currently available from both amateur and professional sources. At just £1 to members by post you can't really afford not to have one.

OTHER NEW TITLES

Finally, a brief look at some more recent additions to the RSGB book list. The ***MASTER HANDBOOK OF HAM RADIO CIRCUITS*** is crammed with just about every circuit idea you could ever possibly want. It includes traditional circuits using valves, circuits using ics and microprocessors, and everything in between. A must for the experimenter at £8.49 to members by post. The ***RTTY AWARDS BOOK*** by Ted Double, G8CDW, of BARTG has just become available. This is a directory of all the awards available to rtty enthusiasts around the world. It costs £6.29 to RSGB members by post. And if you ever operate through repeaters you must have a copy of the RSGB Repeater Management Group's latest booklet ***THE INS & OUTS OF REPEATERS***. All you need to know about repeaters in one handy booklet for £1.89 to members by post.

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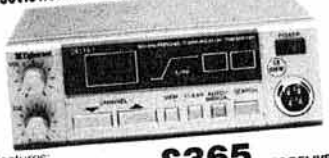

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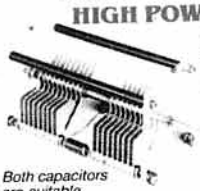

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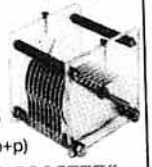

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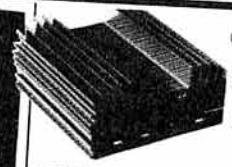
MOBILE RF AMPLIFIERS



C.T.E. MOD 757

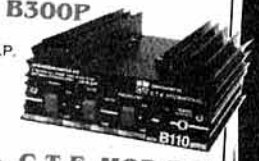
FREQ: 3-30MHz
RF OUTPUT: 300W P.E.P.
100W Class AB
150W Class C
Remote Control Facility

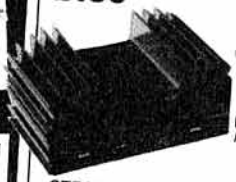
£116

ZETAGI MOD B300P

FREQ: 3-30MHz
RF OUTPUT: 300W P.E.P.
150W FM
RF INPUT: ·5 to 10W

£136





C.T.E. MOD 767

FREQ: 26-30MHz
RF OUTPUT: 76W FM
150W P.E.P.
RF INPUT: ·5 to 10W
Remote Control Facility

£49.90

CTE MOD 737 50W FM/80W P.E.P **£44.76**

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SUPPLY:- 13.8V DC
FREQ.- 26-30 MHz

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Finally, an HT that's built to take the realities of life.

Let's face it. It's easy to bump, drop, or get rain on a portable. But if *your* portable is Yaesu's mini 2-meter FT-23R or 70 cms FT-73R, such mishaps are a lot less worrisome. They're built to last, with rugged aluminium-alloy cases that prove themselves reliable in a one-meter drop test onto solid concrete. Plus, their moisture-resistent seals really help keep the rain out.

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Radios above shown actual size.

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